WSMR 06

DEPARTMENT OF THE ARMY
U.S. ARMY GARRISON WHITE SANDS
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WHITE SANDS MISSILE RANGE, NEW MEXICO 88002-5000

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NMED Hazardous Waste Bureau

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REPLY TO
ATTENTION OF

Public Works Directorate

Mr. James Bearzi
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

Subject: Submittal of the *Phase III RCRA Facility Investigation Work Plan Former Main Post Landfill No. 3 (Scrap Yard)* dated June 2006; IRP Site WSMR-61 (SWMU 65)

Dear Mr. Bearzi:

Enclosed you will find the subject work plan (1 print copy and one electronic copy on CD) for Solid Waste Management Unit 65. The document is in response to a July 14, 2003 letter received by us from Ms. Cheryl Frischkorn of your Bureau and is a follow-up to our December 19, 2003 initial response. The plan's specifics are the result of cooperative and coordinated efforts between Ms. Frischkorn and our staff. We believe the work plan addresses all NMED 2003 comments. Our responses are summarized in a table enclosed within the work plan.

We currently posses funding to execute the work plan as it is currently written. We urge its expeditious review so that fieldwork can begin. We understand final review is subject to payment of any applicable review fees. We appreciate your attention to this matter.

The following certification is provided as required by our permit:

> *"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."*

Copies furnished, with enclosure (1 print copy w/CD), to Ms. Cheryl Frischkorn, NMED-HWB; Mr. Chuck Hendrickson, Region VI EPA; Ms. Stephanie Sigler, U.S. Army Environmental Center; and, without enclosure, to Mr. John Kieling, NMED-HWB; and White Sands Technical Services, LLC.

Should you have any questions regarding this matter, please contact Mr. Jose Gallegos at (505) 678-1007.

Sincerely,

Thomas A. Ladd

Thomas A. Ladd
Director, Public Works

Enclosure

WSMR Environmental Document ES-EC-TO-009-05-090

FINAL

PHASE III
RCRA FACILITY INVESTIGATION WORK PLAN

Former Main Post Landfill No. 3
(Scrap Yard)

WHITE SANDS MISSILE RANGE

INSTALLATION RESTORATION PROGRAM
WSMR-61 (SWMU 65)

June 2006

White Sands Missile Range
Environment and Safety Directorate
White Sands Missile Range, New Mexico 88002
EPA ID# NM 2750211235

WHITE SANDS TECHNICAL SERVICES

Response to NMED Request for Supplemental Information relating to the Report on the RCRA Facility Investigation, Former Main Post Landfill No. 3 (SWMU 65) WSMR-61 (June 2001)				
Com-ment Number	**Document Reference**	**NMED Comments**	**Document Reference**	**How the comment is addressed in the Phase III RFI Work Plan (June 2006)**
1	RFI Report (Jun 01) Section 2.2.2	Section 2.2.2 states that the ground water analysis resulted in the detection of barium at background concentrations and that all laboratory results from the analysis of the drilling mud and cuttings were reported at background levels. However, WSMR has not presented statistical background calculations for inorganic constituents in the ground water or the soils at Main Post Landfill #3. In order for WSMR to use detected inorganic parameters for comparison to background, background must be statistically calculated for both soil and ground water at the site. WSMR may use the values that will be generated from the forthcoming soil background study for the Main Post.	Ph. III RFI Work Plan Section 2.3.3 & 2.4.3	WSMR has and will develop a suite of background levels in soil and groundwater for this site. WSMR completed the background soils study (*Background Soils RCRA Facility Investigation Report for the Main Post, September 2004),* currently under review with NMED. Data from prior groundwater monitoring events (1997-2001) at the site will be utilized to define the inorganic background constituents.
2	RFI Report (Jun 01) Section 2.2.2	Section 2.2.2 of the report states that during Phase I RFI (1992) sampling, the trace amounts of total petroleum hydrocarbons (TPH) that were detected in the ground water were considered to be the result of either well material leachate or from ambient air near freshly painted well encasements. However, the Phase II RFI (1994) soil sampling results indicated levels of TPH as high as 13,000 mg/kg. WSMR must investigate the occurrence of TPH in the soil and ground water at the site and determine the source.	Ph. III RFI Work Plan Section 2.4	WSMR has developed the Phase III RFI Work Plan to investigate the occurrence of TPH both in the groundwater and soil at the site.
3	RFI Report (Jun 01) Section 2.2.3	Section 2.2.3 states that during the Phase II RFI activities, soil samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), TPH, and metals and that the results of the analysis revealed no constituent of concern above background levels. Again, WSMR has not presented statistical background calculations for inorganic constituents in the soil at the Main Post. In addition, WSMR cannot compare detected organic constituents with background values.	Ph. III RFI Work Plan Section 2.4 & 4.2.4	See response to Comment Number 1. Analytical results from the Phase III RFI that have detections of organic compounds will be screened (Tier 1) for human and ecological contaminants of concern. Tier 1 screening levels will be based on NMED-HWB guidance.
4	RFI Report (Jun 01)	WSMR must compare concentrations of contaminants detected in the ground water and soil to residential values or site-specific calculated background values for inorganics and not industrial values.	Ph. III RFI Work Plan Section 2.3.3, 2.4.3, & 4.2.4	See response to Comment Numbers 1 and 3.

Response to NMED Request for Supplemental Information relating to the Report on the RCRA Facility Investigation, Former Main Post Landfill No. 3 (SWMU 65) WSMR-61 (June 2001)				
Com-ment Number	**Document Reference**	**NMED Comments**	**Document Reference**	**How the comment is addressed in the Phase III RFI Work Plan (June 2006)**
5	RFI Report (Jun 01)	Hydrogeologic cross-sections are needed to illustrate the geology, hydrogeology, and the relationships of well screen locations and depths to the potentiometric surface, and the dimensions of the landfill. Construct hydrogeologic cross-sections to illustrate significant data at the site. Refer to Section 1.2.3 of the 1986 RCRA Groundwater Monitoring Technical Enforcement Guidance Document.	Ph. III RFI Work Plan Figures 4 & 5	WSMR has developed hydrogeologic cross sections from existing data.
6	RFI Report (Jun 01) Table 2-4	Table 2-4 lists the analytical results for SVOCs for soil samples during the Phase II RFI. Benzo(a)pyrene was detected at 1060 *u*g/kg at 15 feet, which is greater than the New Mexico Soil Screening Level (NMSSL) of 620 *u*g/kg. WSMR must address this SVOC detection.	Ph. III RFI Work Plan Section 2.4 & Figure 6	As part of the Phase III RFI Work Plan, WSMR has specified sampling locations to address this SVOC detection.
7	RFI Report (Jun 01)	A review of the ground water monitoring system at the Former Main Post Landfill #3 has revealed several potential problems. First, it appears that monitoring well MW-5 is currently the only true downgradient well that is capable of promptly detecting releases from the landfill. Second, the screened intervals of all the wells are well below the historic potentiometric surface, therefore, the current monitoring well system is unable to detect light non-aqueous phase liquids (LNAPLs) that may be in dissolved phase near the water table or on the water table. And lastly, WSMR states that the source of THP detected in the ground water during Phase I RFI activities as either well material leachate or from ambient air near freshly painted well encasements. This may be an indicator that some ground water monitoring wells may not meet the requirements for RCRA-constructed wells and, therefore, do not yield representative samples. WSMR must re-evaluate the ground water monitoring system to determine if it has the capability to yield representative samples, whether it meets RCRA monitoring well construction requirements, and whether there are at least two downgradient wells located directly downgradient of the landfill that are capable of detecting any releases from the landfill.	Ph. III RFI Work Plan Section 2.4.2 & Figure 6	WSMR has evaluated the groundwater monitoring system and the well construction data available for MW-4, 5, 7 and 8. Based on this review WSMR has proposed locations for new monitoring wells which will be screened at the water table interface and will be constructed according to appropriate RCRA guidance. The proposed monitoring well network should be capable of detecting potential releases from Main Post Landfill No. 3.

Response to NMED Request for Supplemental Information relating to the Report on the RCRA Facility Investigation, Former Main Post Landfill No. 3 (SWMU 65) WSMR-61 (June 2001)				
Com-ment Number	**Document Reference**	**NMED Comments**	**Document Reference**	**How the comment is addressed in the Phase III RFI Work Plan (June 2006)**
8	RFI Report (Jun 01)	The title of the document does not indicate if this document is a report or a work plan. In the future, WSMR must use correct document titles that correspond with those specified in 20.4.2.200 (G) NMAC.	Ph. III RFI Work Plan Section 4.2.4	WSMR will provide correct document titles in accordance with those specified in NMAC 20.4.2.200 (G).

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6. AUTHOR(S) James J. Thompson, P.E., White Sands Technical Services, LLC Fred Bourger, Senior Engineer, White Sands Technical Services, LLC		**5d. PROJECT NUMBER** TO09 **5e. TASK NUMBER** TO09
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) White Sands Technical Services, LLC P.O. Box 363 WSMR, NM 88002		**5f. WORK UNIT NUMBER** **8. PERFORMING ORGANIZATION REPORT NUMBER** ES-EC-TO-09-05-090
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Department of the Army U.S. Army White Sands Missile Range 100 Headquarters Avenue ATTN: IMSW-WSM-PW-E-EC (Jose Gallegos) White Sands Missile Range, NM 88002		**10. SPONSOR/MONITOR'S ACRONYM(S)** **11. SPONSORING/MONITORING AGENCY REPORT NUMBER** ES-EC-TO-09-05-090
12. DISTRIBUTION AVAILABILITY STATEMENT		
13. SUPPLEMENTARY NOTES		

14. ABSTRACT

This Work Plan specifies the proposed actions necessary to continue the investigation of SWMU 65 and determine with a reasonable amount of certainty whether a release of contamination has occurred. In order to accomplish this, four additional monitoring wells will be installed and six new bore holes sampled within the former landfill area. From the additional data gathered more accurate hydrogeologic cross-sections may be developed. Additionally, the wells and borings described in this work plan are intended meet NMED's requirements for appropriate sampling in order to determine if SWMU 65 has impacted the local groundwater.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**		23	**19b. TELEPHONE NUMBER (*Include area code*)**

PHASE III
RCRA FACILITY INVESTIGATION WORK PLAN
FORMER MAIN POST LANDFILL NO. 3 (SCRAP YARD) WSMR-61; SWMU 65

Submitted to:

U.S. Army
White Sands Missile Range
Environment and Safety Directorate
White Sands Missile Range, New Mexico 88002-5048

June 2006

Submitted by:

White Sands Technical Services, LLC
Building 126
White Sands Missile Range, New Mexico 88002

EXECUTIVE SUMMARY

The Former Main Post Landfill No. 3 is located in the southeast portion of the Main Post area, White Sands Missile Range (WSMR). This site is identified as Solid Waste Management Unit (SWMU) 65 in the Resource Conservation and Recovery Act (RCRA) Part B Permit, Corrective Action Module VIII, and as WSMR-61 in the U.S. Army Installation Restoration Program (IRP). The 2004 Annual Unit Audit (AUA) listed this site as an operating unit requiring or undergoing closure. The site is identified as operating unit LDU-10 on Table A (2004 AUA).

SWMU 65 was believed to be in operation from 1965 through 1982, although surface disturbances are visible at the site in a 1961 aerial photograph. This landfill overlies a portion of the fresh water aquifer utilized by WSMR for drinking water. A primary driver in closing the landfill was concern over possible negative impacts to the aquifer due to the location and potential contents of the landfill. The closure occurred in the early 1980s, prior to the implementation of RCRA. During the active use period of the landfill and thereafter, the area was also used as an accumulation point for scrap metal.

A Phase I RCRA Facility Investigation (RFI) was conducted by International Technologies Corporation (ITC) and published in 1992. As part of this investigation, a soil gas survey was performed at SWMU 65. A geophysical survey identified the approximate limits of disturbed soils. Two monitoring wells (designated MW-4 and MW-5) were installed to aid in detecting possible impacts to the groundwater beneath the site. Soil cuttings and groundwater were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), metals, and cyanide.

The Phase II RFI was conducted by Sverdrup Environmental, Inc. (SEI) and published in 1994. This second phase included another soil gas survey, seven soil borings, and the installation of two additional monitoring wells (designated MW-7 and MW-8). Soil and groundwater samples were analyzed for VOCs, SVOCs, TPH, and metals. Based on the soil boring logs, the bottom depth of the landfill was estimated to be 17 to 21 feet below the ground surface.

Long-term groundwater monitoring of the site was conducted semi-annually from the fall of 1996 to 2000 (exceptions to this are spring 1997 and fall 1999, in which no samples were collected). The list of analytes included VOCs, SVOCs, metals, explosive residues, cyanide, dissolved ions, and fuel hydrocarbons. During this monitoring, contaminants of concern were not detected. This led WSMR to believe SWMU 65 posed no threat to the local groundwater. Thus, in June 2001, WSMR submitted an RFI report supporting a determination of “No Further Action” for SWMU 65. The New Mexico Environment Department (NMED) responded with a Request for Supplemental Information (RSI) which included eight comments requiring additional investigation or clarification (Frischkorn, C., correspondence dated 14 July 2003). Thus, WSMR was required to continue the RFI phase at SWMU 65. WSMR has responded with proposed steps to satisfy NMED’s RSI. This RFI Work Plan is a direct result of this aforementioned process. The RSI and WSMR’s response are included with this Work Plan as Appendix A.

This Work Plan specifies the actions necessary to continue the investigation of SWMU 65 and determine, with a reasonable amount of certainty, whether a release of contamination has occurred. In order to accomplish this, four additional monitoring wells will be installed and six new bore holes sampled. From the additional data gathered, more accurate hydrogeologic cross-sections may be developed. Additionally, the wells and borings described in this Work Plan are intended to meet NMED’s requirements for appropriate sampling in order to determine if SWMU 65 has impacted the local groundwater. Detected analytes will either be compared to background values established by the recent RFI Background Soils Study completed by BAE Systems (September 2004) or to soil screening levels established by NMED. After execution of the Work Plan and conclusion of the sampling efforts, a RFI Report will be completed and presented to NMED.

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APPENDIX B Conclusions Phase I & II RCRA Facility Investigations

APPENDIX C Project Schedule

APPENDIX D Site Specific Health & Safety Plan

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LIST OF ACRONYMS

AUA	Annual Unit Audit
CFR	Code of Federal Regulations
DAF	Dilution Attenuation Factor
DQO	Data Quality Objective
DRO	Diesel Range Organics
DSERTS	Defensive Site Environmental Restoration Tracking System
EPA	Environmental Protection Agency
FID	Flame Ionization Detector
GC	Gas Chromatograph
GRO	Gasoline Range Organics
HA	Health Advisory
HPLC	High Performance Liquid Chromatography
ICP-AES	Inductively Coupled Plasma – Atomic Emission Spectroscopy
IRP	Installation Restoration Program
LNAPLs	Light Non-Aqueous Phase Liquids
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MEK	2-Butanone
mg/L	Milligrams per liter
MIBK	4-Methyl-2-pentanone
MS	Mass Spectrometry
NAVD88	North America Vertical Datum 1988
NEL	Nuclear Effects Laboratory
NFA	No further action
NMED	New Mexico Environment Department
NMSA	New Mexico Statutes Annotated
NMWQCC	New Mexico Water Quality Control Commission
PQL	Practical Quantitation Limit
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RPD	Relative Percent Differences
SM	Standard Methods
SSHSP	Site Specific Health and Safety Plan
SSL	Soil Screening Level
SVAD	Survivability, Vulnerability, & Assessment Directorate
SVOCs	Semi-volatile Organic Compounds
SWMU	Solid Waste Management Unit
TCE	Trichloroethylene
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
ug/L	Micrograms per liter
UXO	Unexploded Ordnance
VOCs	Volatile Organic Compounds
WSMR	White Sands Missile Range

PHASE III RCRA FACILITY INVESTIGATION WORK PLAN FORMER MAIN POST LANDFILL NO. 3 (SCRAP YARD) WSMR-61, SWMU 65, and LDU-10

1.0 INTRODUCTION

White Sands Missile Range (WSMR) has the requirement to further investigate the Main Post Landfill No. 3. This site is identified as Solid Waste Management Unit (SWMU) 65 Resource Conservation and Recovery Act (RCRA) Part B Permit and WSMR-61 in the U.S. Army's Installation Restoration Program (IRP). The 2004 Annual Unit Audit (AUA) listed this site as an operating unit requiring or undergoing closure and identified it as operating unit LDU-10 on Table A (2004 AUA). Main Post Landfill No. 3 is located southeast of Main Post and west of the Survivability, Vulnerability, & Assessment Directorate (SVAD) [formally known as the Nuclear Effects Laboratory (NEL)] (see Figure 1).

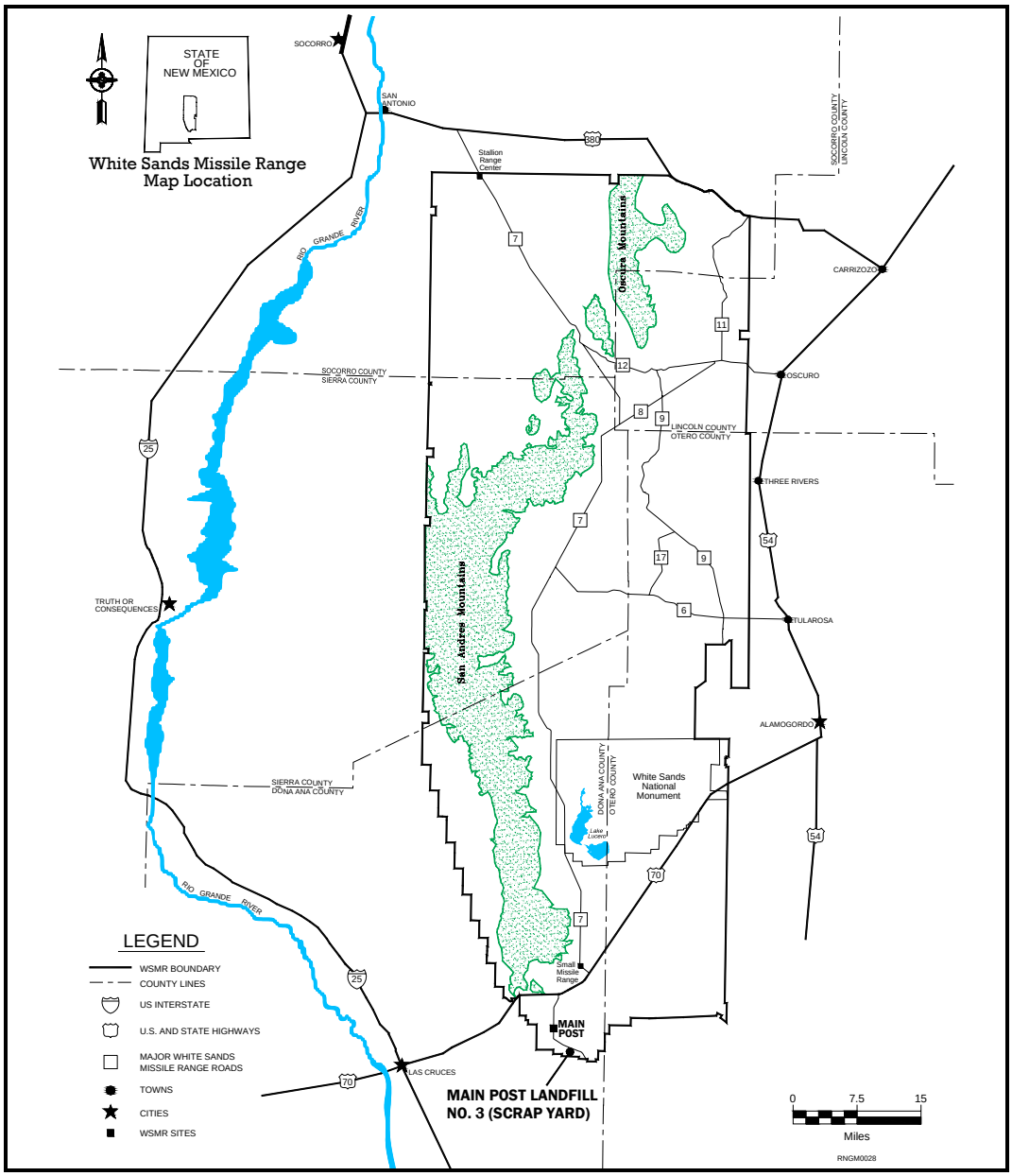


FIGURE 1. SITE LOCATION MAP

Main Post Landfill No. 3 was reportedly utilized to dispose of inert sanitary materials generated on WSMR. A portion of the site was also utilized as a scrap metal accumulation area. Records indicate usage from 1965 to 1982, although 1961 and 1963 aerial photographs show surface disturbances at the site. A site diagram is included as Figure 2.

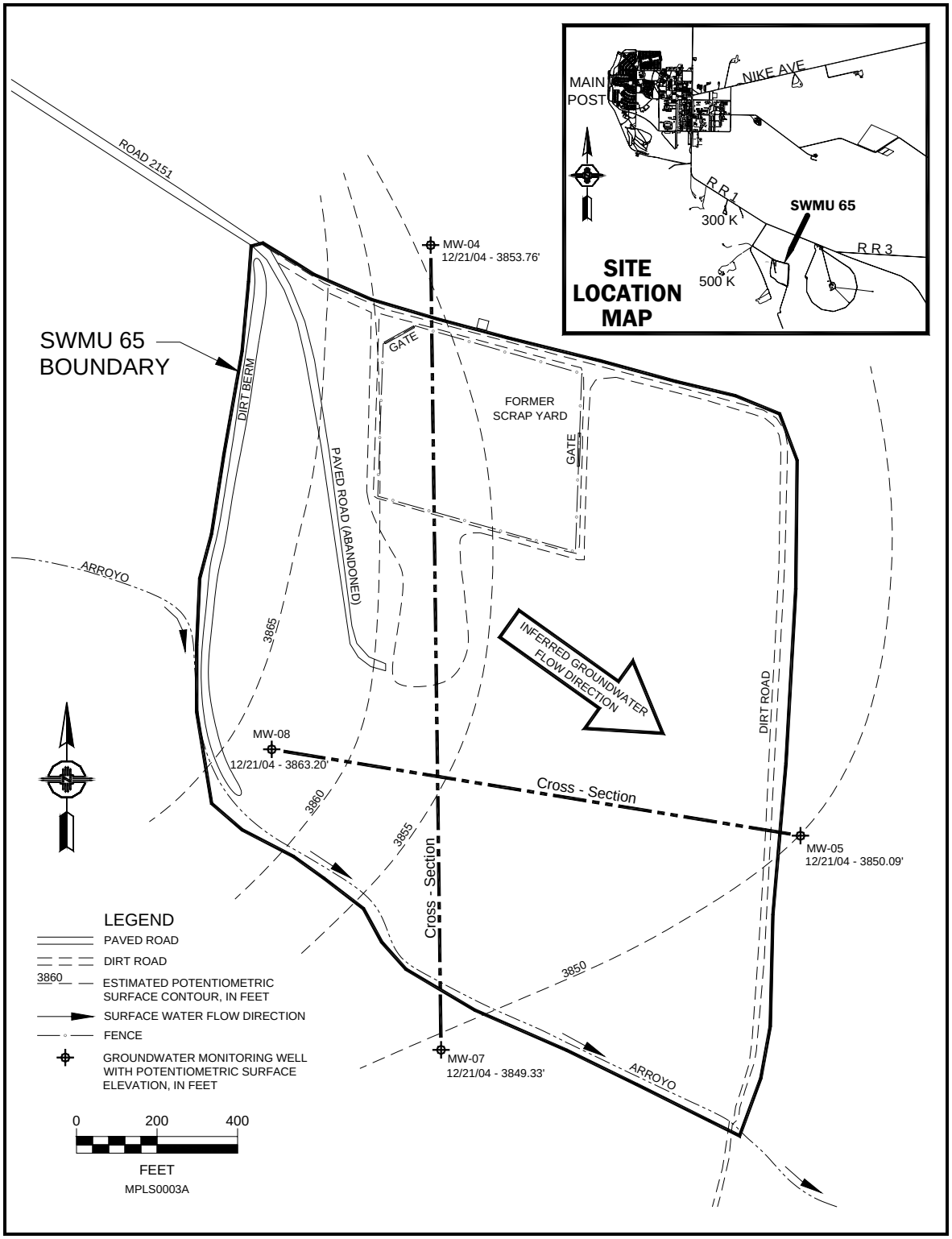


FIGURE 2. SITE DIAGRAM

1.1 Objectives and Scope

The purpose of the measures outlined in this Work Plan is to continue the RFI at SWMU 65, thereby meeting the terms in a Request for Supplemental Information (RSI) issued by the New Mexico Environmental Department (NMED) 14 July 2003 (see Appendix A). NMED requested additional investigation and characterization of the groundwater and potential contaminants within the landfill. The actions detailed herein are intended to allow sufficient data to be gathered from applicable points at the water table to adequately ascertain if the waste material buried at SWMU 65 is negatively impacting the area groundwater. Additional soil borings will aid in further characterization of potential contaminants present within the landfill, particularly total petroleum hydrocarbons (TPH) and benzo(a)pyrene.

The scope of the Work Plan includes the following:

- Soil sampling via six (6) soil borings to a depth not to exceed 30 feet below ground surface;
- Installation of four (4) new monitoring wells to augment the current four, which are screened too deep for representative sampling of potential contaminants. NM solid waste regulations require wells be screened at the groundwater surface (NMAC 20.9.1.802.C); the current wells are screened approximately 30 feet below the groundwater surface. This also serves to increase the amount of down-gradient wells;
- Disposal of investigation derived waste;
- Survey existing and new wells tied to appropriate datum; and
- Perform an initial groundwater sampling event no sooner than one month after well construction. Particular emphasis will be placed on detecting light non-aqueous phase liquids (LNAPLs) at or near the water table. Analytes will include VOCs, SVOCs, TPH, and RCRA metals. Sampling will rely on low-flow sampling methods using portable bladder pumps.

1.2 Approach and Implementation

The efforts described within this Work Plan will be carried out by qualified subcontractors within an approximate three (3) month period. Once approval is received from NMED, WSMR will initiate the process to schedule a qualified drilling contractor to carry out the monitoring well installation and bore hole drilling and sampling. Sampling and analysis will be performed with accepted quality control/quality assurance (QA/QC) practices. Management and off-site disposal of Investigation Derived Waste (IDW) will be complete within 90 days of drilling commencement (see Section 4.4). WSMR will submit a draft RFI Report discussing the results of the efforts laid out in this work plan for NMED review and approval within 180 days of project initiation.

1.3 Regulatory Requirements

This document was prepared in accordance with the regulations established under the Hazardous Waste Act, NMSA 1978, sections 74-4-1 through 74-4-14; the Water Quality Act, NMSA 1978, sections 74-6-1 through 74-6-17; the Resource Conservation and Recovery Act of 1976; and guidance published by NMED.

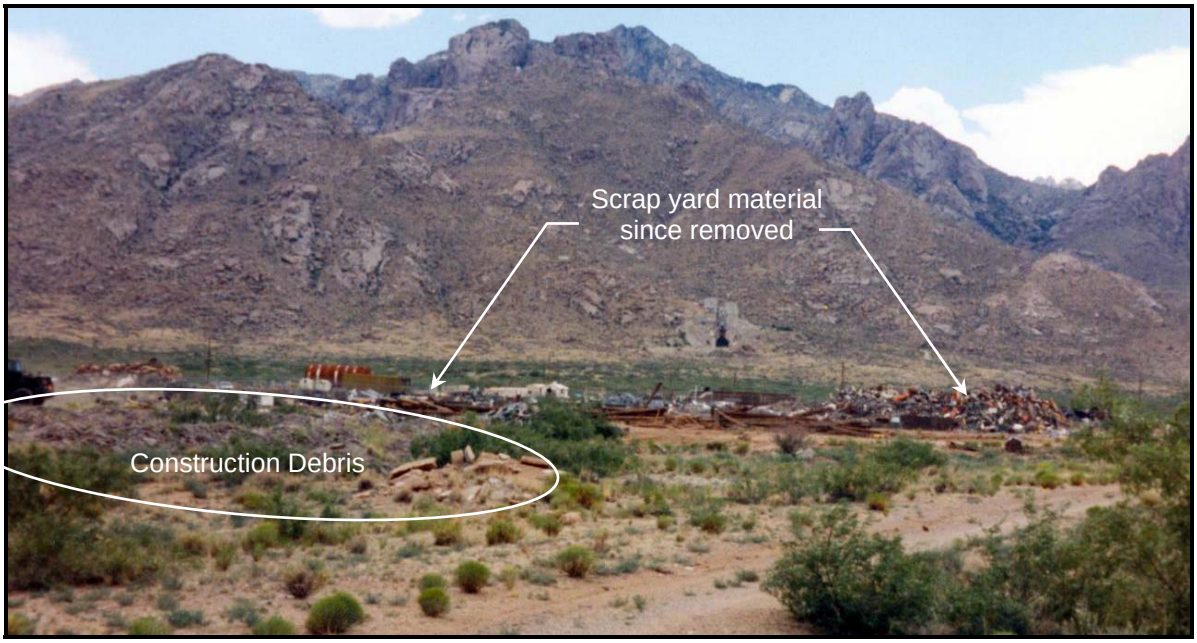
2.0 SOLID WASTE MANAGEMENT UNIT 65 (LDU-10)

2.1 Characterization and Setting

2.1.1 Site Description and Operational History

Based on the results of a geophysical survey conducted by ITC during the 1992 Phase I RCRA Facility Investigation (RFI), the landfill consists of one irregularly shaped inactive cell, which is identified as SWMU 65. The approximate area of SWMU 65 is 49 acres (MEVATEC, 2001). In the north-south direction the landfill measures approximately 1700 feet and 1000 feet in the east-west direction. At present, no disposal activities take place at SWMU 65 due to its proximity to SVAD (formerly NEL). However, there are remnants of construction debris and other assorted scrap visible at the surface in various areas of SWMU 65.

SWMU 65 is alluded to in the 1976 *WSMR Installation Environmental Impact Assessment*, which describes general waste disposal procedures and identifies an area "about 2 miles southeast of the Post area" as the disposal site. The Phase I RFI (ITC, 1992) and Phase II RFI (SEI, 1994) state that information on the design, operation, quantities disposed, exact origin of disposed material, and other history of the landfill is not available.



PHOTOGRAPH 1: MAIN POST LANDFILL NO. 3 (JUNE 1997)

PHOTOGRAPH 2: MAIN POST LANDFILL NO. 3 (MAY 2006)

The beginning date for initial waste disposal activities at SWMU 65 is not specifically known. However, based on literature and aerial photographs, it was in operation by 1965 and likely as early as 1961. According to records, the landfill ceased receiving sanitary wastes in 1982, prior to the implementation of RCRA (ITC, 1992). Scrap metal was accumulated at the site for sorting and later resale from the 1970s to at least the late 1990s. According to photographs from a June 1997 site visit, the landfill site was also used for disposal of construction debris (see Photograph 1). The majority of the scrap metal was removed when the scrap yard was relocated to near the active WSMR Construction and Demolition Landfill. Photograph 2 shows the site as it appears now. It is evident as well that some additional debris has been deposited on the surface at the site more recently (see Photograph 3).

Operation of the landfill is primary described in two reports. The 1976 *WSMR Installation Environmental Impact Assessment* states 128,000 cubic yards of solid wastes were disposed of during FY-73. The principle component of the waste stream is paper, approximately 80 percent. Waste placed in the trenches was covered twice weekly using sandy loam with some caliche. The final cover consisted of a two foot thick layer of this material. Salvageable material such as scrap metal and lumber were collected in a fenced area north of the landfill (included within the current SWMU boundary, see Figure 3) and resold semiannually to the highest bidder. Hazardous solid waste (i.e. missile fragments) was also kept in this area. The 1979 USATHAMA *Installation Assessment of White Sands Missile Range, Report No. 138*, describes Main Post Landfill No. 3 as using the trench method to dispose of sanitary waste. Trench sizes are given as 600 to 800 feet in length, 10 to 12 feet deep, and 30 to 40 feet wide. A *Water Quality Engineering Survey (No. 66-0138-77)* from September 1976 also reports the practice of disposing of cooking grease in the landfill. The grease was spread on the soil surface near the landfill, allowed to dry, and then placed in a trench for final disposal.

PHOTOGRAPH 3: MAIN POST LANDFILL NO. 3 (DECEMBER 2004)

2.1.2 Environmental Setting

Located in south-central New Mexico within the Tularosa Basin, WSMR covers approximately 3,200 square miles. The diverse landscape found on WSMR includes desert basins and rugged mountain ranges. This allows for various plants and animals to be found in the assorted habitats. The climate is relatively warm and dry, typical of the arid southwest. Average annual precipitation varies from 8 inches in the basin

to 16 inches in the mountains. Average annual precipitation at the Orogrande weather station, located approximately 21 miles to the east, is 10.1 inches. The majority of precipitation occurs during summer in the form of thunderstorm activity. During the summer months, temperatures can rise above 100 degrees Fahrenheit. Winters are mild, with average temperatures ranging from 30 to 60 degrees Fahrenheit (U.S. Army, 1998; USDA SCS, 1980). Due to the range's defense related activities access is restricted to military, civilian and contract employees of the U.S. Army and other Department of Defense agencies.

2.1.3 Site Geology

SWMU 65 is located along the western edge of the Tularosa Basin near the alluvial fans of the Organ Mountains. The alluvial fans formed on the slopes of the uplifted fault blocks characteristic of this portion of the Basin and Range province (WSMR EIS, 1998). The alluvial material in the area of the landfill is classified as the Sonoita-Pinaleno-Aladdin association, and is principally made up of gravelly sandy loam (SCS, 1976). Site-specific geology can be further characterized based on the lithography noted when installing monitoring wells in the immediate area. Typical of alluvial fans, the site consists of layers of sand, silt, and clay in various proportions and intermixed with gravel. The unconsolidated alluvial material underlying the site may be as thick as 4000 to 6000 feet. Monitoring wells and test wells in the vicinity of the site have not reached bedrock (US Army, 1976). Groundwater exists at an average depth of just over 200 feet below ground surface. Hydrogeologic cross-sections based on the drilling logs from the four existing monitoring wells are included in Section 2.3.

2.1.4 Site Hydrogeology

The majority of recharge for the area fresh water aquifer occurs due to precipitation in the mountains and at the alluvial fans. In these areas, where the surface material is very permeable, as much as 25 percent of the precipitation may reach the water table (Dept. of Army, 1976). Groundwater flow is typically in a west to east direction, away from the recharge areas toward the center of the Tularosa Basin. As one moves east from the mountains the concentration of dissolved constituents in the groundwater increases and water quality deteriorates. Water level measurements in the monitoring wells at SWMU 65 have demonstrated that the groundwater flows east by southeast (MEVATEC, 2001). The depth to groundwater varies between 202 and 223 feet. The nearest potable water supply well is located in the Main Post area, approximately 2.5 miles to the northwest. Table 1 lists details of existing wells.

2.2 Previous Investigations

2.2.1 RCRA Facility Assessment – 1988

As noted in Section 1.1, several investigations have been conducted at SWMU 65. The first of note was a RCRA Facility Assessment (RFA) carried out by A. T. Kearney, Inc. The RFA was published in 1988. The RFA assumed the potential for release to the groundwater, surface water, or air was low based on the age and location of the SWMU. The suggested action was a RCRA Facility Investigation (RFI) that would include subsurface sampling to "characterize the nature and extent of contamination."

2.2.2 RCRA Facility Investigation (Phase I) – 1992

The Phase I RFI was completed by International Technology, Corporation (ITC) and published in 1992. A ground conductivity study was performed in an effort to delineate the extent of disturbed soil and thus outline the landfill boundaries. A soil gas survey extending from the delineated boundary 100 to 300 feet outward detected carbon dioxide, methane, and xylene in the west and south areas of the landfill. As part of this study two monitoring wells were installed to the north and east, designated MW-4 and MW-5, respectively. The wells were sampled and analytical results demonstrated barium and traces of TPH. The barium was assumed to be equivalent to background, although no background values were given. The presence of TPH was attributed to leaching from well materials or from fresh paint on the well shrouds.

The Phase I RFI concluded that even though sufficient water for percolation is apparently not available, further investigation at the site is warranted. It was recommended that this investigation include several borings (minimum of 30 feet depth) in order to characterize wastes present and determine the vertical extent of contamination. In order to assess the horizontal limits of contamination, a second phase soil

vapor survey was also recommended. Finally, it was recommended the monitoring wells be periodically sampled to test for the presence of any contaminants and to determine the hydraulic gradient. It was noted an additional monitoring well may be necessary. The Phase I RFI conclusions are included in Appendix B.

2.2.3 RCRA Facility Investigation (Phase II) – 1994

The Phase II RFI was completed by Sverdrup Environmental, Inc. (SEI) and published in 1994. The recommendations of the Phase I RFI were carried out with a soil gas survey, drilling of two additional monitoring wells (MW-7 to the south and MW-8 to the west), and seven soil borings to a depth of 30 feet (Figure 3). Samples from the soil borings had detections of VOCs, SVOCs, and TPH. The borehole findings indicated the depth of the landfill appeared to be 17 to 21 feet below ground surface. The soil borings demonstrated lower levels of contamination at depths exceeding 20 feet. SEI concluded that contamination had not migrated downward in appreciable quantities. Groundwater samples were collected from the four monitoring wells. Two VOCs (1,1-dichloroethene and 1,1,1-trichloroethane), arsenic, barium, and lead were detected in the area groundwater. TPH was not detected in any of the groundwater samples. The detected concentration of 1,1-dichloroethene was approximately equal to the associated New Mexico Water Quality Control Commission (NMWQCC) groundwater protection standard (listed as 1,1-dichloroethylene). The detected concentration of 1,1,1-trichloroethane was an order of magnitude below the associated NMWQCC groundwater protection standard. The Phase II RFI recommended that SWMU 65 be monitored periodically but that the RFI be discontinued as “no significant release of contaminants has been identified at the site.” SEI further recommended that WSMR submit a request for Class 3 permit modification to terminate the RFI/CMS for SWMU 65. The Phase II RFI conclusions are included in Appendix B.

2.2.4 Long-term Groundwater Monitoring – 1996 through 2001

Long-term groundwater monitoring of the site has been conducted semi-annually from the fall of 1996 to 2001 (exceptions to this are spring 1997 and fall 1999, in which no samples were collected). No comprehensive sampling has taken place since 2001. The list of analytes included VOCs, SVOCs, metals, explosive residues, cyanide, dissolved ions, and fuel hydrocarbons. Before collecting samples, wells (MW-4, MW-5, MW-7, and MW-8) were purged and monitored for temperature, pH, conductivity and appearance. All data collected during sampling activities was recorded in a bound field logbook. During monitoring activities, contaminants of concern were not detected above the NMWQCC standards. This led WSMR to believe SWMU 65 posed no threat to the groundwater. Thus, in June 2001, WSMR submitted an RFI report supporting a determination of “No Further Action” for SWMU 65. NMED responded with a Request for Supplemental Information (RSI) which included eight comments requiring additional investigation or clarification (Frischkorn, C., correspondence dated 14 July 2003).

TABLE 1. CONSTRUCTION DETAILS FOR EXISTING WELLS (SWMU 65)

Well No.	UTM Coordinates (Zone 13, NAD83)		TOC Elevation (ft)	Total Depth (TOC, ft)	Screened Elev. (ft)	Depth to Water (TOC, ft)	Water Table Elev. (ft)
	Northing	Easting					
MW-4	3579662.10	362971.40	4080.36	268	3839.4 – 3814.4	226.60	3853.76
MW-5	3579228.22	363180.74	4056.72	266	3812.7 – 3792.7	206.63	3850.09
MW-7	3579017.77	362965.66	4060.74	263	3827.7 – 3797.7	211.41	3849.33
MW-8	3579239.37	362785.23	4077.95	265	3833.0 – 3813.3	214.75	3863.2
Note: Depth to water measurements from December 2004.							

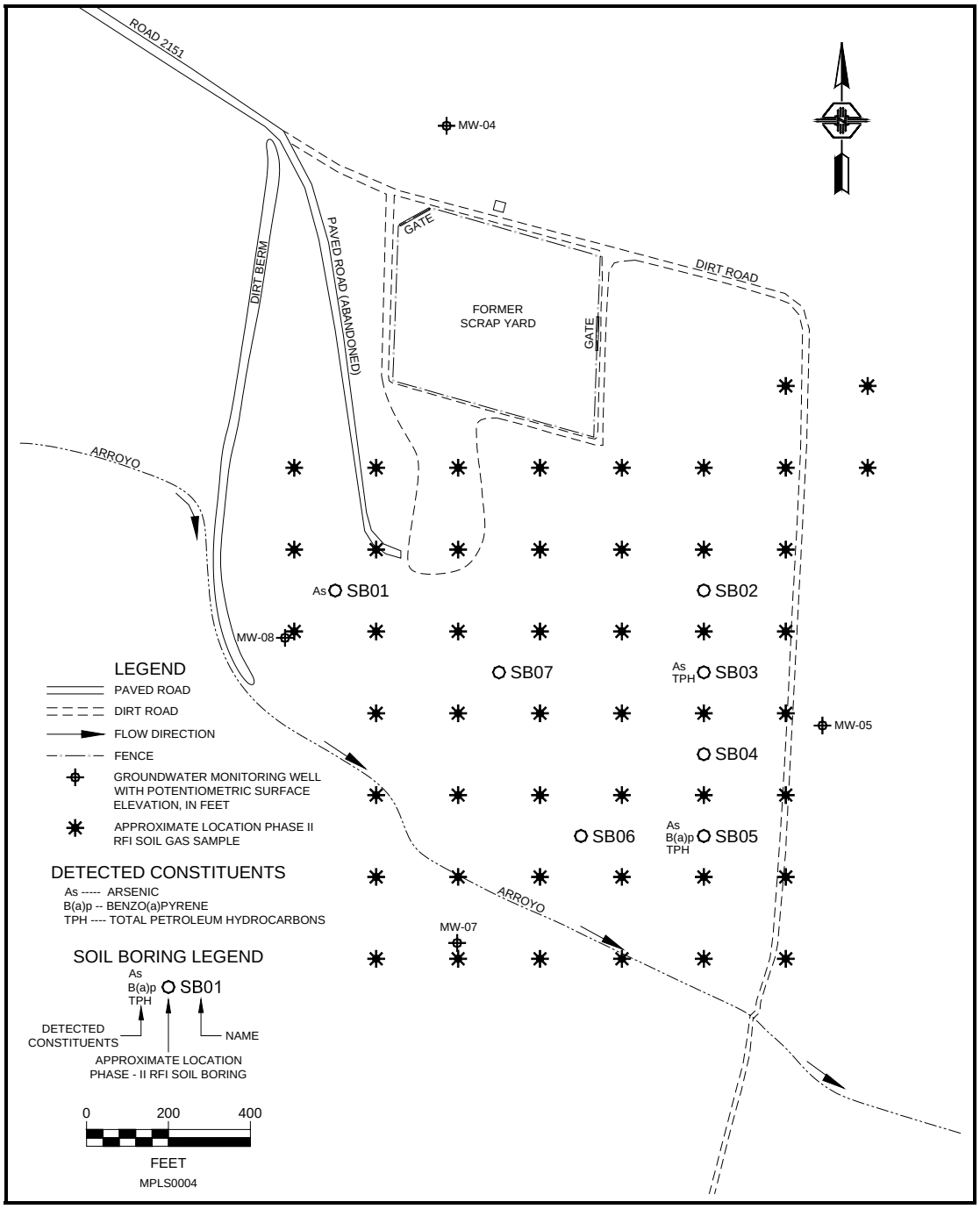


FIGURE 3. PHASE II RFI SAMPLE LOCATIONS

2.2.5 Cultural Review – 2000

A cultural review and survey of the site and adjacent undisturbed land to the southeast was conducted in May 2000 by Human Systems Research, Inc. (HSR). This Class III cultural resources survey investigation (as defined by BLM standards) identified the landfill as a Cold War era site. Eleven isolated occurrences of prehistoric lithic artifacts were recorded. HSR stated the site was potentially eligible for historic preservation; however, the extensive recordation of the site has exhausted the research potential of the isolated prehistoric artifacts. HSR's final determination was that no adverse affect to cultural resources has occurred at SWMU 65 (HSR, 2000).

2.2.6 Radiation Sampling of Former Scrap Yard – 2001

In the fall of 2000, WSMR undertook surface soil sampling at the fenced location of the former scrap yard included in SWMU 65. This effort was deemed necessary because spent missile components were stored in the scrap yard during its active use. The former scrap yard was clear of all surface material at the time of the study. Soil samples were analyzed by EPA Method 900.0 for gross alpha and gross beta activity. No evidence of alpha or beta radiation levels above background measurements were noted during the study. Background samples were collected as part of this study.

2.3 Conceptual Model

Hydrogeologic cross-sections have been developed based on the data compiled to date. This data collected during the Phase I and II RFIs consisted of geophysical logs from each of the four monitoring wells at the site and the various bore holes which have been drilled at the landfill area. Hydrogeologic cross-sections are included as Figures 4 and 5.

2.3.1 Nature and Extent of Contamination

Based on limited documentation, SWMU 65 contains various waste loosely categorized as sanitary waste and inert material. The landfill was active from the early 1960s until landfill operations were ceased in 1982. A fenced portion of the site remained a collection point for scrap metal and other construction debris throughout the 1990s. Debris staged in the fenced enclosure consisted of scrap metal associated with missile testing including expended rocket motors, and other material such as drums containing liquids. Pre-RCRA landfill operational practices and lack of significant documentation at SWMU 65 require WSMR to determine, with a reasonable amount of certainty, whether a release of contamination has occurred.

2.3.2 Fate and Transport

The contaminant migration pathways are important when developing the conceptual model. These are the means by which contamination may impact human heath or the environment. The pathways evaluated in this model include groundwater, surface water, direct contact, air and subsurface gas.

2.3.2.1 Groundwater

The RFA concluded the potential for release to the groundwater was unknown. The nearest potable water supply well is located at the Main Post more than 2.5 miles to the northwest of SWMU 65. Due to the cone of depression developed by the pumping demand from the production wells at Main Post, a groundwater divide exists between the nearest supply well and SWMU-65. This was initially noted in work by Risser in 1988. Thus, the production well is not considered down-gradient.

Groundwater is considered a potential pathway. It was concern for the fresh water aquifer, as well as proximity to SVAD, that prompted closing of the landfill (USATHAMA, 1988). Past monitoring of the groundwater has not consistently detected contaminants. NMED has raised questions regarding the construction of the existing monitoring wells and past results of sampling events (construction details are given in Table 1). Due to the locations of the screens and the surface of the aquifer, the existing wells do not meet the requirements given in the NMED Solid Waste Management Regulations (NMAC 20.9.1.802.C). Thus, additional monitoring wells and analysis is necessary to determine if there has been any impact to the groundwater, and if so, to what degree this has occurred. The efforts discussed in this Work Plan should allow WSMR to effectively monitor the groundwater at the site as required by NMED.

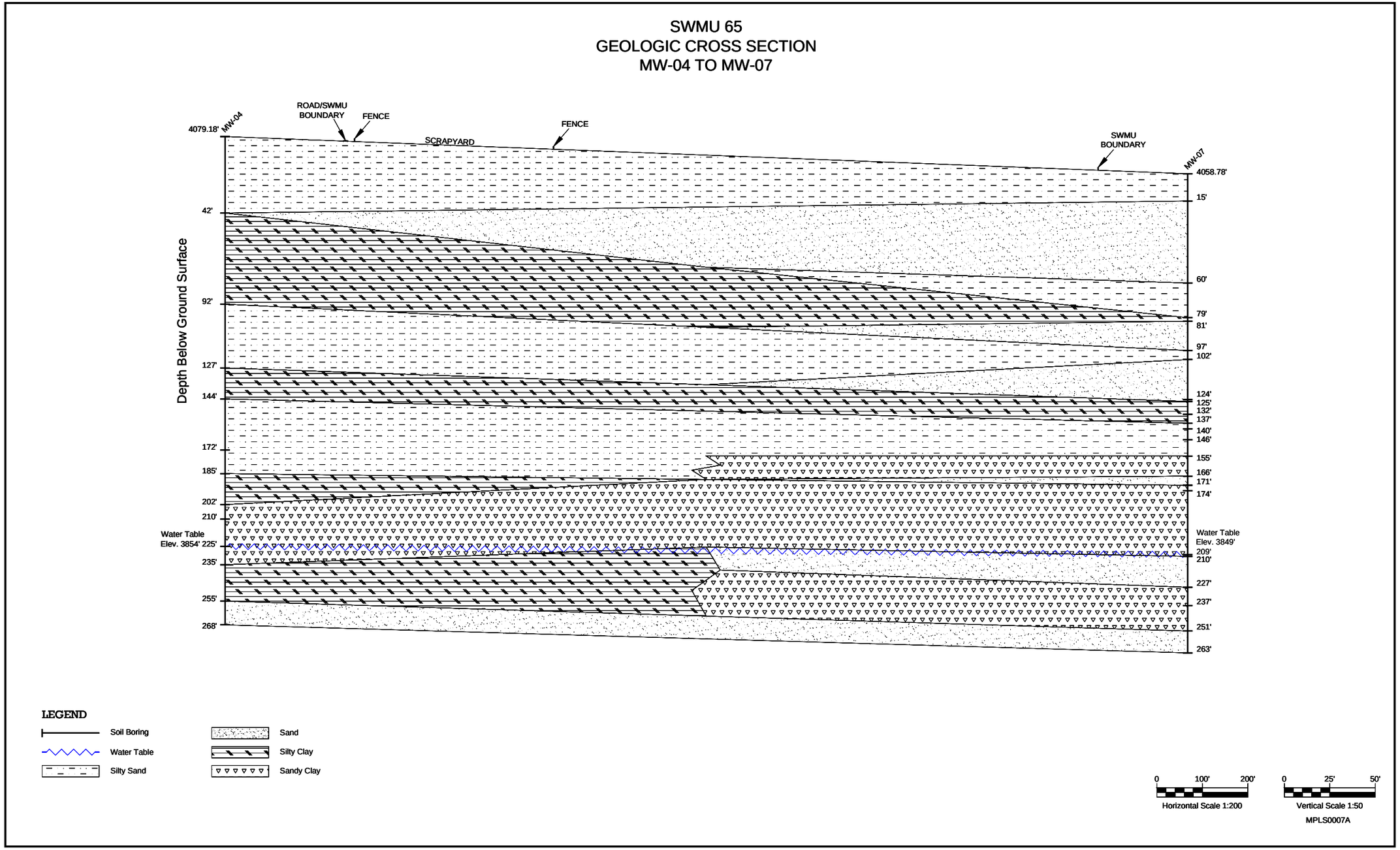


FIGURE 4. HYDROGEOLOGIC CROSS-SECTION MW-04 – MW-07

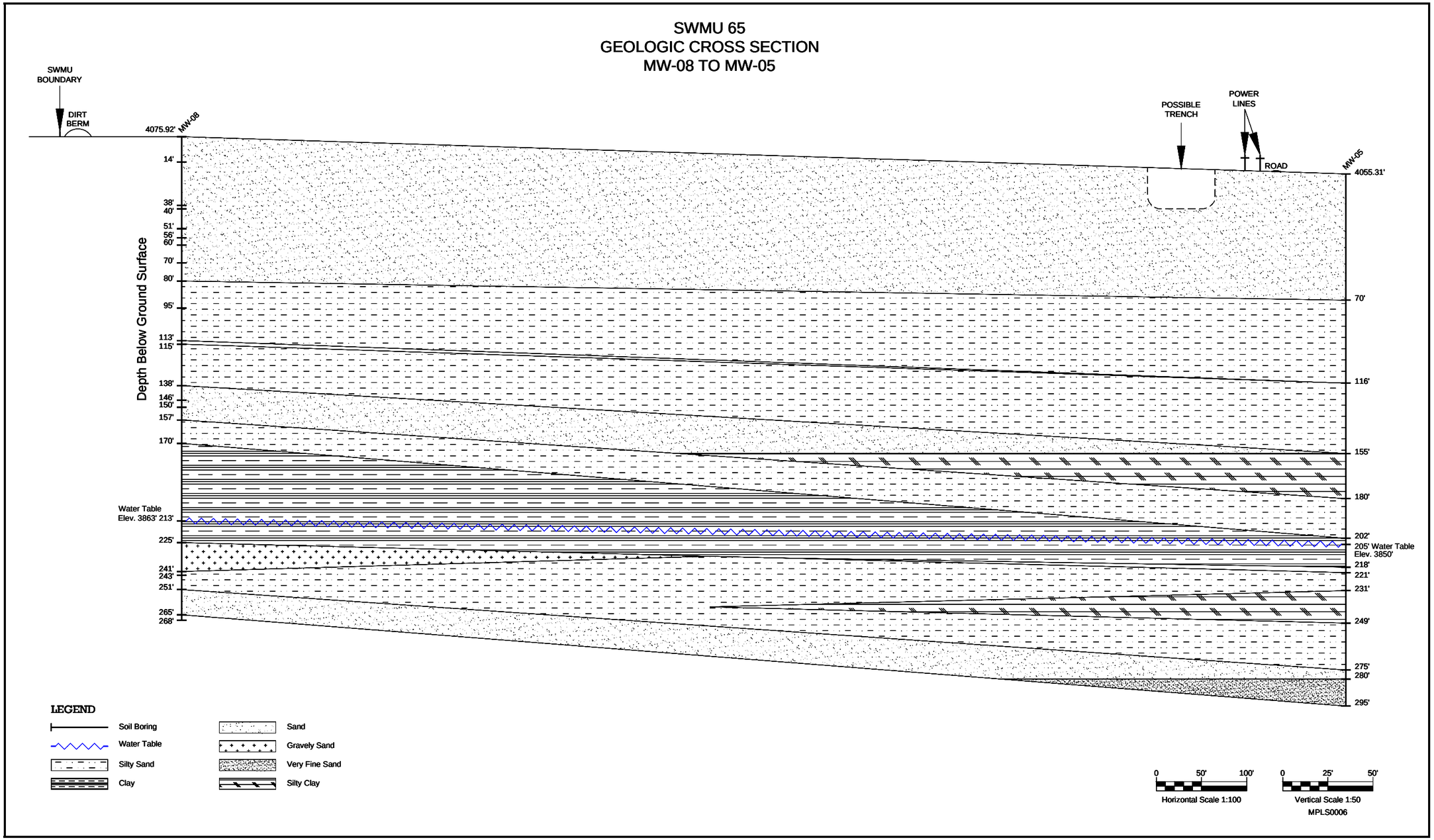


FIGURE 5. HYDROGEOLOGIC CROSS-SECTION MW-08 – MW-05

2.3.2.2 Surface Water

According to the RFA, the potential for ongoing releases to surface water are low due to the inactivity at the site and the distance from a surface water body. Runoff that occurs on the alluvial slopes to the west quickly infiltrates the unconsolidated material and is unlikely to sustain stream flow for any length of time. There is a dike along the upslope (west) side of SWMU 65 that diverts most of the storm runoff to the south around the boundary of the landfill site (see Figure 2). Surface water is a potential pathway if drainage is not appropriately managed, runoff is allowed to infiltrate the landfill cells, or erosion exposes any portion of the buried waste. Surface drainage patterns will be reviewed during the proposed field work.

2.3.2.3 Direct Contact

Direct contact with the landfill material may pose a threat if sharp objects or other materials make their way to the surface via erosion or other means. During this ongoing RFI, institutional controls such as signs and periodic inspection/maintenance will be used to limit exposure. Exposure is also limited by the remote location of the site and its proximity to the SVAD facility, which maintains tight perimeter security, including the SWMU 65 site. Direct contact is considered a potential pathway. Areas with exposed or unburied scrap or other material will be noted. Final determination as to the fate of this material will be discussed once the material is cataloged.

2.3.2.4 Air and Subsurface Gas

According to the RFA, the potential for release to air or generation of significant subsurface gas was low based on the age of the units and current use. Both Phase I and Phase II RFIs conducted soil-gas surveys. The two surveys had limited areas of overlap. Both detected various amounts of VOCs in similar areas of the landfill. The Phase II RFI also included soil borings. Potential contaminants detected included: methane, carbon dioxide, and total xylenes from the Phase I study; and from Phase II methane, total volatile organics, and hydrocarbon tentatively identified compounds. Phase II also had one sample point which detected tetrachloroethene. Phase II soil borings detected total petroleum hydrocarbons in concentrations as high as 13,000 milligrams per kilogram. While subsurface gas is obviously present, and would be expected at a landfill site, it is not of sufficient quantities to be considered a hazard nor are there structures present on site to trap gas. Thus, subsurface gas is not considered a potential pathway. During investigation activities, the work area will be monitored for the presence of potentially harmful gases.

2.3.3 Data Deficiencies

At least three gaps in data collected from prior investigations were identified based on comments from NMED. The effort described in this Work Plan is intended to resolve these issues.

- Past studies did not develop hydrogeologic cross-sections based on area geology. Figures 4 and 5 have been included in this Work Plan to aid in understanding the site geology, hydrology, and monitoring well placement.
- The existing monitoring wells are screened well below the potentiometric surface of the water table. According to comments from NMED, these wells are not suited to detect Light Non-Aqueous Phase Liquids (LNAPLs). NMED also questions whether the well construction meets RCRA standards.
- NMED questioned prior RFI's reporting of inorganic detections at background levels when no background study existed. WSMR has completed a study of inorganic constituents in background soil at the WSMR Main Post. Other constituents to be analyzed for during this RFI include TPH, VOCs, and SVOCs. Detections will be screened according to now established background values, New Mexico Soil Screening Levels (NMSSL), and NMWQCC groundwater protection standards.

2.4 Proposed Phase III RFI Activities

2.4.1 Soil Boring & Sampling

The soil borings will be drilled using a hollow-stem auger supervised by a qualified scientist using industry-standard methods (i.e. ASTM D 5784-95 *Standard Guide for Use of Hollow-Stem Augers for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices*). Six soil borings in the former landfill area, located as noted in Figure 6, will be drilled to a depth below the contamination (estimated to be 20 feet below ground surface). One soil boring will be located in an area of sufficient distance to yield appropriate background samples. Soil samples will be collected for chemical analysis at minimum intervals of five (5) feet. Sampling will begin at the soil surface (0.5 to 1.5 feet below ground surface). Appropriate sampling and decontamination procedures will be followed to minimize the potential for cross-contamination. Sampling procedures for the background sample will be the same as those employed for sampling the former landfill area. A total of 46 soil samples are proposed to be collected from the soil borings. Sample labeling will be accomplished as noted in Section 4.2.

Forty soil samples at seven locations were previously taken during the Phase II RFI up to depths of approximately 30 feet and analyzed for VOCs, SVOCs, TPH, and metals. A similar approach is proposed for this effort; however, borings will be concentrated in areas of SWMU 65 that the Phase I and II RFIs noted detections of potential contaminants, particularly areas with TPH, Benzo(a)pyrene, and VOC detections. Characterization will consist of metals, VOCs, SVOCs and TPH (DRO and GRO), as shown in Table 2. Background data collected during other separate investigations including data collected for the *Final Background Soils RCRA Facility Investigation Report for the Main Post, WSMR* (BAE Systems, 2004) will be used for statistical calculations and comparison.

TABLE 2. SOIL ANALYTE LIST - MAIN POST LANDFILL NO. 3

Parameter		Reference Method	Method Type
Inorganics			
Mercury		SW846-7471A	Cold Vapor-AA
Total RCRA Metals + Cyanide			
Arsenic Barium Cadmium Chromium	Lead Selenium Silver	SW846-6010B	ICP / AES
Cyanide		EPA 335.2	
Organics			
Volatiles (VOCs)		SW846 8260B	GC/MS
Semi-Volatiles (SVOCs)		SW846 8270C	GC-MS
Explosives		SW846-8330	HPLC
Petroleum Hydrocarbons		SW846 8015(Mod) DRO & GRO	GC

Continuous soil cores will be collected. If continuous coring is not possible, split spoon samples will be collected over each approximate 5-foot interval. The site geologist will log soil type from the core. An organic vapor analyzer using a flame ionization detector will be used to provide additional screening for contaminants (in addition to its primary function of monitoring the drill crew breathing space as discussed in the site health and safety program).

Soil cuttings and decontamination water will be collected and containerized as discussed in the IDW Management Plan (Appendix E). Backfilling of the open boreholes will be accomplished with a five (5) percent bentonite grout using a tremmie pipe. This method is intended to prevent bridging and ensure that the open borehole is sealed to prevent creation of a migration pathway.

2.4.2 Groundwater Monitoring Well Installation

A set of four wells, three down-gradient and one up-gradient, are to be installed to an approximate depth not to exceed 300 feet. Based on the existing monitoring wells, depth to water is approximately 200 feet below ground surface. The three down-gradient wells are to be located within approximately 200 feet of the down-gradient (east) site boundary. The up-gradient well will be approximately 200 feet from the up-gradient (west) site boundary. Figure 6 displays the proposed monitoring well locations in relation to SWMU boundary and other surface features. Final locations may vary slightly from Figure 6 depending upon field conditions. Screen intervals will be within the historic potentiometric surface in order for the well systems to detect light non-aqueous phase liquids (LNAPLs).

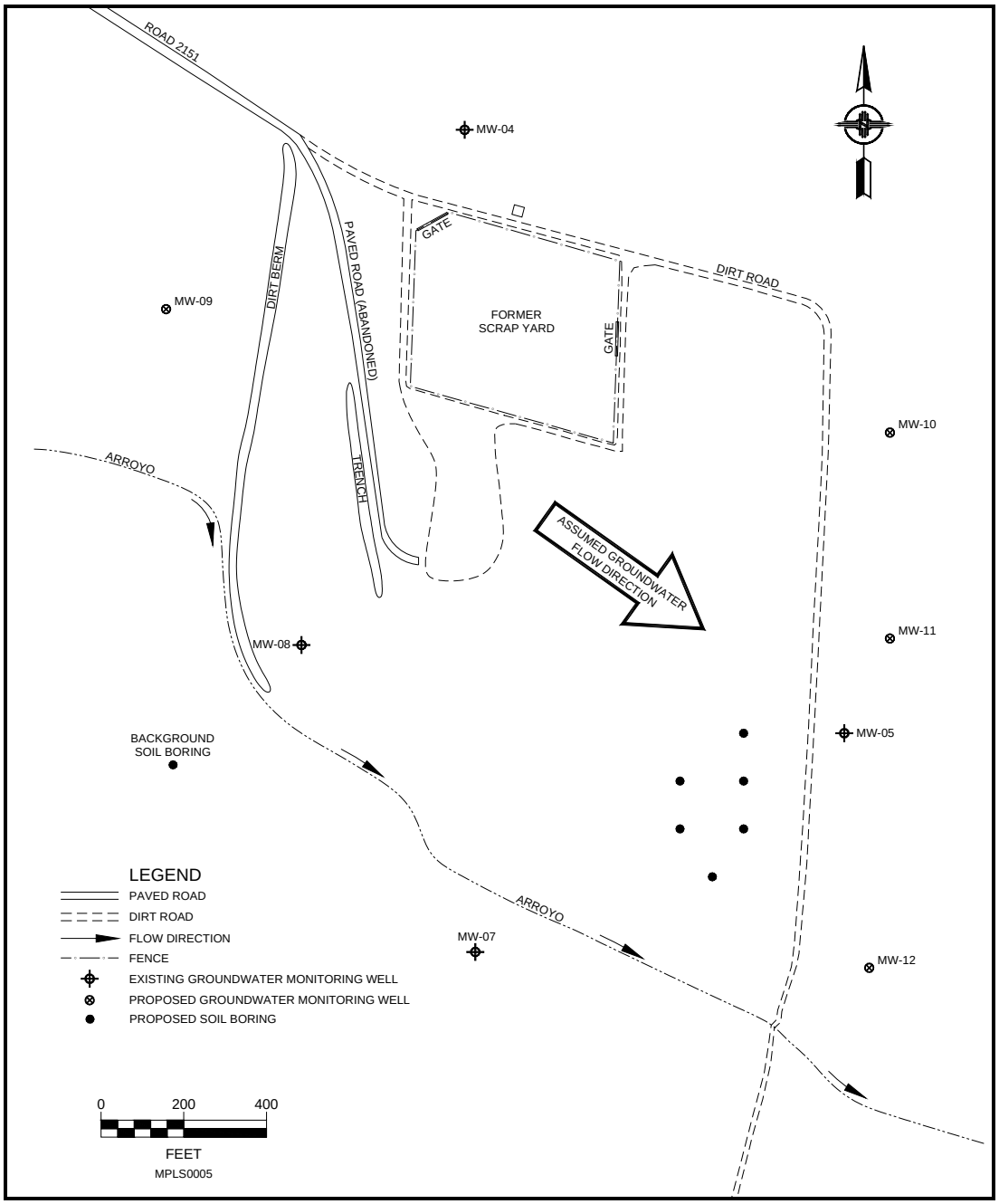


FIGURE 6.
PROPOSED PHASE III SOIL BORING AND MONITORING WELL LOCATIONS

All four wells will be similarly constructed (i.e. 4 inch diameter, PVC casing, screen and sump, locking aluminum riser, bollards and concrete pad) and will follow the guidance provided in *RCRA Ground-water Monitoring Technical Enforcement Document*, dated Sept 1996 and *ASTM Vol 4.08 D5092-02 Standard Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers*.

2.4.3 Groundwater Sampling Event

No sooner than 30 days after well installation is complete, WSMR will sample each of the newly constructed monitoring wells at SWMU 65. Sampling will be accomplished via low-flow techniques as detailed in ASTM D 6771-02, *Standard Practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations*. Collection of samples will follow standard practices as detailed in WTS SOPs. The proposed analyte list is given in Table 3.

TABLE 3. GROUNDWATER ANALYTE LIST - MAIN POST LANDFILL NO. 3

Parameter	Reference Method	Method Type	Hold Time
Water Quality			
CO_3^{-2} & HCO_3^- Alkalinity pH Conductivity Total Dissolved Solids Total Organic Carbon	SM 2320B SM 4500-H+ SM 2510B SM 2540C EPA 415.1	Titrimetric Electrometric Conductivity Meter Gravimetric TOC analyzer	14 days 28 days 7 days 28 days
Dissolved Ions			
Nitrate-N Nitrite-N	EPA 300.0	Ion Chromatography	28 days 48 hours
Ammonium perchlorate	EPA 314.0	Colorimetric	28 days
Nutrients			
Ammonia (NH_3 + NH_4) Total Kjeldahl Nitrogen	SM 4500-NH3 B,E EPA 351.3	Colorimetric	28 days
Total Metals			
Arsenic Barium Beryllium Cadmium Chromium Cobalt Copper Lead Molybdenum Nickel Selenium Silver Tin Vanadium Zinc	SW846-6010B	Inductively Coupled Plasma – Atomic Emission Spectroscopy (ICP / AES)	6 months
Mercury	SW846-7470A	Cold Vapor-AA	28 days
Hexavalent Chromium	SM 3500-Cr D	Spectrophotometer	24 hours
Total Cyanide **(First sampling event only)**	SW846 – 9010B	Distillation	14 days
Dissolved Metals			
Arsenic Barium Beryllium Cadmium Chromium Cobalt Copper Lithium Lead Molybdenum Nickel Selenium Silver Tin Vanadium Zinc	SW846 6010B	ICP / AES	6 months
Organics			
Volatile Compounds (VOCs)	SW846 8260B	Gas Chromotography/ Mas Spectometer (GC-MS)	14 days
Petroleum Hydrocarbons	SW846 – 8015(Mod) DRO & GRO	GC	
Semi-Volatiles (SVOCs)	SW846 8270C	GC-MS	7 days
Explosive Residues	SW846-8330 C18	HPLC	Extraction: 7 days Analysis: 40 days

Standard QC practices will include appropriate trip blanks, one duplicate sample, one rinsate sample collected from the portable sampling equipment, and one MS/MSD sample. The existing wells will be maintained in order to measure depth to groundwater. Data from prior groundwater monitoring events (1997 – 2001) will be utilized to define the inorganic background constituents. Statistical comparisons will be made with the background constituents and the analytical results from the newly installed wells. After the initial sampling of the new wells, WSMR will continue with annual sampling until analytical results and/or good engineering practice demonstrate alternative actions are necessary.

3.0 DATA COLLECTION

Data collected as discussed in this Work Plan will consist of analytical results for soil and water samples. This analytical data is intended to better characterize the potential for subsurface contamination at SWMU 65 and determine if the local groundwater has been impacted. The total number of samples proposed includes 44 soil samples (includes four duplicates) and 5 sets (includes one duplicate) of groundwater samples.

3.1 Data Quality Objectives

Data quality objectives (DQOs) for this work effort are intended to improve the quantitative and qualitative data collected in order to provide sufficient data of suitable quality to determine the potential environmental impact of SWMU 65. The following DQOs serve as guidelines in providing the investigative results necessary for NMED and WSMR decisions relating to SWMU 65.

- Borehole and monitoring well locations will be based on good engineering judgment and will comply with applicable ASTM standards.
- Borehole location and specified analytes will be selected to fill the gaps in data collected during prior investigations as identified in NMED's RSI.
- Analytical results shall meet PQL values based on NMWQCC groundwater protection standards given in Table I, NMAC 20.9.1.1100A and laboratory reporting capabilities. Analytical results, at a minimum, will meet required reporting accuracy for analytes shown in the analyte list.
- Sampling of soil and groundwater will consist of sufficient valid analytical results to characterize and further define potential contamination at the site.

3.2 Quality Assurance/Quality Control

3.2.1 Trip Blanks

Trip blanks are intended to detect potential VOC contamination from sources outside of the area sampled. This QC practice is necessary due to the ease of VOC contamination whether through on site sources (i.e. vehicle exhaust, stored fuel) or though sources at the laboratory. Trip blanks will consist of ASTM Type-II reagent water sealed in 40 milliliter sample vials. These vials will be prepared by the laboratory, accompany the sample containers to the site, and return with the samples to the laboratory. These vials shall not be opened except by the laboratory for analysis purposes. At a minimum one trip blank will accompany each shipment of samples. Trip blank labeling will be as shown in Table 4.

3.2.2 Rinsate Blanks

The intent of rinsate blanks is to measure the QC effectiveness of decontamination practices for non-dedicated equipment in the field. This would include augers, split spoon samplers, shovels, etc. ASTM Type II water used as the final rinse over or through these pieces of equipment is collected as a typical sample and included for analysis with the day's shipment. The rinsate blank is analyzed for the same constituents as the associated soil sample. Two rinsate blanks are proposed to be collected during the soil boring process. Sample labeling will be as shown in Table 4.

3.2.3 Replicate Samples

Replicate (or duplicate) samples serve as a QC measure to verify proper sample collection and handling procedures and can also serve as a QC check for the laboratory. Replicate samples will be collected from the same location as a standard sample. The replicate will be placed in an additional sample container, labeled, and shipped for analysis to the same laboratory or a separate QC laboratory. Two replicate samples shall be collected for the soil sampling and one replicate for the groundwater sampling. Sample labeling will be as shown in Table 4.

3.2.4 Laboratory Control Spike

The Laboratory Control Spike (LCS) is a QA measure carried out by the laboratory to detect issues with laboratory systems. An LCS that demonstrates a high bias reveals a problem with quantitation but not detection. Non-detect results may be reported, but all detections should be reanalyzed once the systems problem is corrected. A low bias requires that all samples be reanalyzed.

3.2.5 Matrix Spike and Matrix Spike Duplicate

The Matrix Spike and Matrix Spike Duplicate (MS/MSD) QA measure consists of a volume of soil or water (relatively free from suspended material) that is collected from an onsite source (i.e. monitoring well) and submitted to the laboratory for analysis. The laboratory uses the additional sample to validate analytical data that may fall outside of the designated MS recovery range (if the LCS is shown to be in control). This demonstrates that the problem is related to the matrix and not the system, and thus the data is acceptable. One MS/MSD sample will be collected from the up-gradient monitoring well during the groundwater sampling. A soil MS/MSD sample will be collected from the background sample at a depth of approximately five feet.

3.3 Field Activities

Sampling and analysis required under this Work Plan include both soil and groundwater samples taken as discussed in this Work Plan and analyzed according to Tables 2 and 3. Soil samples will be taken at minimum 5-foot intervals or where the Task Coordinator or Site Geologist deem appropriate. Groundwater samples will be collected from each of the new monitoring wells no sooner than 30 days after development. Sample labeling will be accomplished as shown in Table 4.

TABLE 4. SAMPLE LABELING SCHEME

Material Sampled	Site Identifier	Sample Type*	Sample Depth	Example
Samples from soil borings	0065	SB-###	(xx.x-yy.y)	Standard: 0065-SB-001-(00.5-01.0) Replicate: 0065-SB-101-(00.5-01.0) Trip blank: 0065-SB-201-(00.5-01.0)
Samples from background soil boring	0065	BG	(xx.x-yy.y)	0065-BG-(00.5-01.0)
Groundwater samples from monitoring wells	0065	MW-###	-	Standard: 0065-MW-001 Replicate: 0065-MW-101 Trip blank: 0065-MW-201
Rinsate blank	0065	RB##	-	0065-RB01-(00.5-01.0)
* A zero "0" in the first digit following SB or MW indicates a standard sample. A one "1" indicates a replicate (or duplicate) sample, and two "2" indicates a trip blank. The following two digits correspond to the proposed soil boring or monitoring well as located in Figure 6.				

4.0 PROJECT MANAGEMENT

4.1 Management Team Responsibilities

The project organization reflects the relationship between the WSMR point-of-contact and the White Sands Technical Services, LLC (WTS) team assembled to plan, organize, control, and execute this project. Within the WTS project management system, the key positions are the Program Manager, Task Manager and Task Coordinator.

4.1.1 WSMR Technical Inspector

The Technical Inspector is an employee of the U.S. Army and functions as the point of contact for WSMR. For this project, the Technical Inspector's responsibilities include:

- Communication with the U.S. Army Environmental Center on funding issues,
- Development of the scope of work,
- Review and approval of the Work Plan,
- Acquirement of funding, and
- Serving as the point of contact for the public and regulatory agencies.

The Technical Inspector for this project is Mr. Jose Gallegos.

4.1.2 WTS Program Manager

The Program Manager is the senior WTS representative on the project, and functions as the focal point for WSMR. For this project, the Program Manager's responsibilities include:

- Overall project management,
- Total planning, organization and execution of the RFI Work Plan,
- Maintaining contact with the Technical Inspector throughout the work process,
- Directing the Task Manager in conducting a successful project,
- Providing resources to the Task Manager to accomplish project responsibilities,
- Guiding the Task Manager on the approach to a public relations program, and
- Reviewing and approving all deliverables.

The Program Manager for WTS is Mr. Edward H. Martinez, P.E.

4.1.3 WTS Deputy Program Manager & QA/QC Manager

The Deputy Program Manager and QA/QC Manager for this project is responsible for the following:

- Acting for the Program Manager in his absence,
- Reviewing project progress,
- Ensuring project QC protocols and procedures are followed,
- Documenting that all quality objectives have been met,
- Assisting the Task Coordinator in evaluating alternatives to meeting project objectives, and
- Providing guidance on the allocation of resources.

The Deputy Program Manager for WTS is Mr. John Mills.

4.1.4 WTS Task Manager

The Task Manager for this project will be responsible and accountable to the Program Manager for overall direction and performance of the project including:

- Developing and executing the Work Plan,
- Directing the Task Coordinator,
- Keeping the Program Manager and Technical Inspector appropriately informed,
- Approving uses of technical resources,
- Coordinating all assigned resources,
- Periodic review of progress and progress reporting,
- Resolving Work Plan issues,
- Schedule and budget tracking,

- Quality and timeliness of deliverables,
- Work performed by subcontractors, and
- Acting as a technical liaison between the Task Coordinator and the Program Manager.

The WTS Task Manager for this project is Mr. Fred Bourger.

4.1.5 WTS Task Coordinator

The Task Coordinator will be responsible for coordinating all site activities, including those of the on-site contractors, all laboratory activities, and implementing the SSHSP. These include execution of the fieldwork in accordance with appropriate sections of this RFI Work Plan. Specific responsibilities include:

- Day to day execution of the Work Plan;
- Reporting project progress to the Task Manager;
- Coordinating, directing and overseeing field technical support staff;
- Providing overall direction and supervision of the site work and related activities;
- Ensuring that all staff and subcontractors meet WSMR security requirements;
- Completing all appropriate field logs for project activities;
- Providing overall supervision of the collection, handling, and shipping of all samples;
- Monitoring sampling operations to ensure that all project site personnel are fully implementing and executing the provisions of this Work Plan;
- Understanding the quality requirements of each field task, and bringing to the attention of management conditions which may adversely impact the quality of the data or other work product;
- Execution of all field QC procedures;
- Reporting safety-related incidents or accidents to the Task Manager;
- Temporarily suspending field activities, if health and safety of personnel are endangered;
- Maintaining health and safety equipment on-site;
- Conducting pre-work and daily health and safety meetings;
- Verifying personnel working on the site have completed medical surveillance and health and safety training; and
- Maintaining documentation of health and safety measures taken at the site.

The WTS Task Coordinator for this project is Mr. James Thompson.

4.1.6 WTS Site Geologist

The Site Geologist will be responsible for providing guidance to the Task Coordinator in sample location selection and making field geologic observations. Specific responsibilities include:

- Development of lithologic logs of all borings;
- Interpretation of geophysical borehole logs;
- Testing of engineering soil properties; and
- Overseeing field activities and site safety in the absence of the Task Coordinator.

The WTS Site Geologist for this project is Mr. Brad Davis.

4.1.7 WTS Project Chemist

As part of the project team, the project chemist will provide technical support during sample collection and analysis. The project chemist will report to the Task Coordinator and duties will include:

- Coordinating sampling supplies and delivery with the selected laboratory,
- Evaluating analytical data to determine usability of results,
- Verifying laboratory procedures and QA protocols,

- Immediate notification to the Task Manager of potential data problems, and
- Confirming field QC procedures to obtain representative data.

The WTS Project Chemist for this project is Mr. Marcos Delgado.

4.2 Project Scheduling and Reporting Requirements

4.2.1 Tentative Schedule

The actual project schedule is dependent upon approval of this Work Plan, funding of the work efforts described herein, and the availability of qualified drilling subcontractors. A tentative schedule in the form of a Gantt chart is included in Appendix C.

4.2.2 Field Activity Completion Letter Report

Following the completion of the soil borings and construction of additional monitoring wells at SWMU 65, a letter report summarizing the work completed during the field activities will be submitted to the TI (within 60 days). The purpose of this document is to demonstrate the intentions of the Work Plan have been carried out as dictated herein, while noting any deviations from this Work Plan.

4.2.3 Investigation Derived Waste Letter Report

Upon completion of drilling and soil sampling activities, a letter report will be generated detailing the quantities and characterization (based on available analysis) of any IDW generated during the work effort. The letter report will discuss current disposition of the IDW and appropriate disposal options. WTS expects that only drill cuttings, personal protective equipment, and decontamination water will be generated for this project. An IDW Management Plan is included as Appendix E.

4.2.4 RFI Report of Findings

Following the completion of investigation at SWMU 65, an RFI Report of Findings will be completed and submitted for review and approval. The Report of Findings will detail the type, concentration, and extent of the COCs observed, calculations estimating the rate and direction(s) in which a potential release is migrating (if data is adequate to support such analysis). Additionally, the Report of Findings will include appropriate Tier 1 screening for human and ecological contaminants of concern. Tier 1 screening levels will be based on NMED-HWB guidance. The format for the Report of Findings will consist of, but is not limited to, the guidance provided by *NMED HRMB Standard Operating Procedures Manual*, dated March 4, 1998.

4.3 Health and Safety Plan

The site specific health and safety plan (SSHSP) is intended to supplement the *Safety/Health and Accident Prevention Reporting Program* (2004) originally developed by BAE Systems and revised by WTS for all activities conducted at WSMR. As the SSHSP is a stand alone document to be kept on site during all investigative activities, it is included in this Work Plan as Appendix D. The SSHSP will be reviewed and signed by all individuals engaging in work or supervisory activities at SWMU 65.

4.4 Investigation Derived Waste Plan

Investigation Derived Waste (IDW) will be managed as detailed in the IDW Management Plan included as Appendix E. If deemed appropriate, disposal of non-hazardous soil, drilling fluid and development water will take place on site. Any IDW designated as hazardous will be disposed of at an appropriate off site facility.

4.5 Community Relations Plan

Information regarding investigative and/or corrective actions taking place on WSMR is relayed to the interested public through several means. These methods constitute the community relations plan.

If deemed necessary, the public will be notified of the proposed corrective actions once the nature and extent of possible contamination at the site is better understood. WSMR will do one of more of the following depending on the interest of the public and the findings of this study:

1. Conduct an open house/informal meeting in a public location where people can speak in person with representatives of NMED and WSMR regarding SWMU 65.
2. Maintain an easily accessed public repository of information on the site-specific corrective action program. This repository shall include work plans, investigative reports, and other documentation relative to SWMU 65. This repository is known as the WSMR Administrative Record and is located in Building 163, WSMR, New Mexico.
3. Publish a newsletter for distribution to the interested public describing the investigative findings and proposed actions for SWMU 65.
4. The interested public may also directly contact the WSMR Installation Restoration Program Manager, Mr. Jose Gallegos (505-678-1007).

REFERENCES

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APPENDIX A

NMED'S REQUEST FOR SUPPLEMENTAL INFORMATION & WSMR'S RESPONSE

State of New Mexico
ENVIRONMENT DEPARTMENT
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
Telephone (505) 428-2500
Fax (505) 428-2567
www.nmenv.state.nm.us

BILL RICHARDSON
GOVERNOR

RON CURRY
SECRETARY

DERRITH WATCHMAN-MOORE
DEPUTY SECRETARY

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

July 14, 2003

Thomas A. Ladd, Director
Environment and Safety Directorate
U.S. Army White Sands Missile Range
White Sands Missile Range, New
Mexico 88002-5000

SUBJECT: REQUEST FOR SUPPLEMENTAL INFORMATION
RCRA FACILITY INVESTIGATION
FORMER MAIN POST LANDFILL NO. 3
(SWMU 65)
HWB-WSMR-01-003

Dear Mr. Ladd:

On February 17, 2003 the New Mexico Environment Department (NMED) determined that the White Sands Missile Range (WSMR), *RCRA Facility Investigation (RFI) Former Main Post Landfill 3* submitted in June of 2001 was administratively complete. NMED confirmed receipt of the fees paid by WSMR on June 3, 2003.

In accordance with 20.4.2.200.A(7) NMAC and 20.1.4 NMAC, NMED has completed a technical review of WSMR's RFI. NMED does not concur with the conclusions of this report. Several inconsistencies were noted in WSMR's RFI document, which must be addressed. Additionally, previous reviews by the Environmental Protection Agency (EPA) and NMED of the Phase I and II RFI Reports (see Reference List) noted problems with Solid Waste Management Unit (SWMU) 65, which were not adequately addressed by WSMR. The deficiencies regarding Former Main Post Landfill 3, SWMU 65 are listed in Attachment 1. Based on the information presented in the

RFI document and, information contained in the Phase I and II RFI Reports, and the correspondence regarding these reports, it appears that WSMR has not completed its investigation at Main Post Landfill #3. WSMR must submit a response to NMED within 180 days of receipt of this letter, which indicates how and when it will complete its investigation. This final investigation must address all the outstanding issues (see Attachment 1) and resolve any remaining data gaps. The goal is to determine whether there has been a release and, if so, to characterize the release to determine if corrective measures are necessary. NMED will not consider a No Further Action (NFA) petition for this SWMU until WSMR resolves all discrepancies and outstanding issues regarding this site.

If you have any questions regarding this letter, please call me at (505) 428-2550.

Sincerely,

Cheryl A. Frischkorn
White Sands Missile Range Project Leader
Permits Management Program

cc: S. Martin, NMED HWB
G. von Gonten, NMED HWB
L. King, EPA Region 6 (6PD-N)
Gene Forsythe, WSMR

File: Reading File and WSMR 2003 File
HWB-WSMR-01-003

Reference Documents

- RCRA Facility Investigation (RFI) Report, Appendix II, III, and IV Sites, Volume I, White Sands Missile Range, New Mexico, U. S. Army Corps Of Engineers (December 1992).

- RCRA Facility Investigation (RFI) Report, Appendix I Sites, Volume II, White Sands Missile Range, New Mexico, U. S. Army Corps Of Engineers (December 1992).

- Phase II RCRA Facility Investigation Report, Appendix I, II, III, and IV Sites, Volume 1, White Sands Missile Range, New Mexico, U. S. Army Corps Of Engineers (December

1994).

- Phase II RCRA Facility Investigation Report, Appendix I, II, III, and IV Sites, Volume II, White Sands Missile Range, New Mexico, U. S. Army Corps Of Engineers (December 1994).

- Letter from the Environmental Protection Agency (EPA) to WSMR regarding the Phase I RFI (February 26, 1992).

- Notice of Deficiency (NOD) from the New Mexico Environment Department (NMED) to WSMR responding to the Phase II RFI Report (September 4, 1996).

- EPA's letter to WSMR responding to the Phase II RFI Report (February 15, 1996).

- WSMR's Final response letter to NMED's September 4, 1996 NOD (September 22, 1997).

ATTACHMENT 1
REQUEST FOR SUPPLEMENTAL INFORMATION
TECHNICAL ADEQUACY REVIEW
RCRA FACILITY INVESTIGATION
FORMAER MAIN POST LANDFILL NO. 3

COMMENT 1
Section 2.2.2 states that the ground water analysis resulted in the detection of barium at background concentrations and that all laboratory results from the analysis of the drilling mud and cuttings were reported at background levels. However, WSMR has not presented statistical background calculations for inorganic constituents in the ground water or the soils at Main Post Landfill #3.

In order for WSMR to use detected inorganic parameters for comparison to background, background must be statistically calculated for both soil and ground water at the site. WSMR may use the values that will be generated from the forthcoming soil background study for the Main Post.

COMMENT 2
Section 2.2.2 of the report states that during Phase I RFI (1992) sampling, the trace amounts of total petroleum hydrocarbons (TPH) that were detected in the ground water were considered to be the result of either well material leachate or from ambient air near freshly painted well encasements. However, the Phase II RFI (1994) soil sampling results indicated levels of TPH as high as 13,000 mg/kg.

WSMR must investigate the occurrence of TPH in the soil and ground water at the site and determine the source.

COMMENT 3
Section 2.2.3 states that during the Phase II RFI activities, soil samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), TPH, and metals and that the results of the analysis revealed no constituent of concern above background levels. Again, WSMR has not presented statistical background calculations for inorganic constituents in the soil at the Main Post. In addition, WSMR cannot compare detected organic constituents with background values.

COMMENT 4
WSMR must compare concentrations of contaminants detected in the ground water and soil to residential values or site-specific calculated background values for inorganics and not industrial values.

COMMENT 5
Hydrogeologic cross-sections are needed to illustrate the geology, hydrogeology, and the relationships of well screen locations and depths to the potentiometric surface, and the dimensions of the landfill.

Construct hydrogeologic cross-sections to illustrate significant data at the site. Refer to Section 1.2.3 of the 1986 RCRA Groundwater Monitoring Technical Enforcement Guidance Document.

COMMENT 6

Table 2-4 lists the analytical results for SVOCs for soil samples collected during the Phase II RFI. Benzo(a)pyrene was detected at 1060 *ug*/kg at 15 feet, which is greater than the New Mexico Soil Screening Level (NMSSL) of 620 *ug*/kg.

WSMR must address this SVOC detection.

COMMENT 7

A review of the ground water monitoring system at the Former Main Post Landfill #3 has revealed several potential problems. First, it appears that monitoring well MW-5 is currently the only true downgradient well that is capable of promptly detecting releases from the landfill. Second, the screened intervals of all the wells are well below the historic potentiometric surface, therefore, the current monitoring well system is unable to detect light non-aqueous phase liquids (LNAPLs) that may be in dissolved phase near the water table or on the water table. And lastly, WSMR states that the source of TPH detected in the ground water during Phase I RFI activities as either well material leachate or from ambient air near freshly painted well encasements. This may be an indicator that some ground water monitoring wells may not meet the requirements for RCRA-constructed wells and, therefore, do not yield representative samples.

WSMR must re-evaluate the ground water monitoring system to determine if it has the capability to yield representative samples, whether it meets RCRA monitoring well construction requirements, and whether there are at least two downgradient wells located directly downgradient of the landfill that are capable of detecting any releases from the landfill.

COMMENT 8

The title of the document does not indicate if this document is a report or a work plan.

In the future, WSMR must use correct document titles that correspond with those specified in 20.4.2.200 (G) NMAC.

DEPARTMENT OF THE ARMY
U.S. ARMY GARRISON WHITE SANDS
100 Headquarters Avenue
WHITE SANDS MISSILE RANGE, NEW MEXICO 88002-5000

December 19, 2003

REPLY TO
ATTENTION OF
Environment and Safety Directorate

Ms. Cheryl Frischkorn
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

SUBJECT: Response to Request for Supplemental Information for RCRA Facility Investigation at SWMU 65 (IRP Site WSMR-61)

Dear Ms. Frischkorn:

In response to your July 14, 2003 Request for Supplemental Information, White Sands Missile Range (WSMR) submits the enclosed comment responses. WSMR is in the process of acquiring the necessary funding to begin developing the work plan referenced in the our responses. We will continue to work with you in establishing a milestones schedule for this project.

Copies of this correspondence, with enclosure, are being furnished to Ms. Sandra Martin and Mr. John Kieling, NMED-HWB; Mr. James Harris, Region VI EPA; Mr. Mike Kelly, U.S. Army Environmental Center; and BAE Systems.

Should you have any questions regarding this matter, please contact Mr. Jose Gallegos at (505) 678-1007.

Sincerely,

Thomas A. Ladd

Thomas A. Ladd
Director, Environment and Safety Directorate

Enclosure

Response to NMED Comments on RCRA Facility Investigation Former Main Post Landfill No. 3 (SWMU 65) HWB-WSMR-01-003				
Comment Number	**Document Reference**	**NMED Comments**	**C, DNC, or CWE [a]**	**WS-ES-EC Response to NMED Comments**
1	Section 2.2.2	Section 2.2.2 states that the ground water analysis resulted in the detection of barium at background concentrations and that all laboratory results from the analysis of the drilling mud and cuttings were reported at background levels. However, WSMR has not presented statistical background calculations for inorganic constituents in the ground water or the soils at Main Post Landfill #3. In order for WSMR to use detected inorganic parameters for comparison to background, background must be statistically calculated for both soil and ground water at the site. WSMR may use the values that will be generated from the forthcoming soil background study for the Main Post.	C	WSMR will develop a suite of background levels both in soil and groundwater for this site. Currently the *Background Soils RCRA Facility Investigation Work Pan for the Main Post, WSMR* is under review with NMED.
2	Section 2.2.2	Section 2.2.2 of the report states that during Phase I RFI (1992) sampling, the trace amounts of total petroleum hydrocarbons (TPH) that were detected in the ground water were considered to be the result of either well material leachate or from ambient air near freshly painted well encasements. However, the Phase II RFI (1994) soil sampling results indicated levels of TPH as high as 13,000 mg/kg. WSMR must investigate the occurrence of TPH in the soil and ground water at the site and determine the source.	C	WSMR will develop a work plan that will provide an approach to investigate the occurrence of TPH both in the groundwater and soil at the site.
3	Section 2.2.3	Section 2.2.3 states that during the Phase II RFI activities, soil samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), TPH, and metals and that the results of the analysis revealed no constituent of concern above background levels. Again, WSMR has not presented statistical background calculations for inorganic constituents in the soil at the Main Post. In addition, WSMR cannot compare detected organic constituents with background values.	C	WSMR will develop a suite of background levels for inorganics both in soil and groundwater for this site. Currently the *Background Soils RCRA Facility Investigation Work Pan for the Main Post, WSMR* is under review with NMED. Organic detections will be compared to residential New Mexico Soil Screening Levels (NMSSL).

Response to NMED Comments on RCRA Facility Investigation Former Main Post Landfill No. 3 (SWMU 65) HWB-WSMR-01-003				
Comment Number	**Document Reference**	**NMED Comments**	**C, DNC, or CWE [a]**	**WS-ES-EC Response to NMED Comments**
4		WSMR must compare concentrations of contaminants detected in the ground water and soil to residential values or site-specific calculated background values for inorganics and not industrial values.	C	WSMR will develop a suite of background levels both in soil and groundwater for this site. Currently the *Background Soils RCRA Facility Investigation Work Pan for the Main Post, WSMR* is under review with NMED. These levels will be compared to the residential NMSSL's or site specific depending on the data gathered.
5		Hydrogeologic cross-sections are needed to illustrate the geology, hydrogeology, and the relationships of well screen locations and depths to the potentiometric surface, and the dimensions of the landfill. Construct hydrogeologic cross-sections to illustrate significant data at the site. Refer to Section 1.2.3 of the 1986 RCRA Groundwater Monitoring Technical Enforcement Guidance Document.	C	WSMR will develop hydrogeologic cross sections from existing data as part of a work plan that will be submitted for NMED approval.
6	Table 2-4	Table 2-4 lists the analytical results for SVOCs for soil samples during the Phase II RFI. Benzo(a)pyrene was detected at 1060 *u*g/kg at 15 feet, which is greater than the New Mexico Soil Screening Level (NMSSL) of 620 *u*g/kg. WSMR must address this SVOC detection.	C	As part of work plan to be developed, WSMR will address this SVOC detection.
7		A review of the ground water monitoring system at the Former Main Post Landfill #3 has revealed several potential problems. First, it appears that monitoring well MW-5 is currently the only true downgradient well that is capable of promptly detecting releases from the landfill. Second, the screened intervals of all the wells are well below the historic potentiometric surface, therefore, the current monitoring well system is unable to detect light non-aqueous phase liquids (LNAPLs) that may be in dissolved phase near the water table or on the water table. And lastly, WSMR states that the source	C	As part of the work plan that will be developed, WSMR will evaluate the groundwater monitoring system and the well construction data available for MW-4, 5, 7 and 8. Based on this review WSMR will then propose an approach for the detection of releases from the site.

Response to NMED Comments on RCRA Facility Investigation Former Main Post Landfill No. 3 (SWMU 65) HWB-WSMR-01-003				
Comment Number	**Document Reference**	**NMED Comments**	**C, DNC, or CWE [a]**	**WS-ES-EC Response to NMED Comments**
		of THP detected in the ground water during Phase I RFI activities as either well material leachate or from ambient air near freshly painted well encasements. This may be an indicator that some ground water monitoring wells may not meet the requirements for RCRA-constructed wells and, therefore, do not yield representative samples. WSMR must re-evaluate the ground water monitoring system to determine if it has the capability to yield representative samples, whether it meets RCRA monitoring well construction requirements, and whether there are at least two downgradient wells located directly downgradient of the landfill that are capable of detecting any releases from the landfill.		
8		The title of the document does not indicate if this document is a report or a work plan. In the future, WSMR must use correct document titles that correspond with those specified in 20.4.2.20 (G) NMAC.	C	In the future, WSMR will provide correct document titles in accordance with those specified in NMAC 20.4.2.20 (G).

Notes a: C-concur; DNC-do not concur; CWE-concur with exception

APPENDIX B

CONCLUSIONS PHASE I & II
RCRA FACILITY INVESTIGATIONS

2. Continue periodic monitoring of the two wells, including sampling of the groundwater to re-assess the presence of Phase I constituents; metals samples, both filtered and unfiltered, should be collected; a rinsate sample and a field blank collected at the wellhead should be analyzed for TPH. Water levels should be measured in the two monitoring wells and in at least one test or supply well in the vicinity to determine the hydraulic gradient. If the hydraulic gradient cannot be determined, an additional monitoring well should be installed around the SWMU.

3. Evaluate the analytical results to determine whether the RFI for this SWMU should be discontinued or go into further phases.

Although the occurrence of elevated methane in the soil vapor was isolated, the concentration was substantial (29,000 ppm) and should be investigated further to evaluate the safety hazard. A limited soil vapor survey concentrated around the hot spot should be conducted to evaluate the extent of elevated methane and to determine whether it could represent a hazard to nearby structures and their occupants.

2.10 SWMU 65 Former WSMR Post Sanitary Landfill No. 3

2.10.1 RFI Unit Operational History and Delineation

Former sanitary landfill No. 3 (SWMU 65), located in the southeast area of the Post, was in operation from 1965 to 1982, and is the present location of a scrap metal yard (Figure 2-23 and Figures 2-24 through 2-26). The landfill was closed because of its proximity to the freshwater aquifer utilized by the Main Post and the Nuclear Effects Directorate.

The unit is described as a sanitary landfill where only "inert materials" were disposed. Details are not available on the size or shape of the landfill, the types of waste which were managed, where the waste was generated or the volumes of waste which were disposed. No historical information was available on the design, construction and operating procedures used at this unit. Additionally, no documentation of a release from this unit was located in the file material.

This unit was in operation prior to the implementation of RCRA and the local hazardous waste landfill (SWMU 91). The generation and management of waste containing hazardous constituents prior to 1972 at WSMR is unknown.

In March 1991, a Geonics EM-31 was used to measure conductivity values at stations along a pre-established grid lines located along the perimeter of SWMU 65. The grid was emplaced over suspected landfill boundaries and adjacent to undisturbed native soil.

The ground conductivity measured for the interpreted undisturbed soils ranged from 10 mmhos/m^3 to 23 mmhos/m^3, while conductivity values over the landfill were primarily greater than 23 mmhos/m^3. The interpreted boundary between the undisturbed soils and the soils and wastes encountered in the landfill is discernable on the southern, western, and eastern areas of the survey site (Appendix C, Figure 3-2). The northern boundary could not be discerned, partly because of interference from the fenced scrap metal yard and the presence of localized randomly aligned excavations to the north and east of the scrap metal yard.

2.10.2 Hydrogeologic Conditions

The shallow soils at SWMU 65 southeast of the Main Post area are mapped as Sonoita-Pinaleno-Aladdin association and consist of approximately 35 percent Sonoita gravelly sandy loam, 23 percent Pinaleno gravelly sandy loam and 20 percent Aladdin gravelly loamy sand. Geographically, the Sonoita and Pinaleno soils are located on broad areas of old alluvial fans. The Aladdin soil crops out on younger surfaces associated with arroyos or narrow elongated ridges along arroyos. In general, the soil is well drained and salinities minimal (less than 1 mmho/cm) (see Table 1-6, Neher 1969, and Neher and Bailey, 1976).

The stratigraphy beneath SWMU 65 can be characterized from geophysical logs and stratigraphic descriptions logged by the field geologist during the installation of MW-4 and MW-5 monitor wells. The natural radioactivity signature of the subsurface at MW-4 and MW-5 (Appendix A) indicate numerous alternating zones of high natural radioactivity alternating with zones of lower radioactivity. Zones of naturally higher radioactivity usually represent an increase in clay content, whereas lower counts of natural radioactivity suggest an increase in sand and/or silt. Therefore, it is apparent from the geophysical and boring logs that numerous alternating thinly to thickly bedded units of unconsolidated and poorly sorted sand, silt and clay with occasional granule and cobble lenses characterize the stratigraphy from the surface to approximately 295 feet below grade. The stratigraphy is typical for basin fill/alluvial fan depositional cycles.

The aquifer (as described by the field geologist) in the vicinity of SWMU 65 is generalized below from the description of split spoon soil samples retrieved from the screened interval of MW-4 and MW-5:

- MW-4; brown, friable, poorly sorted, saturated SAND
- MW-5; brown, friable, poorly sorted, moist SAND.

The primary color of the sediment, as described by the field geologist at MW-4 and MW-5 is brown. In semi-arid fans, sediments are often red to brown due to weathering of ferromagnesian minerals and biotite. These colors are an indication of high oxide and hydroxide content in the upper soil profile during deposition, suggesting an oxidizing environment (Reading, 1986). In addition, the fact that the soil is well aerated is further evidence of an oxidizing environment.

Grain size distribution determined using sieve and hydrometer analyses characterize the interval sampled in the aquifer as well graded sand and silty sand (Table 1-5). The depth below grade to the regional aquifer in June 1991, ranges from 224.18 feet (3856.18 feet, msl) at MW-4 to 205.14 feet (3879.10 feet, msl) at MW-5 (Table 1-2). Hydraulic conductivity values calculated from slug tests at MW-4 and MW-5 are similar and range from 0.32 feet/day (1.7×10^{-3} cm/sec) to 4.9 feet/day (1.7×10^{-3} cm/sec), respectively (Table 1-4).

Groundwater gradient directions at SWMU 65 could not be confirmed with only two wells but are assumed from previous reports to be to the north and east.

2.10.3 Characterization of Contaminants and Release Evaluation

Depth to fresh groundwater beneath SWMU 65 exceeds 200 feet (see Table 1-2). The soil is of moderate pH, and is expected to be of relatively high organic content in the upper profile, and well-aerated throughout (see Table 1-6). Oxidizing conditions are assumed throughout the vadose zone and in the saturated zone.

Mud and cuttings from monitor wells MW-4 and MW-5 were analyzed for metals and resulted only in concentrations below background levels (see Table 2-14 and Figures 2-24 through 2-26). No other soil or sediment analytical samples were collected during Phase I of the RFI.

Groundwater analyses resulted in barium at probable background concentrations and TPH at very low levels, 2.6 to 4.2 mg/L (see Table 2-13). The trace TPH presence is common to all six of the deep wells installed in the Main Post area and is considered to be the result of either leaching from well materials, or from ambient air at the wellhead where fresh paint on well encasements may have released some of the more volatile TPH fractions during sampling.

The soil vapor survey at SWMU 65 revealed a hot spot in the southeastern quarter of the suspected landfill area (see Appendix F). Elevated CO_2 and methane and low levels of xylenes defined an area of several thousand square feet. No structures exist nearby which could be threatened by accumulation of methane. The detection of these elevated levels of gaseous-phase constituents over a relatively large area suggests a significant accumulation of wastes in this portion of the inactive landfill. It should also be noted that relatively high concentrations of unidentified hydrocarbons were detected at isolated sampling point F2. These compounds may have interfered with quantification of target compounds.

2.10.4 Conclusions and Recommendations

Although a viable transport mechanism for constituents (i.e., sufficient water for percolation) is not apparently available, the landfill should be investigated further due to the suspected presence of concentrated wastes. The following Phase II activities are recommended:

1. Auger several borings in the hot spot to a minimum of 30 feet; collect soil/waste samples at 5-foot intervals to assess the vertical extent of contamination and to characterize the wastes; total depth should extend below visual and PID indications of contamination.

2. Conduct a second phase soil vapor survey (the first phase survey grid terminated at the geophysically-determined landfill boundaries) to assess horizontal limits of contamination.

3. Continue with periodic monitoring of MW-4 and MW-5. This should include sampling to re-assess the presence of Phase I constituents of concern, particularly TPH; metals samples, both filtered and unfiltered, should be collected; a rinsate sample and a field blank collected at the wellhead should be analyzed for TPH.

4. Monitoring should also include measurement of water levels in the two monitor wells and at least one nearby test or supply well in order to define the hydraulic gradient. If the hydraulic gradient cannot be determined an additional monitoring well should be installed around the SWMU.

5. Data should be evaluated to determine whether further investigation under the RFI is warranted.

2.11 SWMU 79 Sewage Treatment Plant (STP) Sludge Beds

2.11.1 RFI Unit Operational History and Unit Delineation

This unit is located 2 miles east of the Main Post area, is currently active, and consists of a series of 11 parallel beds used for the drying of STP sludge (Figures 2-27 and 2-28).

In 1978, a flash flood destroyed the original sludge beds. The remaining debris was removed and stored in a nearby waste pile (SWMU No. 80). The sludge beds are separated by 2-foot-high concrete walls and have sand bottoms. The unit is bounded on the north by a concrete distribution trough, (approximately 2 feet wide and 2 feet high) for the entire length of the beds. Each bed is approximately 15 to 20 feet wide and 50 feet long. The southern end of each bed is designed with an elevated concrete drive for unloading of the sludge from trucks. Sludge is deposited in the beds approximately once a month, and the dried sludge is removed once a year. Facility representatives estimated that 3 to 4 cubic yards of sludge cake is removed from each cell each year.

2.11.2 Hydrogeologic Conditions

The shallow soils at SWMU 79 are mapped as Sonoita-Pinaleno-Aladdin association and consist of approximately 35 percent Sonoita gravelly sandy loam, 23 percent Pinaleno gravelly sandy loam and 20 percent Aladdin gravelly loamy sand. Geographically, the Sonoita and Pinaleno soils are located on broad areas of old alluvial fans. The Aladdin soil crops out on younger surfaces associated with arroyos or narrow elongated ridges along arroyos. In general, the soil is well drained and salinities minimal (less than 1 mmho/cm) (see Table 1-6, Neher 1969, and Neher and Bailey, 1976).

6.15 SWMU 65 - FORMER WSMR POST SANITARY LANDFILL NO. 3

6.15.1 Unit Description

Former sanitary landfill No. 3 (SWMU 65), located in the southeast area of the Post, was in operation from 1965 to 1982, and is the present location of a scrap metal yard (Figure 6.15-1).

The unit is described as a sanitary landfill where only "inert materials" were disposed. Details are not available on the size or shape of the landfill, the types of waste which were managed, where the wastes were generated or the volumes of waste which were disposed of. Historical information is not available on the design, construction and operating procedures used at this unit. Additionally, no documentation of a release from this unit has been located in the file material. This unit was in operation prior to the implementation of RCRA. The generation and management of waste containing hazardous constituents prior to 1972 at WSMR has not been documented.

6.15.2 Summary of Phase-I Findings

In March 1991, a Geonics® EM-31 surface conductivity meter was used to measure conductivity values at stations along pre-established grid lines located along the perimeter of SWMU 65 in an attempt to delineate the landfill's boundary. The grid was emplaced over suspected landfill boundaries and adjacent undisturbed native soil. The interpreted boundary between the undisturbed soils and the soils and wastes encountered in the landfill was discernable on the southern, western and eastern areas of the survey site. The northern boundary could not be discerned, partly because of interference from the fenced scrap metal yard and the presence of

localized randomly aligned excavations to the north and east of the scrap metal yard.
As indicated in Phase-I, the interpreted landfill boundary conforms to many of the present surficial features shown in Figure 6.15-1. The western edge of the landfill was interpreted to begin just west of the southwest corner of the scrap yard and run south-southeast toward the southern arroyo, along the abandoned paved road and drainage ditch. The southern boundary was interpreted to be just north of the arroyo. The eastern boundary was interpreted to exist just west of the north-south running dirt road.

During Phase-I, an assessment of SWMU 65 was performed via SVS during 1991 and 1992. The SVS (1991) revealed a suspect area in the southeastern quarter of the potential landfill area. Elevated CO_2 and methane and low levels of xylenes were detected in an area of several thousand square feet. No structures exist nearby which could be threatened by the accumulation of methane. Methane was detected at Phase-I sampling points A5, A6, B5, B6, C5 and C6 (Figure 6.15-2). The elevated CO_2 corresponded with the methane detects. The total xylenes were detected at sample points C7, C8, D7, D8, E7, E8, F7 and F8. Additionally, relatively high concentrations of unidentified hydrocarbons were detected at an isolated sampling point F2.

In 1992, twenty-one points were resampled as part of Phase-I to verify the results of the SVS conducted in 1991. Only CO_2 and CH_4 were detected at concentrations above their quantitation limits (QL) in the south-central section of the suspected landfill area. Additionally, 1,1,2-trichloroethane was detected in sample A5.

Two monitoring wells, MW-4 and MW-5, were installed during Phase-I. The drilling mud and the cuttings from these two wells were sampled in addition to the groundwater. The samples were analyzed for VOCs, SVOCs, TPH, metals and cyanide. A composite sample of drilling

mud and cuttings was collected and sample analyses resulted in barium, chromium and lead concentrations which were at or below background soil levels. The Phase-I groundwater analysis revealed barium at probable background concentrations and TPH at very low levels (2.6 and 4.2 mg/l). The trace TPH presence was common to the six deep wells installed at the Main Post during Phase-I and was considered to be the result of ambient air at the wellhead where fresh paint on well encasements may have released some of the more volatile TPH fractions during sampling.

6.15.3 Phase-II Findings

6.15.3.1 Geophysical Survey

A surface geophysical survey utilizing Ground Penetrating Radar (GPR) (Subsurface Interface Radar) was planned at SWMU 65 in an attempt to delineate the extent and depths of the landfill cells and locate anomalies and areas for possible trenching at a later date. As noted in the Surface Geophysical Survey Report, Appendix IV, a GPR survey was not performed at SWMU 65 during Phase-II because, during the planned SWMU 38/39 GPR survey, it was determined that only limited data could be obtained from the survey due to natural soil conditions. The presence of gypsum in the soil increased the attenuation of the GPR signal which greatly reduced GPR's depth of penetration. Based on this condition and the presence of readily visible surficial debris at SWMU 65, it was decided that the geophysical survey at SWMU 65 would be relatively ineffective and was abandoned after communication with USACE-Tulsa and WSMR. Visual observations at the site, however, indicate that the only unknown boundary of the former landfill, the northern boundary, appears to be located south of the east-west running dirt road as there was no visually apparent surficial debris or any other evidence of an old landfill

observed to the north of the road. The boring log for monitoring well MW-4 also indicates that fill material was not encountered.

6.15.3.2 Soil Gas Survey

A Phase-II SGS was performed over the majority of the suspected landfill area at SWMU 65 in order to better delineate the identified vapor-phase constituents detected during the Phase-I SVSs. A total of forty-eight sample points laid out on an approximate 200 ft grid pattern were sampled as located on Figure 6.15-1. Soil gas samples were collected from the 5 to 10 ft depth interval. Samples were analyzed for methane, benzene, toluene, total xylenes, 1,1,1-trichloroethane, tetrachloroethene, total volatile organics, and tentatively identified compounds (TICs). The SGS analytical results are included in Appendix V.

The Phase-II SGS detections were located within the suspected landfill boundaries as described in Section 6.15.2. The SGS analytical results are shown in Appendix V. Tetrachloroethene was detected once at Phase-II sample point G106, in the northeast corner of the landfill (Figure 6.15-1). 1,1,1-trichloroethane and benzene were not detected at all. Only fifteen of the forty-eight Phase-II sample points had detections. Most of the detections consisted of methane, total volatile organics, and hydrocarbon TICs. In general, the locations with the greater hits of total volatile organics and hydrocarbon TICs tended to also detect higher values of xylene and toluene. As identified from the Phase-II SGS, the five most impacted Phase-II sample points were G204, G302, G403, G405 and G605. The highest detected value of total volatile organics was 80 ug/l (G204). The highest detected values of toluene and xylene respectively were 17 ug/l (G302) and 10 ug/l (G605).

6.15.3.3 Soil

A total of forty soil samples were collected during Phase-II from seven 30 ft soil borings and one background hand auger boring. The soil borings were located near Phase-I and Phase-II SGS points which indicated organic constituents in order to further study the vapor-phase constituents of concern (Figure 6.15-1). The samples were analyzed for VOCs, SVOCs, TPH and metals.

As shown in Tables 6.15-1 and 6.15-2, many VOCs and SVOCs were detected in the soil borings. Although nine VOCs and seventeen SVOCs were detected none of them exceeded any of their respective action levels. The vast majority of the compounds detected occurred in nine samples collected from four soil borings. SB-01, SB-02 and SB-07 did not detect any compounds with the exception of a couple of trace TPH detects in SB-01 and SB-02. The two most impacted borings were SB-03 and SB-05. The 9 ft and 15 ft samples from SB-03 contained numerous VOCs (Table 6.15-1). The 9 ft sample also detected TPH (NM Land Disposal Standard = 1000 mg/kg) at 4360 mg/kg (Table 6.15-2). The constituents diminished in the 18 ft sample and the underlying 24 ft and 29 ft samples were free of the constituents. The 10 ft, 15 ft and 19 ft samples of SB-05 contained nearly the full list of the nine detected VOCs (Table 6.15-1). The most impacted single soil sample at SWMU 65 was the 15 ft sample from SB-05. All but two of the seventeen detected SVOCs were detected in the 15 ft sample (Table 6-15B). Additionally, TPH was detected in this sample at 13,000 mg/kg. TPH was found at reduced levels in the 19 ft sample, but the detected level was 971 mg/kg. Like SB-03, no constituents of concern were detected in the underlying 24 ft and 29 ft samples indicating that the detected TPH from above is not migrating downward. It should be pointed out that, due to poor recovery with the drill rig, the 14 ft sample from SB-04 was collected with a stainless steel bowl and

spoon as the cuttings were being brought to the surface by the augers. Therefore, the amount of organics detected (especially VOCs), should be considered to be biased low.

Table 6.15-3 summarizes the metals which were detected in the Phase-II analyses. Five metals were detected, however, none of them approached their respective action levels. The background hand auger sample detected barium and lead, and cadmium at a level which was higher than any of the SWMU specific soil samples (6.43 mg/kg). Arsenic, barium and cadmium were not detected in the site soils at elevated levels compared to the off-site sample that was collected. Lead and mercury were detected at elevated levels in only those samples which were previously described as having significant levels of VOCs and SVOCs. The highest value of lead was detected in the 14 ft sample of SB-04 at 85.6 mg/kg. The highest value of mercury was detected in the 9 ft sample of SB-03 at 0.0945 mg/kg.

Based on the boring logs presented in Appendix I, the depth of the landfill appears to be ranging from approximately 17 ft (SB-04 and SB-06) to 21 ft (SB-05). The soil zones identified above which were considered to contain the most significant level of constituents also had elevated PID readings and visual staining. SB-07 is the only boring from which samples had no obvious signs of landfill debris.

6.15.3.4 Groundwater

To increase the monitoring coverage of the groundwater surrounding SWMU 65, two additional monitoring wells were installed during Phase-II around the landfill. Groundwater samples were collected from these two wells, MW-7 and MW-8, and the existing Phase-I wells, MW-4 and MW-5 (Figure 6.15-1). A fifth water sample was collected from the WSMR water supply used

during the installation of the wells. The four groundwater samples were analyzed for VOCs, SVOCs, TPH, metals (total and filtered), and TDS. SVOCs and TPH were not detected in the samples.

Two VOCs were detected in the groundwater sample from MW-7 (Table 6.15-4). 1,1-Dichloroethene (MCL = 7 ug/l; NM Groundwater Standard = 5 ug/l) and 1,1,1-trichloroethane (MCL = 200 ug/l; NM Groundwater Standard = 60 ug/l) were both detected slightly above their quantitation limits. VOCs were not detected in the WSMR water supply sample.

Table 6.15-5 indicates that the only metals detected were arsenic (MCL = 50 ug/l; NM Groundwater Standard = 100 ug/l), barium (MCL and NM Groundwater Standard = 1000 ug/l), and lead (MCL = 15 ug/l; NM Groundwater Standard = 50 ug/l). None of the detected constituents surpassed their respective action levels. Arsenic was detected just above its detection limits in MW-5 and the highest barium concentration was detected in the WSMR water supply sample. Total lead was detected near its action level at 12.3 ug/l in MW-8. Lead was not detected in the dissolved sample of MW-8. Table 6.15-5 also reveals that none of the four sampled monitoring wells around SWMU 65 detected TDS at levels which approach the State's groundwater protection limit of 10,000 mg/l.

6.15.4 Hydrogeologic Conditions

The stratigraphy beneath SWMU 65 can be characterized from down-hole geophysical logs and stratigraphic descriptions from the field geologists during the installation of MW-4 and MW-5 during Phase-I and MW-7 and MW-8 during Phase-II. The Phase-II boring logs and well construction diagrams are located in Appendix I and the Phase-II down-hole geophysical report

is presented in Appendix VI. The stratigraphy is typical for basin fill/alluvial fan depositional systems. In general, from the surface down to about 295 ft, the subsurface is characterized by numerous alternating thinly to thickly bedded units of unconsolidated sand, silt, and clay and all combinations in between (Appendix I). In general, the subsurface at SWMU 65 contains much more clay than at SMWUs 63 or 64. At SMWU 65, thick beds of clay are present while at SWMUs 63 and 64 clay is present only occasionally and in subordinate amounts.

The grain size distributions of the transmissive zone, examined by running sieve analyses on a sample collected from within each of the screened zones during Phase-II, characterize the units as silty sand (MW-7) to poorly graded sand (MW-8) (see Appendix II). The grain size distribution showed that both MW-7 and MW-8 contained 8% gravel and sand ranged from 67 to 88%, respectively. The grain size distribution, as examined in Phase-I, characterized the screened interval of MW-4 as silty sand and the screened interval of MW-5 as well graded sand.

The hydraulic conductivities, estimated from slug test data obtained during Phase-II, of MW-7 and MW-8 were 0.55 ft/day (1.96×10^{-4} cm/sec) and 0.94 ft/day (3.30×10^{-4} cm/sec), respectively as shown in Table III-3 of Appendix III. The Phase-II slug test data, assumptions and estimations can be found in Appendix III. The hydraulic conductivity values estimated from slug tests performed at MW-4 and MW-5 during Phase-I range from 0.32 ft/day (1.1×10^{-4} cm/sec) to 4.9 ft/day (1.7×10^{-3} cm/sec), respectively.

The static groundwater depths, measured from the top of casing on February 8, 1994, in the four monitoring wells sampled for SWMU 65 ranged from 204.80 ft in MW-5 to 224.16 ft in MW-4. As summarized in Table 6.0-2, the static groundwater elevations in the four wells ranged from 3851.92 ft MSL (203.4 ft bgs) in MW-5 to 3865.27 ft MSL (210.7 ft bgs) in MW-8.

As stated in the Phase-I RFI, the groundwater flow in the Main Post area is apparently influenced by pumping from the local water supply wells. This is a potential explanation for the differences in groundwater elevations observed in the monitoring wells at the site. The groundwater elevations measured on February 8, 1994 at SWMU 65 suggest a groundwater gradient direction toward the east.

6.15.5 Conclusions and Recommendations

1. Fifteen of the forty-eight Phase-II SGS points had "detects" which consisted primarily of methane, total volatile organics, and hydrocarbon TICs. These subsurface detections confirmed the presence of the Phase-I detected vapor-phase compounds. All of the detects occurred within the suspected landfill boundaries.

2. The soil samples collected from soil borings SB-03, SB-04, SB-05 and SB-06 detected organic compounds. None of the VOCs or SVOCs detected, however, were present at levels greater than their regulatory levels. The State's TPH land disposal standard was exceeded in two samples. The 9 ft sample from SB-03 contained TPH at 4360 mg/kg and the 15 ft sample contained TPH at 13,000 mg/kg.

3. Based on the analytical soil results, the two most impacted soil borings, SB-03 and SB-05, showed significant levels of constituents of concern at depths of less than 20 ft, however, it appears as if the downward migration of these constituents is minimal since none of the samples collected below 20 ft detected any of the constituents of concern.

4. The four groundwater samples collected from SWMU 65 during Phase-II did not

detect any significant levels of constituents of concern. The Phase-II results also did not detect TPH which was reported in Phase-I.

5. The Phase-II groundwater level data indicate that the regional groundwater gradient direction under SWMU 65 is generally toward the east. The downgradient monitoring well, MW-5, did not detect any organic compounds and only detected some metals at potentially background concentrations.

6. The depth of the landfill, based on the soil boring logs (Appendix I), appears to be approximately 17 to 21 ft.

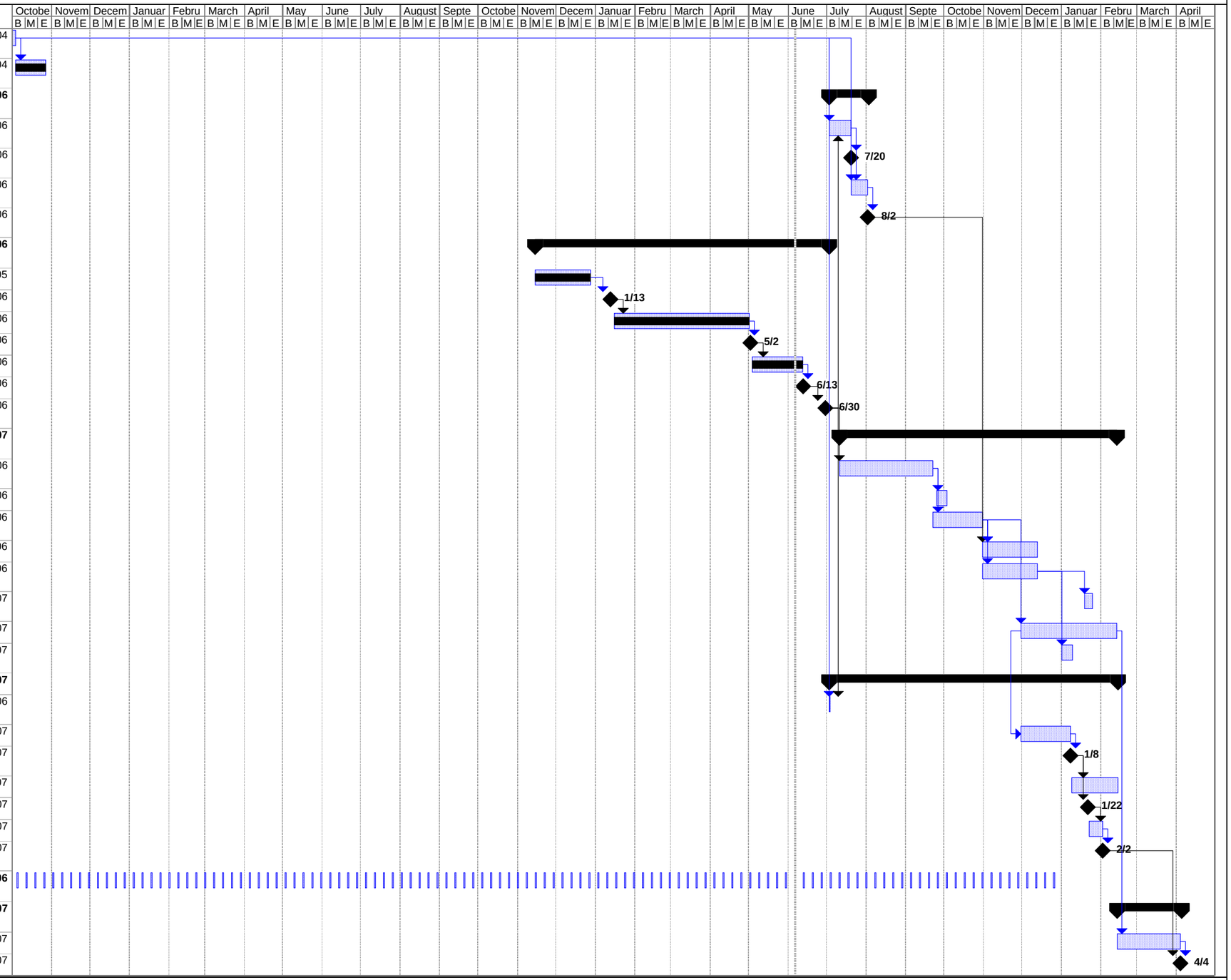
While the data generated to date indicates that a significant release of contaminants has not occurred at SWMU 65, it is recommended that the SWMU be periodically monitored. Since SWMU 65 is an old landfill and by its nature contains some waste material, and because of its proximity to the freshwater aquifer utilized by the Main Post and the Nuclear Effects Directorate, groundwater samples from the four SWMU 65 monitoring wells should be periodically monitored for quality. It is recommended that the RFI for SWMU 65 be discontinued since no significant release of contaminants has been identified at the site. A request for a Class 3 permit modification should be submitted by WSMR to terminate the RFI/CMS for this unit.

APPENDIX C

PROJECT SCHEDULE

Project Scheduling Main Post Landfill No. 3 (TO-009)

ID		Task Name	Duration	Start	Finish
1		**Receive Notice to Proceed from TI**	1 day	Fri 10/1/04	Mon 10/4/04
2	✓	**Phase 1 - Data review and response to NMED-HWB**	20 days	Mon 10/4/04	Wed 10/27/04
3		**Phase 2 - Preparation of NEPA documentation**	**26 days**	**Mon 7/3/06**	**Thu 8/3/06**
4		Prepare REC & RPPBA documentation	15 days	Mon 7/3/06	Thu 7/20/06
5		Submit REC & RPPBA documentation	1 day	Thu 7/20/06	Fri 7/21/06
6		Perform natural & cultural resources surveys	10 days	Thu 7/20/06	Wed 8/2/06
7		Submit natural & cultural resources surveys	1 day	Wed 8/2/06	Thu 8/3/06
8		**Phase 3 - Complete work plan**	**184.56 days**	**Tue 11/15/05**	**Mon 7/3/06**
9	✓	Prepare draft work plan	35 days	Tue 11/15/05	Wed 12/28/05
10		Submit draft work plan to TI	1 day	Fri 1/13/06	Mon 1/16/06
11		TI review period	85.31 days	Mon 1/16/06	Mon 5/1/06
12		Receive comments from TI	1 day	Tue 5/2/06	Wed 5/3/06
13		Prepare final work plan	31.31 days	Thu 5/4/06	Mon 6/12/06
14		Meeting with NMED-HWB	1 day	Tue 6/13/06	Tue 6/13/06
15		Submit final work plan to TI for submittal to NMED-HWB	1 day	Fri 6/30/06	Mon 7/3/06
16		**Phase 4 - Work plan implementation**	**175 days**	**Tue 7/11/06**	**Tue 2/13/07**
17		NMED review & approval of work plan	60 days	Tue 7/11/06	Fri 9/22/06
18		Complete utility clearances	7 days	Mon 9/25/06	Tue 10/3/06
19		Procure subcontractors & materials	30 days	Fri 9/22/06	Tue 10/31/06
20		Soil boring & sampling	35 days	Tue 10/31/06	Wed 12/13/06
21		Installation of four new monitoring wells	35 days	Tue 10/31/06	Wed 12/13/06
22		Sampling event at specified wells	5 days	Fri 1/19/07	Thu 1/25/07
23		Laboratory analysis	60 days	Thu 11/30/06	Tue 2/13/07
24		Survey of new & existing wells	7 days	Mon 1/1/07	Wed 1/10/07
25		**Phase 5 - Report of findings**	**183 days**	**Mon 7/3/06**	**Wed 2/14/07**
26		Submit master project schedule to TI	1 day	Mon 7/3/06	Tue 7/4/06
27		Prepare draft RFI report	30 days	Thu 11/30/06	Mon 1/8/07
28		Submit draft RFI report to TI for review	1 day	Mon 1/8/07	Tue 1/9/07
29		TI review period	30 days	Tue 1/9/07	Wed 2/14/07
30		Receive comments from TI	1 day	Mon 1/22/07	Mon 1/22/07
31		Prepare final RFI report	10 days	Tue 1/23/07	Fri 2/2/07
32		Submit final RFI report to TI for submittal to NMED-HWB	1 day	Fri 2/2/07	Mon 2/5/07
33		**Phase 6 - Weekly progress meetings**	**653.5 days**	**Tue 10/5/04**	**Wed 12/27/06**
151		**Phase 7 - Data management / GIS**	**41 days**	**Wed 2/14/07**	**Thu 4/5/07**
152		Organize electronic data	40 days	Wed 2/14/07	Wed 4/4/07
153		Submit electronic data to TI	1 day	Wed 4/4/07	Thu 4/5/07



Project: TO 009 MPL3 Gantt chart 022
Date: Tue 6/6/06

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

Prepared by James Thompson, WTS

APPENDIX D

SITE SPECIFIC HEALTH & SAFETY PLAN

APPENDIX D

SITE SPECIFIC HEALTH AND SAFETY PLAN
PHASE III RCRA FACILITY INVESTIGATION
MAIN POST LANDFILL NO. 3 (SCRAP YARD)
WHITE SANDS MISSILE RANGE, NEW MEXICO

Submitted to:

U.S. Army
White Sands Missile Range
Environment and Safety Directorate
White Sands Missile Range, New Mexico 88002-5048

June 2006

Submitted by:

White Sands Technical Services, LLC
Building 126
White Sands Missile Range, New Mexico 88002

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LIST OF ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
ARARs	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
dBA	decibels, A-weighted
COC	Contaminants of concern
DRO	Diesel range organics
EOD	Explosive Ordinance Disposal
FID	Flame Ionization Detector
GFCI	Ground Fault Circuit Interrupter
HAZWOPER	Hazardous Waste Operations
HSO	Health and Safety Officer
IDLH	Immediate Danger to Life and Health
LEL	Lower Explosive Limit
mg/kg	milligram per kilogram
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
PPE	Personal Protective Equipment
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SSHSP	Site Specific Health and Safety Plan
SVOC	Semi-volatile organic compound
TIC	Tentatively identified compounds
TLV	Threshold Limit Value
TPH	Total petroleum hydrocarbon
TWA	time-weighted average
UXO	Unexploded Ordnance
VOC	Volatile organic compound
WSMR	White Sands Missile Range

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REVIEWS AND APPROVALS

This plan serves as a site-specific addendum to the *Safety/Health and Accident Prevention Reporting Program* dated May 2003, developed by BAE Systems, for all activities conducted at White Sands Missile Range (WSMR) and its sub-installations. The Accident Reporting and Safety Program provides minimum safety standards and accident prevention fundamentals to cover a range of activities at WSMR. To supplement the information in the Accident Reporting and Safety Program, this plan describes specific activities related to site safety for the continuing investigative tasks at the site of the inactive Main Post Landfill No. 3. This Site-Specific Health and Safety Plan was approved by the following individuals:

James Thompson
Task Coordinator
White Sands Technical Services, LLC

13 June 2006
Date

John Mills
Health and Safety Officer
White Sands Technical Services, LLC

14 Jun 2006
Date

Fred Bourger
Task Manager
White Sands Technical Services, LLC

13 June 06
Date

Edward H. Martinez, P.E.
Program Manager
White Sands Technical Services, LLC

13 June 2006
Date

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SITE SPECIFIC HEALTH AND SAFETY PLAN FOR THE PHASE III RCRA FACILITY INVESTIGATION MAIN POST LANDFILL NO. 3 WHITE SANDS MISSILE RANGE, NEW MEXICO

1.0 INTRODUCTION

The Main Post Landfill No. 3, identified as Solid Waste Management Unit (SWMU) 65, is located west of the Nuclear Effects Laboratory (NEL) and southeast of Main Post. This site was reportedly utilized to dispose of inert sanitary materials generated on WSMR. A portion of the site was also utilized as a scrap metal accumulation area. Records indicate usage from 1965 to 1982, although 1961 and 1963 aerial photographs show surface disturbances at the site. The work plan prepared by the Army, and approved by NMED, identified appropriate investigation methods.

This SSHSP serves as a general safety plan for overall work at SWMU 65. The drilling subcontractor(s), who will carry out the bulk of work, will be required to develop their own SSHSP. All non-essential personnel, including Army, WTS, and regulatory personnel will be required to adhere to the subcontractor's work plan when on-site. When conflicts are found between the subcontractor's SSHSP and this SSHSP, the more protective of the two will dictate health and safety practices at the specific area where the subcontractor is carrying out their work. WTS' onsite supervisor will make the determination as to which plan is more protective.

This work area has been extensively sampled in the past. The WSMR RCRA Facility Assessment (RFA) first identified this site as requiring investigation to determine if the landfill contains contaminants that could impact the fresh water aquifer located below the site. Two RCRA Facility Investigations (RFIs) have been conducted but were not able to conclusively show the site is not a concern.

TABLE 1. RESULTS OF PAST STUDIES

Study	Date	Groundwater Detects (Potential COCs)	Soil Detects (Potential COCs)	Soil Vapor Detects (Potential COCs)
RCRA Facility Assessment	1988	NA	NA	NA
Phase I RCRA Facility Investigation	1991	Barium, TPH	Barium, Chromium, Lead	Carbon dioxide, Methane, Xylenes
Phase II RCRA Facility Investigation	1994	Arsenic; Barium; Lead; 1,1dichloroethene; 1,1,1-trichloroethane;	Arsenic, Barium, Cadmium, Lead, TPH, VOCs, SVOCs	Methane, Total volatile organics, TIC hydrocarbons, Tetrachloroethene
Bi-annual Groundwater Monitoring	1996 - 2001	Arsenic, Barium, Cobalt, Lead, Nitrate, TPH	NA	NA
Notes: All groundwater detect values were below applicable Maximum Contamination Levels (MCLs) except 1,1dichloroethene and 1,1,1-trichloroethane, which were attributed to laboratory error due to the low levels detected. Soil samples detecting VOCs and SVOCs came from the borings in areas containing landfilled waste.				

2.0 HAZARD ASSESSMENT

2.1 Anticipated Hazards

2.1.1 Potential Chemical Hazards

WSMR records and analytical results from previous phases of the RFI indicate the presence of solid waste, heavy metals (arsenic, barium, cadmium, and lead), and petroleum products in the area defined as SWMU 65. Of these potential contaminants of concern (COCs) only soil samples from the actual landfill cells detected elevated levels of VOCs, SVOCs, and TPH that were above regulatory limits. Metals are naturally occurring in the geology of this region. Potential COCs for SWMU 65 are summarized in Table 2.

Analytical results given are for the highest noted concentrations detected. The majority of samples had considerably lower concentrations or non-detects. Groundwater detections included initial samples taken directly after monitoring well installation and during the bi-annual monitoring period thereafter. Soil analytical results are from samples taken during soil borings performed as part of the Phase II Investigation.

TABLE 2. POTENTIAL COC CONCENTRATIONS DETECTED

Constituent		Max Detected Groundwater Concentration (mg/L)	Max Detected Soil Concentration (mg/kg)	Ground-water Protection Standard [1] (mg/L)	Residential Soil Screening Level [2] (mg/kg)
Metals	Arsenic	0.064	5.49	0.05	3.9
	Barium	0.12	266	1.0	5450
	Cadmium	0.0017	6.4	0.005	74.1
	Lead	0.021	35.1	0.05	400
VOCs	Acetone	ND	2.360	PQL = 0.1	70400
	2-Butanone	ND	0.236	Not listed	573
	Carbon disulfide	ND	0.009	PQL = 0.1	3760
	1,4-Dichlorobenzene	ND	0.322	0.075	36
	Ethyl benzene	ND	0.201	0.7	10600
	Methylene chloride	0.006 [3]	0.014	0.005	165
	Styrene	ND	0.047	EPA 0.1 PQL = 0.01	419
	Toluene	ND	0.070	0.75	248
	Xylenes (total)	ND	0.920	0.62	132
SVOCs	Acenaphthene	ND	0.604	PQL = 0.01	4690
	Anthracene	ND	1.890	PQL = 0.01	23500
	Benzo(a)pyrene	ND	1.060	0.0002	0.621
	Benzo(k)fluoranthene	ND	1.560	PQL = 0.02	62.1
	Benzyl alcohol	ND	3.510	PQL = 0.01	Not listed
	Bis(2-ethylhexyl) phthalate	ND	0.886	PQL = 0.02	347
	Butylbenzylphthalate	ND	0.364	PQL = 0.01	Not listed
	Dibenzofuran	ND	0.398	PQL = 0.01	313
	1,4-Dichlorobenzene	ND	0.357	0.075	36.0
	Di-n-butylphthalate	ND	0.570	PQL = 0.01	6000
	Fluoranthene	ND	6.420	PQL = 0.01	2250
	Fluorene	ND	1.090	PQL = 0.01	3130
	2-Methylaphthalene	ND	0.525	PQL = 0.01	Not listed
	Naphthalene	ND	0.708	PQL = 0.01	71.9
	Phenanthrene	ND	8.210	PQL = 0.01	1800
	Phenol	ND	1.970	0.005	18000
	Pyrene	ND	3.610	PQL = 0.01	2300
	Total petroleum hydrocarbons	0.58	13,000	Not listed	1000 mg/kg (Remediation goal 20 NMAC 9.1)

Notes:
1) 20 *NMAC 9.1.1100 A*. PQL – Practical Quantification Limit, used by NMED as a baseline value for determining Corrective Action Levels (CALs) when true baseline is unknown.
2) NMED, *Technical Background Document for Development of Soil Screening Levels, Revision 2.0*, February 2004.
3) The RFI Report (MEVATEC, June 2001) stated methylene chloride was likely a laboratory contaminant.
4) ND – non-detect

Should dangerous levels of gasses be identified by the monitoring during investigative action, all work will cease, all equipment shut down, and all personnel shall leave the affected area. The event will be documented and periodic monitoring will continue until such time that levels are safe to return to work.

A hazard analysis has been prepared for potential site contaminants. The hazard analysis utilizes exposure and toxicity information generated by OSHA, the American Conference of Governmental Industrial Hygienists (ACGIH), the National Institute for Occupational Safety and Health (NIOSH), the National Toxicology Program, and the International Agency for Research on Cancer and accepted industry data.

Arsenic

Note: Arsenic is present in the native soil and geologic formations of the area. Thus, exposure to some levels of natural arsenic is possible for individual site workers.

Routes of Entry	Inhalation, Ingestion, Skin and Eye Contact
Target Organs	Liver, Kidneys, Skin, Lungs, Lymphatic System
Hazard	Toxic
TLV	0.01 mg/m^3
IDLH	100 mg/m^3 (Potential occupational carcinogen 5 mg/m^3)

Trivalent arsenic compounds are corrosive to the skin, mucous membranes, eyes, nose and mouth. Wrists, genitalia, armpits, chest and neck are sites of dermatitis. Perforation of the nasal septum may occur. Arsenic may produce keratoses, and may cause cancer. Acute inhalation may cause cough, chest pain, dyspnea, headache, and weakness.

Barium

Note: Barium is present in the native soil and geologic formations of the area. Thus, exposure to some levels of natural barium is possible for individual site workers.

Routes of Entry	Inhalation, Ingestion, Contact
Target Organs	Eyes, Skin, Respiratory System, Heart, Central Nervous System
Hazard	Toxic
TLV	0.5 mg/m^3
IDLH	50 mg/m^3 as Ba

Pure barium does not occur in nature. Occurrences in nature are as barite and witherite. When exposed to acute levels in drinking water above the MCL, the EPA has found barium to cause muscular weakness and gastrointestinal disturbances. Long-term exposures at levels in drinking water above the MCL may also cause hypertension. There is no evidence the barium has the potential to cause cancer from the exposures typically found in drinking water.

Cadmium

Routes of Entry	Inhalation, Ingestion
Target Organs	Respiratory System, Kidneys, Prostrate, Blood
Hazard	Toxic
TLV	0.005 mg/m^3
IDLH	9 mg/m^3 as Cd

Cadmium occurs in ores of zinc, copper, and lead. Cadmium is slightly more mobile in soils than other metals. Acute exposures to cadmium can cause nausea, vomiting, diarrhea, muscle cramps, salivation, sensory disturbances, liver injury, convulsions, shock and renal failure. Long-term exposures in drinking water above the MCL may lead to kidney, liver, bone, and blood damage.

Lead

Note: Lead is naturally occurring in the geology of the region, there is potential to come into contact with naturally occurring lead, which is typically present in small quantities.

Routes of Entry	Inhalation, Ingestion, Skin and Eye Contact
Target Organs	Gastrointestinal Tract, Central Nervous System, Kidneys, Blood, Gingival Tissue.
Hazard	Toxic
TLV	0.05 mg/m^3
IDLH	100 mg/m^3

Inhalation or ingestion may cause headache, weakness, irritability, aching muscles, constipation, anorexia, abdominal pains, anemia, high blood pressure, fine tremors, and decreased hand grip. Exposure over an extended period causes convulsions, coma, kidney damage, infertility in both sexes, fetal damage and anemia. Lead is a cumulative toxin since the half-life of lead in the body is around 27 years.

TABLE 3. VOLATILE AND SEMI-VOLATILE ORGANIC CARBONS (VOCS, SVOCS)

Constituent	Route of Entry	Target Organs	Hazard	TLV (ppm)	*IDLH* (ppm)
Acetone	Inhalation, ingestion, skin or eye contact	Eyes, skin, resp sys, CNS	Toxic	250	2500
2-Butanone	Inhalation, ingestion, eye and skin contact	Eyes, skin, resp sys, CNS	Toxic	200	3000
Carbon disulfide	Inhalation, ingestion, absorption, skin or eye contact	CNS, PNS, CVS, eyes, kineys, liver, skin, repro sys	Toxic	1	500
1,4-Dichlorobenzene	Inhalation, ingestion, absorption, skin or eye contact	Liver, resp sys, eyes, kidneys, skin	Potential Carcinogen		150
Ethyl benzene	Inhalation, ingestion, skin or eye contact	Eyes, skin, resp sys, CNS	Toxic	100	800
Methylene chloride	Inhalation, ingestion, absorption, skin or eye contact	Eyes, skin, CVS, CNS	Potential Carcinogen	25	2300
Styrene	Inhalation, ingestion, absorption, skin or eye contact	Eyes, skin, resp sys, CNS, liver, repro sys	Toxic	50	700
Toluene	Inhalation, ingestion, absorption, skin or eye contact	Eyes, skin, resp sys, CNS, liver, kidneys	Toxic	100	500
Xylenes (total)	Inhalation, ingestion, absorption, skin or eye contact	Eyes, skin, resp sys, CNS, GI tract, blood, liver, kidneys	Toxic	100	900
Benzyl alcohol	No specific guidance				
Bis(2-ethylhexyl) phthalate	No specific guidance				
Butylbenzyl-phthalate	No specific guidance				
1,4-Dichlorobenzene	Inhalation, ingestion, absorption, skin or eye contact	Liver, resp sys, eyes, kidneys, skin	Potential Carcinogen	75	150
Di-n-butylphthalate	No specific guidance				
2-Methylaphthalene	No specific guidance				
Naphthalene	Inhalation, ingestion, absorption, skin or eye contact	Eyes, skin, blood, liver, kidneys, CNS	Toxic	10	250
Phenol	Inhalation, ingestion, absorption, skin or eye contact	Eyes, skin, resp sys, liver, kidneys	Toxic	5	250
Total petroleum hydrocarbons	No specific guidance				

The above table describes the dangerous concentrations, routes of entry, and target organs which can be affected by the specific VOC or SVOC. These compounds have been detected in soil samples from the landfilled material at SWMU 65. On site monitoring will be conducted during all drilling and soil boring operations.

Polycyclic Aromatic Hydrocarbons (PAHs)

PAHs include approximately 10,000 compounds which mostly result from the incomplete burning of carbon containing materials. Cigarette smoke, industrial emissions, wood burning, and automobile exhaust all contain PAHs. Limited quantities of these compounds can also be found in beneficial products used daily. When introduced into the environment, PAHs typically bind to the soil and have the potential to enter groundwater. Over a time of weeks to months, microorganisms can break down PAHs to less harmful compounds. Certain PAHs were detected in limited quantities during the Phase II RFI at SWMU 65.

Detected PAHs	Acenaphthene, Anthracene, Benzo(a)pyrene, Benzo(k)fluoranthene, Dibenzofuran, Fluoranthene, Fluorene, Phenanthrene, Pyrene
Routes of Entry	Inhalation, ingestion, skin contact
Target Organs	Resp. sys, kidneys (?), liver (?)
Hazard	Toxic, possible carcinogens
TLV	0.20 mg/m^3 for coal tar products, 5 mg/m^3 for mineral oil mists
IDLH	ND

PAHs can enter the body via inhalation, ingestion, and by contact with skin. Studies on the effects of PAH exposure are limited. Of the detected PAHs, benzo(a)pyrene and benzo(k)fluoranthene are probable human carcinogens, as determined by EPA. Dangerous exposure concentrations are not thoroughly known. Sources did note recommended occupational exposure limits for two products which could be assumed to contain PAHs. Good safety practices would be to limit exposure, use PPE (i.e. gloves), wash exposed skin surfaces before leaving the site, do not consume food in a contaminated area, and avoid working in a contaminated area during periods of high winds.

2.1.2 Physical Hazards

Drilling activities include possible physical hazards which could result in cuts or punctures from sharp objects, falls from uneven terrain, steep grades or slippery surfaces, sprains and strains from lifting activities and noise. Personnel should be aware that as the level of personal protective equipment increases, dexterity and visibility may be impacted and performing some tasks may be more difficult.

Heavy equipment operations present inherent safety hazards. Employee experience in the use of such equipment and awareness of potential hazards will reduce risk. All equipment operations must be in accordance with guidelines set forth in applicable Occupational Safety and Health Administration (OSHA) regulations. The primary hazards potentially encountered during the investigation activities will be those associated with heavy equipment operation.

The Accident Prevention Plan provided in Section 6.0 contains specific practices used to reduce or eliminate anticipated physical hazards (listed below) that may be present and encountered during the site operations. Below each indicated hazard is a list of operations and/or tasks that may involve the indicated hazard. An “X” indicates specific actions that will be taken to control the respective hazards. These control measures may include work practice controls, engineering controls, and/or use of appropriate personal protective equipment.

- Hazards Associated with Potential Exposure to Hazardous Chemicals or Materials
- Fire Hazards Associated with Handling or Working Near Flammable or Combustible Materials
- Slip, Trip, Fall Hazards
- Hazards Associated with Operation of Heavy Equipment
- Hazards Associated with Working in Hot Environments
- Hazards Associated with Working in Cold Environments
- Hazards Associated with Insects, Snakes, or Wild Animals
- Hazards Associated with Falling Objects
- Hazards Associated with Electricity
- Hazards Associated with Materials Handling
- Hazards Associated with Limited Communication Due to Location, Distance, or Noise
- Hazards Associated with Noise
- Hazards Associated with Underground or Overhead Utilities
- Hazards Associated with Unauthorized Personnel Onsite, and in Controlled Work Zones
- Hazards Associated with Excessive Traffic Through or Near the Work site
- Hazards Associated with Unexploded Ordnance (UXO)

2.1.3 Unexploded Ordnance

As expended missile parts were staged in the scrap yard in the past, the project site has potential to contain unexploded ordnance (UXO). All site workers will be required to receive UXO training prior to work at the project site. Before drilling, the Explosive Ordinance Disposal (EOD) team will be requested to perform a surface inspection of the immediate work area. It is impossible for this type of inspection to locate all UXO. Thus, site workers should remain diligent during drilling and sampling for any UXO that becomes exposed. When any object that could potentially be UXO is located, work in the area should cease, all site workers attain a safe distance, and the EOD Team shall be notified (contact information is given in section 3.3).

2.1.4 Noise

Noise will be generated during site activities. As a precautionary measure, hearing protection, either earmuffs or earplugs, are mandatory while working adjacent to heavy equipment producing noise of 85 dBA or greater. A noise meter will be onsite to monitor noise conditions (see Section 4.0).

2.1.5 Utility and Electrical Hazards

Prior to work activities at the site WTS will verify, with appropriate WSMR officials, the locations of all known utilities within the work area. There are no structures near the proposed work areas. There are overhead electric lines in the area. If possible WTS will attempt to have these de-energized. However, great care should be taken when operating drilling equipment near overhead electric lines. Should utility lines be encountered during excavation activities, work shall cease and personnel will move to a safe distance until a qualified individual deactivates or determines the line to be dead.

All field activities will be in a remote location. In the event that electrical power is required a portable generator will be used. Electrical shock can occur by direct contact with live wires or with electrical equipment and instruments that are wet or have faulty wiring. Any extension cords used with the equipment should be checked for cuts or loose connections in the coating protecting the wires prior to use. All extension cords will also be connected to ground-fault circuit interrupters. Use of properly grounded and/or double insulated tools will also reduce the potential for electric shock.

2.1.6 Biological Hazards

The field team should be aware that site activities might disturb the local wildlife population. Therefore, there is potential for field personnel to be bitten by snakes, animals, and insects. Prompt first aid measures are extremely important. All field team members will be properly briefed regarding the potential for encountering wildlife, as well as prompt first aid procedures in the event of a snake, insect, or animal bite.

Normally, the noise created by a person approaching a snake is sufficient to frighten snakes away. However, extreme caution is necessary when exploring areas where snakes might be found, such as behind rocks, under bushes, or in holes, crevices, and abandoned pipes. The rules to follow if bitten by a snake are:

- Do not cut the bite area, since it will exacerbate the effect of the venom;
- Do not apply suction to the wound, since this is minimally effective in removing venom;
- Do not apply a tourniquet since venom is most dangerous when concentrated in a small area;
- Do not allow the victim to run for help, since this accelerates circulation;
- Do seek immediate medical attention;
- Do keep the victim calm and immobile; and
- Do have the victim hold the affected extremity lower than the torso while waiting for medical assistance.

2.1.7 Heat Stress

Elevated temperatures may be a concern at this site. Heat and cold stress monitoring and prevention procedures will be initiated when appropriate. Heat stress reduction procedures shall consist of the following:

- Field personnel will be encouraged to drink fluids (chilled, potable water) frequently.
- When temperatures exceed 33 degrees Celsius (92 degrees Fahrenheit), all field personnel working outdoors will measure their heart rates no less than hourly. If the heart rate exceeds 110 beats per minute, the individual will rest for 10 minutes, drinking fluids throughout the rest period. If the heart rate has dropped below 110 beats per minute at the end of the rest period, the individual may return to work. If the heart rate exceeds 110 beats per minute, contact the onsite health and safety officer.
- Any personnel displaying signs or symptoms of heat stress will stop work and rest for at least 15 minutes. If symptoms persist beyond this rest period, the onsite health and safety officer will be contacted. Personnel displaying symptoms of heat stroke should immediately be taken to the nearest medical facility.

Symptoms of heat exhaustion include dizziness, light-headedness, nausea, slurred speech, fatigue, copious perspiration, cool clammy skin, and an increased resting heart rate. Symptoms of heat stroke include delirium, fainting, and hot, dry, flushed skin. Heat stroke is a life threatening condition, and immediate medical attention is required if any symptoms of heat stroke are observed.

2.1.8 Cold Exposure

Extreme cold temperatures may also be a concern at this site. Cold stress monitoring and prevention procedures will be initiated when appropriate. Precautionary measures shall consist of the following:

- Field personnel will be encouraged to wear thermal underwear, long pants, long sleeve shirts, sweaters, sweatshirts, gloves, thick socks, and/or jackets to prevent problems related to cold exposure.
- Field personnel will be encouraged to drink fluids frequently.
- If temperatures drop below freezing and wind chill causes subzero-degree (Fahrenheit) working conditions, field work will be limited to the warmest hours of the day or in extreme cases all work at the site will cease until temperatures and weather return to a safe level.
- Any personnel displaying signs or symptoms of hypothermia will stop work and add additional layer(s) of warmth. If symptoms persist beyond this, the onsite health and safety officer will be contacted. Personnel displaying symptoms of frostbite should immediately be taken to the nearest medical facility.

Symptoms of hypothermia include reduced feeling or tingling in affected area, especially in the fingers, toes, ears and face, slight numbness, and loss of color. Symptoms of frostbite include loss of feeling and movement in affected area and extreme change in color. Frostbite is preventable with the use proper attire and precautions. Frostbite can result in amputation of the affected appendage if medical attention is not administered promptly.

2.2 Personal Protection for Site Work

Prior to entering the area of activity, all personnel will be required to read and sign the Compliance Agreement (Section 6.0) to verify compliance with the provisions of this SSHSP. Site workers should have prior medical surveillance records with their respective employer and have received fit testing for proper use of respiratory protection equipment. The level of protection expected for the majority of this site work will be Level D: **hard hat, hard-toed shoe, safety glasses, leather/latex gloves, and hearing protection as needed.** Visitors and subcontractor employees are expected to comply with relevant OSHA regulations and provide their own protective equipment. Continuous monitoring can be conducted to verify the safety of all site personnel. The use of sunscreen with a minimum of SPF (Solar Protection Factor) 30 for all on-site personnel is also recommended during warm weather. Additionally, at least one onsite WTS employee will have current CPR and First Aid training. A first aid kit will be available to site workers.

Any PPE (e.g. disposable coveralls, leather or nitrile gloves) that is utilized during work or sampling activities will be disposed of after each use. PPE may not be reused for any reason. All PPE will be bagged and bags will be closed using duct tape or similar means.

2.3 Training

All personnel working onsite will have completed the OSHA 40-hour HAZWOPER training course and subsequent 8-hour annual refresher courses. Excavation contractor shall be responsible for providing individuals with current training/certification. Copies of everyone's training certificates must be on file with the WTS On-Site Supervisor prior to the start of work.

2.4 On-Site Communications

Since SWMU 65 is a remote work location, on-site communications are an important part of this SSHSP. Cellular telephones and two-way radios with a minimum range of two miles will be utilized in case of an emergency. The radios are to be used in the event of an accident and to facilitate day-to-day site operations. The radios and cell phones are a required part of this safety plan.

Depending the severity of an accident, either the Post Clinic Emergency Room (minor injuries) or Memorial Medical Center in Las Cruces, New Mexico (major injuries) shall be notified immediately of an incoming accident victim. Appropriate telephone numbers are listed in Section 3.3. A cellular telephone will travel with the accident victim to the medical center in case the phone is needed in-route.

3.0 SITE ORGANIZATION AND EMERGENCY CONTACTS

3.1 Project Management

The project organizational structure and key project personnel are shown in Table 4. The WTS personnel assigned specific health and safety responsibilities are identified below.

TABLE 4. PROJECT PERSONNEL ORGANIZATION CHART

Edward H. Martinez, P.E. Program Manager White Sands Technical Services, LLC	• Overall project management.
Fred Bourger Task Manager White Sands Technical Services, LLC	• Responsible for all site activities.
John Mills Health & Safety Officer White Sands Technical Services, LLC	• Responsible for project review of health and safety issues.
James Thompson Task Coordinator White Sands Technical Services, LLC	• Responsible for assembly of the Site Specific Health and Safety Plan (SSHSP). • Responsible for all site coordination issues during site activities. • Responsible for execution of the Site Specific Health and Safety Plan.
Brad Davis James Thompson On-site Supervisor White Sands Technical Services, LLC	• Responsible for execution of the Site Specific Health and Safety Plan.

3.2 Responsibility and Authority of Key Personnel

The responsibility and authority of key personnel relative to the implementation of this SSHSP are described below.

3.2.1 Task Manager

The Task Manager has the following responsibilities:

- Reporting to the Program Manager.
- Overall responsibility for all on-site health and safety matters.
- Reviewing and recommending approval of the SSHSP.
- Verifying that the project is performed in a manner consistent with the Work Plan and the SSHSP.
- Approving the On-Site Supervisor for the project.
- Coordinating with the Health and Safety Officer (HSO) and the Program Manager on health and safety matters.
- Temporarily suspending field activities if the health and safety of personnel are endangered.
- Reporting all infractions of the SSHSP to the WTS HSO and the Program Manager.

3.2.2 On-Site Supervisor

The On-Site Supervisor will serve as the WTS representative and has the following responsibilities:

- Serving as the on-site responsible individual who has the authority necessary to implement the SSHSP and verify compliance with applicable safety and health requirements.
- Implementing the requirements of the SSHSP.
- Reporting to and coordinating with the Program Manager on health and safety matters.
- Reporting safety-related incidents or accidents to the HSO and taking corrective actions to mitigate hazards and potential losses.
- Verifying that personnel working on-site have completed medical surveillance and health and safety training.
- Maintaining health and safety equipment on-site.
- Directing personnel to change work practices if they are deemed hazardous to the health and safety of the personnel and initiating necessary field revisions to the SSHSP.
- Removing personnel from the site if their action or condition endangers their health and safety or the health and safety of their co-workers.
- Temporarily suspending field activities, if health and safety of personnel are endangered, pending further consideration by the HSO and Program Manager.
- Maintaining documentation of health and safety measures taken at the site, including
    - Communication of provisions of the SSHSP,
    - Levels of protection and required upgrades,
    - Environmental monitoring results, and
    - Incident reporting.
- Upgrading or downgrading levels of protection in response to changing field conditions, with the concurrence of the HSO.
- Reporting all infractions of the SSHSP to the HSO and Program Manager.

Mr. Brad Davis or Mr. Jim Thompson will serve as the On-Site Supervisor for this project. Mr. Davis and Mr. Thompson have completed the Occupational Health and Safety Administration (OSHA) initial 40-hour Hazardous Waste Operations (HAZWOPER) Training and additional refresher courses as applicable.

3.3 Emergency Contact Numbers and Route to Emergency Medical Treatment

Table 5 provides name and telephone numbers for emergency contact personnel. In the event of a medical emergency, personnel will take direction from the onsite senior responsible individual and notify the appropriate emergency organization. Minor injuries will be referred to the Post Clinic Emergency Room located in Building 530, WSMR, NM. See Attachment A for a map to this facility. Major medical emergencies are referred to Memorial Medical Center at 2450 S. Telshor Blvd., Las Cruces, New Mexico, approximately 30 miles west of WSMR along NM State Highway 70. See Attachment B for a map to Memorial Medical Center. The exact address to each facility is listed on the following page:

Post Clinic Emergency Room
Building 530
WSMR, NM 88002
Phone: (505) 678-2882

Memorial Medical Center
2450 S. Telshor Blvd.
Las Cruces, NM 88011-5076
Phone: (505) 521-2286

If personnel require immediate emergency medical attention the On-site Supervisor will have a first-aid kit, eye wash station, and radio/cell phone on site during work periods. In the event of a fire or spill, the On-Site Supervisor will notify the appropriate WSMR Fire Department followed by the Emergency Operations Center. In the case of a spill of hazardous materials, the appropriate WSMR representative will be responsible for notification of the appropriate local, state, and federal agencies.

TABLE 5. EMERGENCY CONTACT TELEPHONE NUMBERS
(Fire and medical emergency numbers are bolded)

Organization	Contact	Telephone Number(s)
Ambulance Service/Fire Dept./Police	**N/A**	**911**
Fire Station #1 (Main Post)	**N/A**	**WSMR Land Line: 117** **(505) 678-9128**
Fire Station #2 (Nike Ave. at LC-38)	**N/A**	**WSMR Land Line: 117** **(505) 678-1234**
Post Clinic Emergency Room (Building 530)	**N/A**	**(505) 678-2882**
Police	**N/A**	**WSMR Land Line: 118** **(505) 678-1234**
Emergency Operations Center	**N/A**	**(505) 678-3803**
Explosive Ordinance Disposal Team	N/A	(505) 678-1234
WTS Front Office Building 126, White Sands, NM	Stephanie Barncastle	(505) 678-0263
On-Site Supervisor/Task Coordinator White Sands Technical Services, LLC	Brad Davis James Thompson	Work-BD: (505) 678-3397 Home-BD: (505) 526-7951 Work-JT: (505) 678-1941 Home-JT: (505) 647-9282
Task Manager White Sands Technical Services, LLC	Fred Bourger	Work: (505) 678-3426 Home: (505) 524-8033
Health & Safety Officer White Sands Technical Services, LLC	John Mills	Work: (505) 678-0891 Home: (505) 525-0122 Cell: (505) 649-7296
Program Manager White Sands Technical Services, LLC	Edward H. Martinez, P.E.	Work: (505) 678-7907 Home: (505) 522-5763 Cell: (505) 644-8048
WSMR Environment and Safety Directorate	T. A. Ladd	(505) 678-8966
U.S. Army Remedial Project Manager White Sands Missile Range	Jose Gallegos	(505) 678-1007

3.4 Smoking

Smoking within 50 feet of the work area is prohibited**. A smoking area will be located greater than 50 feet from the site. All extinguished cigarette butts will be disposed of in an appropriate manner.**

4.0 SITE MONITORING

Hazardous materials may be encountered during work procedures. Site monitoring can be conducted to verify the safety of workers. Table 6 describes the site monitoring that may be conducted. In the event that the action level is exceeded, the area will be immediately evacuated and the contaminant allowed to dissipate. No other industrial hygiene monitoring is required. In the event that the action level for noise is exceeded, the use of hearing protection will be required.

TABLE 6. POTENTIAL SITE MONITORING SUMMARY

Chemical / Physical Agent	Action Level	Monitoring Equipment	Sampling and Analysis	Frequency of Analysis
Volatile Organic Compounds	20 ppm[a] in the breathing zone	PID	Direct Reading	During drilling
Flammable gasses, VOCs	0.25 LEL	Flammable gas meter	Direct Reading	During drilling
Noise Levels	85 dBA[b]	Sound Level Meter	Direct Reading	During drilling
Notes a: ppm – parts per million B: dBA – decibels, A-weighted				

5.0 ACCIDENT PREVENTION PLAN

Prior to beginning work, the On-Site Supervisor will conduct a site safety meeting to alert workers to potential hazards at the work site. In addition to attending the site safety meeting, each worker must read this SSHSP before working at the site. The contractors will be required to designate their own Site Health and Safety Officers. Those persons will be responsible for conspicuously posting the emergency telephone numbers, route maps, and directions in their personnel's vehicles. The sub-contractors' Site Health and Safety Officers must conduct daily safety briefing each morning at the start of work. The maps, directions, and phone numbers for medical emergency response will be verified prior to starting work at the site.

Hazards Associated with Potential Exposure to Hazardous Chemicals or Materials:

- Drilling and sampling of potentially contaminated material
- Handling of potentially contaminated material
- Managing investigation derived waste (IDW)

Actions to be taken to control hazards:

_X_ Minimize free liquids to reduce airborne vapor concentrations.
_X_ Tops shall be securely attached to chemical containers when not in use to minimize airborne vapor concentrations.
_X_ Utilize wet methods to control airborne dusts emissions.
____ Delineate and control access into the Exclusion Zone(s) and Contamination Reduction Zone(s).
_X_ Utilize Chemical Protective Clothing and Equipment
____ Decontaminate or remove outer protective clothing in the Contamination Reduction Zone, prior to entering the Support Zone from the Exclusion Zone.
_X_ Decontaminate all equipment leaving the Exclusion Zone in the Contamination Reduction Zone, prior to entering the Support Zone.
_X_ Wash hands and face prior to drinking/smoking breaks.
____ Personnel working in the Exclusion Zone will be required to shower out at the end of the workday, prior to leaving the work site to go home.

Fire Hazards Associated with Handling or Working near Flammable or Combustible Materials:

Operations and/or Tasks Associated with the Above-Referenced Hazards:

- Working near fuels used in equipment

Actions to be taken to control hazards:

____ Monitor work environment as necessary with a combustible gas meter to determine the percent LEL concentration of combustible gases and vapors.
____ Should concentrations exceed the LEL (see Section 5.0) in a work area, operations within the area will cease immediately, and all potential sources of ignition removed from the area.
____ All "Hot Work" performed in hazardous locations shall require the issuance of a Hot Work Permit issued by White Sands Missile Range safety office. Combustible or flammable materials shall be purged of combustible gasses and vapors (less than 10 percent LEL) prior to being cut.
__X__ Smoking shall not be permitted onsite, except in designated areas.
__X__ All containers of flammable or combustible materials must be properly labeled to indicate its contents and appropriate fire hazard.

Slip, Trip, Fall Hazards:

Operations and/or Tasks Associated with the Above-Referenced Hazards:

- Drilling and sampling potentially contaminated material
- Managing investigation derived waste (IDW)

Actions to be taken to control hazards:

__X__ Workers shall ensure that walking/working surfaces are kept free of potential slip, trip, and fall hazards.
__X__ Whenever possible, avoid routing cords, ropes, hoses, etc. across isles and walking paths.
__X__ Flag and/or cover inconspicuous holes to protect against accidental trips and falls.
__X__ Delineate and/or guard open excavations to protect against falls.

Hazards Associated with Operations of Heavy Equipment or Motor Vehicles

Operations and/or Tasks Associated with the Above-Referenced Hazards:

- Drilling of potentially contaminated material
- Managing investigation derived waste (IDW)

Actions to be taken to control hazards:

__X__ Personnel operating heavy equipment or vehicles shall maintain a constant awareness of personnel and stationary objects in the areas adjacent to its operation.
__X__ Spotters shall be utilized to assist operators in manipulating vehicles and equipment into tight or confined areas.
__X__ Equipment operators shall inspect their equipment prior to and during each use, to ensure it is working properly, and that all safety devices are functioning as they should.
__X__ Ensure operators are adequately trained and/or licensed as necessary to operate their equipment or motor vehicles.
__X__ All moving heavy equipment must have properly functioning backup alarms.
__X__ Motor vehicle operators are responsible for conducting a pre-trip vehicle safety inspection prior to its use. No motor vehicle with any known mechanical defect, which endangers the safety of the driver or passengers, shall be used.

Hazards Associated with Working in Hot Environments

Operations and/or Tasks Associated with the Above-Referenced Hazards:

- Drilling of potentially contaminated material
- Managing investigation derived waste (IDW)

Actions to be taken to control heat stress:

_X_ Drink plenty of fluids, preferably water before, during and after each activity
_X_ Acclimate to site conditions by slowly increasing work loads
_X_ Use cooling devices to aid natural body ventilation
_____ Conduct field activities in early morning or evening
_____ Use shelter to protect against heat stress
_____ Rotate shifts of workers

Hazards Associated with Working in Cold Environments

Operations and/or Tasks Associated with the Above-Referenced Hazards:

- Drilling of potentially contaminated material
- Managing investigation derived waste (IDW)

Actions to be taken to control hazards:

_X_ Adequate protective clothing shall be worn at all times
_____ Provide shelter from wind and cold temperatures
_____ Do not remove chemical-protective equipment unless sheltered from wind and cold temperatures.
_X_ Field activities shall be curtailed if equivalent chill temperature is below zero degrees Fahrenheit.

Hazards Associated with Insects, Snakes, or Wild Animals

Operations and/or Tasks Associated with the Above-Referenced Hazards:

- Drilling of potentially contaminated material
- Managing investigation derived waste (IDW)

Actions to be taken to control hazards:

_X_ Ensure that personnel are aware of such hazards, and encourage them to be constantly on the lookout.
_____ Maintain a supply of insecticide sprays to be used as necessary to kill flying or crawling insects.
_____ Utilize heavy equipment to clear areas where high grass and brush have grown, prior to accessing these areas on foot.

Hazards Associated with Falling Objects

Operations and/or Tasks Associated with the Above-Referenced Hazards

- Drilling of potentially contaminated material
- Managing investigation derived waste (IDW)

Actions to be taken to control hazards:

_X_ Require that hard hats be worn at all times by onsite personnel except in break areas.
_____ Whenever possible, personnel will avoid walking or working beneath areas where overhead work is being performed.
_____ All overhead work platforms will be equipped with standard toe board to reduce the potential of objects falling from them.

Hazards Associated with Electricity

Operations and/or Tasks Associated with the Above-Referenced Hazards:

- Drilling of potentially contaminated material
- Managing investigation derived waste (IDW)

__X__ Ground Fault Circuit Interrupters (GFCIs) shall be used whenever possible, to protect workers from shock or electrocution while working with electrical equipment.
__X__ Repair or remove from service all damaged electric cords.
__X__ Route extension cords in a manner and/or location that would prevent potential damage to the cord.
__X__ All electrically powered hand tools shall be of the grounded or double-insulated type.
__X__ Obtain proper utility clearances prior to the start of field activities.

Hazards Associated with Materials Handling

Operations and/or Tasks Associated with the Above-Referenced Hazards:

- Drilling of potentially contaminated material
- Managing investigation derived waste (IDW)

Actions to be taken to control hazards:

__X__ Mechanical equipment (i.e., dolly, hoist, fork lift) shall be utilized whenever possible to minimize manual labor.
__X__ Size up the job before lifting and get help if needed. The maximum weight to be manually lifted by WTS and/or subcontractor personnel is 27.2 kilograms (60 pounds).
__X__ Personnel will be reminded during daily safety meeting to utilize proper lifting methods to avoid muscle or back strains.

Hazards Associated with Limited Communication Due to Location, Distance, or Noise

Operations and/or Tasks Associated with the Above-Referenced Hazards:

- Drilling of potentially contaminated material
- Managing investigation derived waste (IDW)

Actions to be taken to control hazards:

__X__ Where direct verbal communication is limited, portable 2-way radios, and/or hand signals shall be utilized to facilitate communication among workers.
__X__ Where work sites are in remote locations without access to nearby existing telephones, a cellular telephone (if service is available) or two-way radios shall be maintained onsite for use in the event of an emergency.

Hazards Associated with Noise

Operations and/or Tasks Associated with the Above-Referenced Hazards:

- Drilling of potentially contaminated material
- Managing investigation derived waste (IDW)

__X__ Appropriate hearing protection shall be provided to and worn by personnel working in areas where noise levels are known or suspected to exceed 85 dBA (See Section 4.0).
____ Inspect noise control devices (i.e., mufflers) on equipment to ensure they are working properly.
__X__ Periodically inspect pressurized systems (i.e., compressed air or steam) for leaks that create potential noise hazards, and if any are found, repair as soon as possible.
____ Whenever possible, start noise equipment in a remote area to reduce the potential for personnel exposure to noise, and to facilitate verbal communication among personnel.

Hazards Associated with Underground or Overhead Utilities

Operations and/or Tasks Associated with the Above-Referenced Hazards:

- Drilling of potentially contaminated material
- Managing investigation derived waste (IDW)

Actions to be taken to control hazards:

_X_ White Sands Missile Range Installation Support shall be contacted to establish the location of underground utilities and communication lines through the area of anticipated excavation.
____ When excavating with heavy equipment near underground utilities, personnel on the ground will assist in probing to find the exact location of lines, and will use hand shovels to carefully remove the soil immediately adjacent to the lines.
_X_ When operating machinery near overhead electrical distribution and transmission lines, refer to 29 CFR 1926.550 (a)(15)(I)-(vii) for minimum clearances, and safe work practices.

Hazards Associated with Unauthorized Personnel Onsite and in Controlled Work Zones

Operations and/or Tasks Associated with the Above-Referenced Hazards:

- Drilling of potentially contaminated material
- Managing investigation derived waste (IDW)

Actions to be taken to control hazards:

____ Install temporary fencing, traffic cones, or other appropriate barriers to delineate the work site, and to deter unauthorized personnel from entering the work site. If necessary, post security guards at each point of access into the work site.
____ Maintain a visitor's sign in/out log.
____ Post warning signs "Authorized Personnel Only" at all entrances to the work site.
_X_ Utilize badge identification system.
_X_ Delineate controlled work zones with temporary fencing and/or caution tape.
____ Post hazard warning sign at the entrances into controlled work zones.
_X_ Utilize security guards to provide site security during off-hours.
_X_ Prior to entry into contaminated zone, ensure that all personnel have a current 40-hour OSHA HAZWOPER certification card or appropriate identification.

Hazards Associated with Unexploded Ordnance

Operations and/or Tasks Associated with the Above-Referenced Hazards:

- Drilling of potentially contaminated material
- Managing investigation derived waste (IDW)

_X_ All field personnel will review the UXO Orientation Video prior to field activities.
_X_ All field personnel will be required to sign the UXO Orientation sheet following review of orientation video.

____ All field personnel will receive a UXO Range Hazards Card and will be required to keep the card on-hand at all times.
____ If UXO is identified, all field personnel will be verbally notified to follow directions listed on UXO Range Hazards Card.

6.0 COMPLIANCE AGREEMENT

The drilling contractor is responsible for their own OSHA compliance and the health and safety of their workers. WTS accepts no such responsibility for any contractors. WTS does require that each person entering the jobsite read and be briefed in the requirements of this SSHSP.

I have read this SSHSP and hereby agree to abide by its provisions and to aid the Health and Safety Officer and his representative in its implementation. I understand that it is in my best interest to see that site operations are conducted in the safest manner possible; therefore, I will be alert to site health and safety conditions at all times.

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7.0 DAILY HEALTH AND SAFETY BRIEFING COMPLIANCE AGREEMENT

Topics covered during today's ( ) health and safety briefing:

I hereby agree to abide by the provisions of the SSHSP, issues discussed in today's health and safety briefing, and to aid the Site Health and Safety Officer or his representative in its implementation.
I understand that it is in my best interest to see that site operations are conducted in the safest manner possible; therefore, I will be alert to site health and safety conditions at all times.

_____	_____
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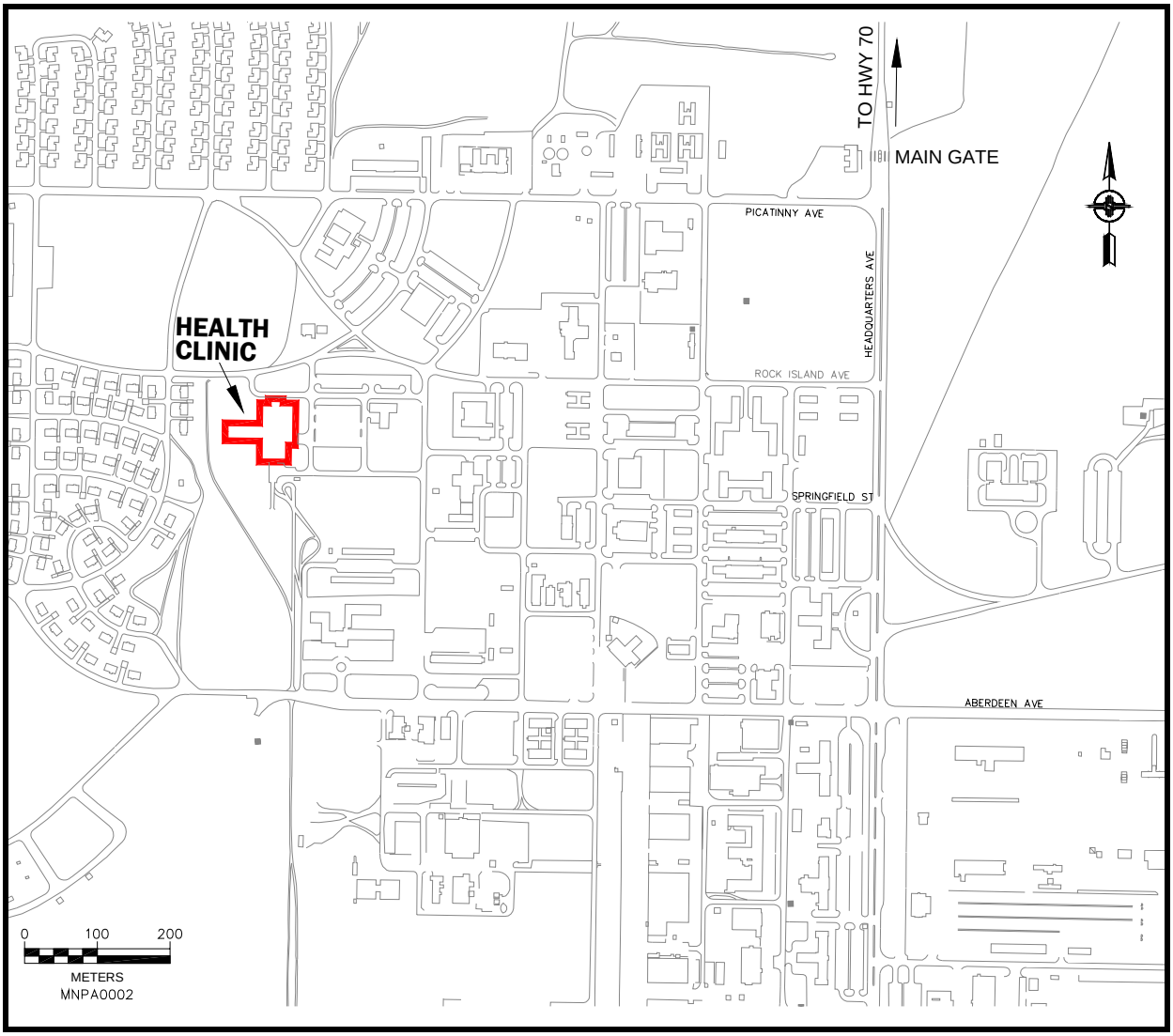
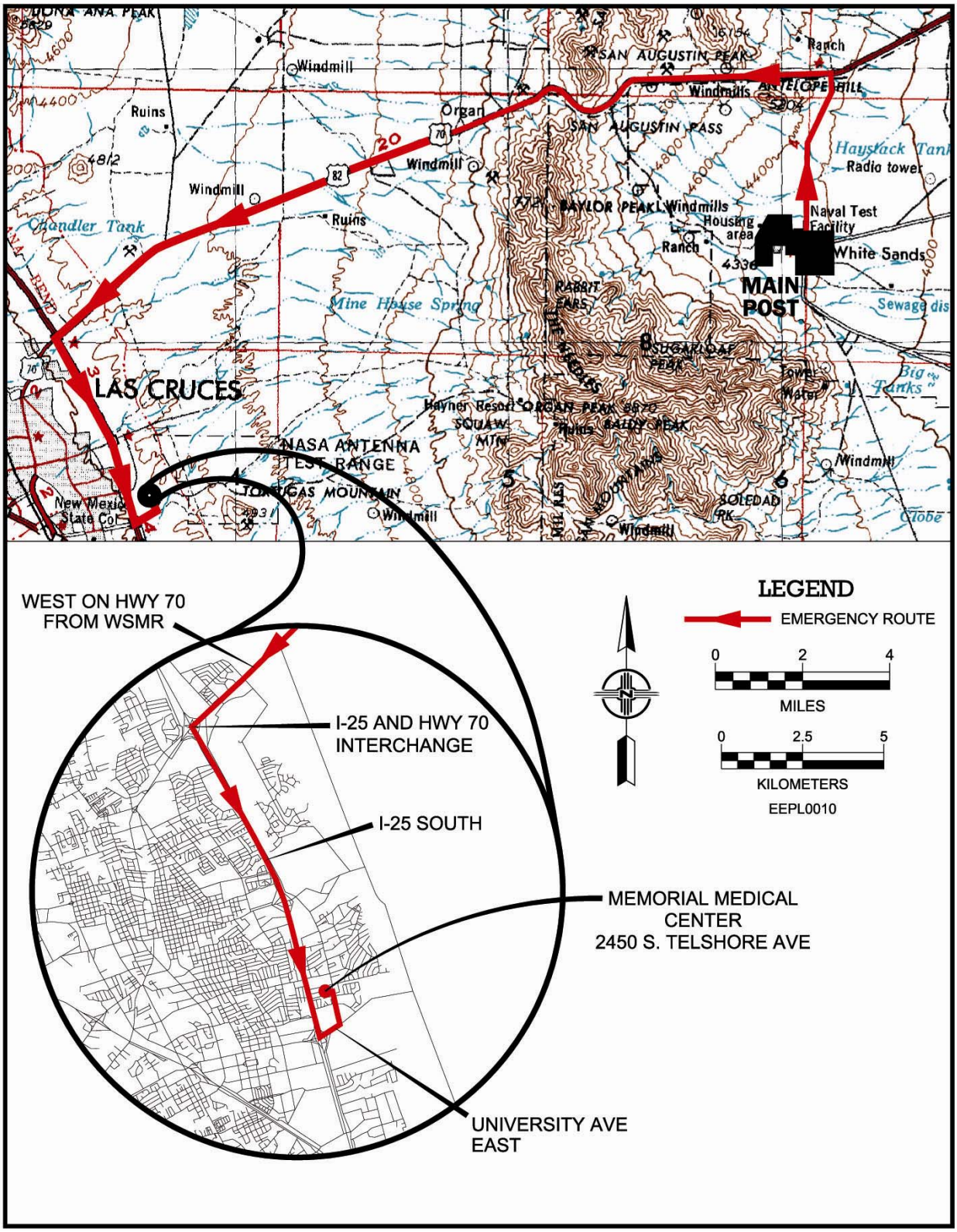
ATTACHMENT A
Location Map for Post Clinic Emergency Room (McAffee Clinic)



ATTACHMENT B
Map to Memorial Medical Center



APPENDIX E

IDW MANAGEMENT PLAN

APPENDIX E
INVESTIGATION-DERIVED WASTE MANAGEMENT PLAN
PHASE III RCRA FACILITY INVESTIGATION
MAIN POST LANDFILL NO. 3 (SCRAP YARD)
WHITE SANDS MISSILE RANGE, NEW MEXICO

Submitted to:

U.S. Army
White Sands Missile Range
Environment and Safety Directorate
White Sands Missile Range, New Mexico 88002-5048

October 2005

Submitted by:

White Sands Technical Services, LLC
Building 126
White Sands Missile Range, New Mexico 88002

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ATTACHMENT IDW TOXICITY CONCENTRATION LIMITS

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LIST OF ACRONYMS

ARARs	applicable or relevant and appropriate requirements
ASTM	American Society of Testing and Materials (now known as ASTM International)
CFR	Code of Federal Regulations
°C	degrees Celsius
°F	degrees Fahrenheit
EPA	Environmental Protection Agency
gal	gallon(s)
HazMinCen	WSMR Hazardous Materials Minimization Center
IDW	investigation-derived waste
kg	kilogram(s)
L	liter(s)
lbs.	pounds
m	meter(s)
mg/kg	milligram per kilogram
mg/L	milligram per liter
PE	polyethylene
PPE	personal protective equipment
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SVOC	semi-volatile organic compound
TCLP	Toxicity Concentration Leaching Procedure
U.S.	United States
VOC	volatile organic compound
WSMR	White Sands Missile Range

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INVESTIGATION DERIVED WASTE MANAGEMENT PLAN
PHASE III RCRA FACILITY INVESTIGATION WORK PLAN
FORMER MAIN POST LANDFILL NO. 3
WHITE SANDS MISSILE RANGE, NEW MEXICO

1.0 INTRODUCTION

This Investigation-Derived Waste (IDW) Management Plan provides a guide for the characterization and disposal of IDW generated during the Phase III RCRA Facility Investigation (RFI) at the Main Post Landfill No. 3, designated at Solid Waste Management Unit (SWMU) 65. Material streams expected to be produced include: soil cuttings from drilling activities, drilling mud, development and purge water from groundwater monitoring wells, sampling equipment decontamination wastewater, used personal protective equipment (PPE), liners from one or more equipment decontamination pads, and other miscellaneous wastes which may be generated at an environmental sampling location. Soil samples from previous investigations at this site have detected VOCs, SVOCs, TPH, and some metals in varying concentrations. The majority of the detections were at levels below the Residential Soil Screening Levels (SSLs) developed by NMED (2004). Constituents which were detected above NMED SSLs included arsenic, benzo(a)pyrene, and total petroleum hydrocarbons (TPH). Based on the low detections in most of the previous samples, IDW produced will be managed as non-hazardous to potentially hazardous.

This IDW Management Plan was prepared based on the guidance of the United States (U.S.) Environmental Protection Agency (EPA) documents *Management of Investigation-Derived Wastes During Site Inspections* (EPA/540/G-91/009) (EPA, 1991) and *Guide to Management of Investigation-Derived Wastes* (Publication # 9345.3-03FS) (EPA, 1992).

Characterization and disposal actions will be coordinated through the White Sands Missile Range (WSMR) Hazardous Materials Minimization (HazMin) Center. Applicable or relevant and appropriate requirements (ARARs), as specified by the State of New Mexico (20.4.1 NMAC and 20.9.1 NMAC) and RCRA (40 CFR 260-273), will be followed for the characterization and disposal of the RFI generated IDW. If required, off site disposal of IDW will be coordinated with the EPA Region VI Offsite Disposal Coordinator prior to any disposal action. If materials are determined to be non-hazardous soil cuttings, drilling fluid, and development water will be disposed of on site.

TABLE 1: SUMMARY OF ANTICIPATED IDW

Activity	Estimated Quantity of IDW	Proposed Disposal Method
Drilling four monitoring wells	A) Drilling fluid: 56,550 gallons B) Development water: 600 gallons	A) On-site pit B) Surface near well
Drilling seven soil borings	Soil cuttings: 2.7 cubic yards	Containerized (55 gallon drums), characterized, returned to boring or disposed at an approved off-site subtitle C or D facility
Initial sampling of four monitoring wells	A) Purge water: 30 gallons B) Misc. sampling PPE	A) Containerized, characterized, if approved disposed on-site, otherwise through WSMR HazMin Center B) Double bagged, disposed at Subtitle D facility, unless PPE is determined to be hazardous

2.0 CONTAINERIZATION AND IDENTIFICATION

As appropriate, generated waste streams will be placed in containers or lined staging piles and labeled according to the requirements in this section. A key goal of any IDW management plan is the minimization of waste. This will be aided by the following guidelines:

- Removal of soil and other contamination from sampling equipment prior to washing, thus minimizing the amount of wastewater generated;
- Maintain site traffic on predetermined and approved routes; and
- Avoid excessive well development or purging of monitoring wells with careful measurement and monitoring techniques.

2.1 Containerization

Soil cuttings, PPE, and other miscellaneous wastes which are produced within the SWMU boundary will remain within the SWMU boundary until they are disposed of. Drilling mud, well development water, and purge water are not likely to be classified as hazardous, and will be staged near the associated well. If necessary, material will be staged near the point of generation until the results from sampling (environmental or characterization) are complete. All containers will be properly labeled as discussed in Section 2.2. Drums will be DOT approved and free from dents or rust. Roll off containers will be appropriately lined and free from foreign material.

2.1.1 Soil Cuttings

Soil cuttings generated during the soil boring process will be piled on two layers of 6-mil polyethylene (PE) plastic near the boring location. Once the bore hole is complete the cuttings and associated PE plastic will be transferred to a 55 gallon drum(s). It is anticipated that up to 15 drums will be utilized to contain the soil cuttings produced from the soil boring process.

2.1.2 Well Development, Purge Water, and Decontamination Wastewater

Various activities in the proposed work plan will utilize water and thus generate liquid IDW. It is anticipated that the majority of this liquid will be non-hazardous and could be disposed of on site (based on the results of previous investigations and the proposed locations of the monitoring wells). The standard practice for WTS is to contain purge water in 55 gallon drums. Decontamination water is typically collected from a temporary pad constructed of two layers of 6-mil PE plastic and then transferred to 55 gallon drums. Until such liquids are characterized they will be contained in the labeled 55 gallon drums and staged at the point of generation. Each drum will be sealed and secured when full. Liquids will not be mixed with solids in storage containers.

2.1.3 Well Drilling Fluid

The proposed method for drilling the monitoring wells is direct rotary. This method typically uses a water/bentonite slurry to remove soil cuttings from the hole. The fluid is pumped down through the shaft to nozzles at the drill head. The fluid and cuttings then rise along the borehole and are expelled to a pit where the cuttings settle out so the fluid may again be pumped down the shaft. This pit may be constructed using an excavated area or a portable “mud pit.” Based on past sampling of the existing monitoring wells, it is anticipated that the well drilling fluid and cuttings will be non-hazardous and appropriate for onsite disposal. The proposed locations of the monitoring wells are outside of the boundary of SWMU 65.

2.1.4 Personal Protective Equipment and Miscellaneous Wastes

Waste PPE generated daily will be bagged, sealed, and labeled with project and date. Bags will be stored in 55 gallon drums. Additional miscellaneous waste (i.e. paper towels, packaging, etc.) related to PPE may also be contained with the associated PPE.

2.1.5 Decontamination Pad(s)

Decontamination pads will consist of polyethylene plastic placed on the ground to collect decontamination water. Once used these plastic pads will be placed within trash bags that will be sealed and labeled with the date and material enclosed. These trash bags then will be placed within 55 gallon drums.

2.2 Container and Sample Identification

Each drum or container will be individually labeled. A record of the container and material located within will be maintained in the field log book. Characterization samples collected from each of the containers will also be individually identified and noted in the field log book. Thus, a clear record should be available to correlate the sample results back to the correct container from which the sample was collected. IDW container labels will contain the following information:

- "CONTENTS PENDING ANALYSIS"
- Unique Container Identification Number
- Unique Sample Identification Number
- Sample Date
- Emergency Contact Number
- Activity from which the waste was derived

Container identification numbers will follow a standardized numbering system to ensure that all IDW drums are numbered uniformly. Each drum will be labeled as follows:

WSMR - 61 - DRUM - XXX

where:

XXX = consecutive number scheme starting with 001.

Characterization sampling may rely on compositing which would consist of material from several drums. Thus, a unique sample identification system is required to relate the sample to the source drum(s). Each drum which is sampled will be marked with the following sample identification number:

WSMR - 61 - YYYYY - XXX-mm/dd/yy

where:

YYYYY = the type of material to be characterized (i.e. WELLF for well drilling fluid, DEVPW for development water, DECON for decontamination water, PURGE for purge water, etc.);
XXX = consecutive number scheme starting with 001; and
mm/dd/yy = the month, day, and year on which the sample was collected.

Individual bags of PPE and other miscellaneous wastes generated are not proposed for characterization sampling. The drum(s) containing the PPE and plastic sheeting from decontamination pad(s) will be labeled as "WSMR - 61 - PPE - mm/dd/yy." Contents and label information will be noted in the field log book.

3.0 SAMPLING METHODOLOGY

3.1 IDW Analytical Method Selection

When applicable, WSMR intends to utilize the investigative analytical results to characterize the associated waste streams. If review of the investigative results indicates that the IDW is hazardous, then additional sampling may be necessary to determine the toxicity concentrations. If necessary, additional samples will be collected from the solid waste containers for toxicity characteristics leaching procedure (TCLP) analysis (metals – method 6010B, VOCs – method 8260B, and SVOCs – method 8270C). The proposed preparation method for TCLP analysis is EPA Method 1311. Liquid wastes will be analyzed using totals methods. PPE and miscellaneous waste associated with material determined to be hazardous will not be sampled but will be disposed of as hazardous waste.

A summary of the analytical methods, sample containers, required preservations, and holding times for soil and water IDW samples is shown in Tables 2 and 3. If IDW characterization samples are necessary, laboratory procedures and protocols will be identical to those specified for the environmental samples.

TABLE 2. SOIL CUTTINGS SAMPLING AND ANALYSIS REQUIREMENTS

Contaminant Group	Reference Method*	Container Type, Number, and Volume	Preservation and Storage Requirements	Maximum Holding Time (Preparation)	Maximum Holding Time (Analysis)
TCLP – Metals	1311/6010B	One (1) 4-oz wide-mouth glass jar	4 °C	None	180 days
TCLP – VOCs	1311/8260B				7 days
TCLP – SVOCs	1311/8270C				7 days
Note: * Analytical methods will follow SW-846 methodology.					

TABLE 3. WATER SAMPLING AND ANALYSIS REQUIREMENTS

Contaminant Group	Reference Method*	Container Type, Number, and Volume	Preservation and Storage Requirements	Maximum Holding Time (Preparation)	Maximum Holding Time (Analysis)
Total Metals	6010B	One (1) 500-mL, glass container	4 °C	None	90 days
VOCs	8260B	Two (2) 40-mL VOAs			7 days
SVOCs	8270C	One (1) 1-L, amber, glass container			7 days
Note: * Analytical methods will follow SW-846 methodology.					

3.2 IDW Sampling

3.2.1 Soil Cuttings

As the purpose of the soil borings is to sample the landfill at predetermined depths, characterization of the soil cuttings will simply rely on the results of the soil boring samples. Thus, no initial TCLP samples will be collected from the drums used to contain the soil cuttings. If further characterization is necessary, then a composite sample from the affected drum will be collected for TCLP analysis. Proposed analysis techniques for the composite samples are given in Table 2.

3.2.2 Well Drilling Fluid and Development Water

If deemed necessary, characterizing the development water from the monitoring wells will be accomplished by composite sampling from each 55 gallon drum. The samples will be analyzed for appropriate constituents. Proposed analysis techniques for the composite samples are given in Table 3.

3.2.3 Well Purge Water

As the purpose of purging the monitoring well is to sample from the associated aquifer, characterization of the purge water will rely on the analytical results of the monitoring well samples. Therefore, no samples will be collected initially. If further characterization is necessary, then a composite sample from the affected drum will be collected for analysis. Proposed analysis techniques for the composite samples are given in Table 3.

3.2.4 Decontamination Water

Decontamination water will be collected using the pads constructed of PE plastic and pumped into 55 gallon drums. Sampling of the drums will only be necessary if hazardous material is detected in one or more of the borehole samples. If the analytical results show a significant presence of hazardous material then further characterization of the associated decontamination water may be necessary.

If required, a composite sample from the affected drum will be collected analysis. Proposed analysis techniques are given in Table 3.

3.2.5 Personal Protective Equipment and Miscellaneous Wastes

Waste PPE is not expected to be characterized as hazardous waste. No sampling of waste PPE is proposed. Any characterization deemed necessary will be based on analytical results from associated soil and water samples.

3.2.6 Decontamination Pad(s)

The decontamination pads are not expected to be characterized as hazardous waste. No sampling is proposed. Any characterization deemed necessary will be based on analytical results from associated soil and water samples.

TABLE 4. CONTAINERIZED IDW SAMPLING PROCEDURES

Sampling Step	Soil Cuttings Sampling	Water Sampling
1	Decontaminate all sampling equipment following the procedure discussed in Section 4.0 of this IDW Management Plan.	
2	Remove the PE plastic covering the pile of soil cuttings.	Move the drums onto a sheet of 10-mil (or two layers of 6-mil) PE plastic sheeting, approximately 10 feet x 10 feet in dimension.
3	Using a stainless steel hand trowel or similar tool, collect an aliquot of soil from several random locations and depths from the pile of cuttings. Place the aliquots of soil cuttings into a stainless steel mixing bowl.	Stand upwind of each drum and be dressed in appropriate PPE. Remove the container lid, bung, or access cover.
4	Thoroughly mix the cuttings in the mixing bowl, producing a uniform homogeneous composite sample. Only mix the cuttings long enough to assure homogeneity, thereby minimizing residual volatile organic compound volatilization.	If possible, mix the contents of the drum to suspend any sediment that may have settled at the bottom of the drum.
5	Using the hand trowel or similar tool, place the required amount of cuttings into an appropriate sample container.	Collect samples using a Norwell® Dipstik™ or equivalent free-flowing liquid sampler (i.e. glass tube). A Teflon ® bailer may be substituted but is not preferred. Insert the free-flowing liquid sampler as far as possible into the drum.
6	Empty excess soils remaining in the mixing bowl back in to the IDW pile.	Secure the top of the sampler tube and withdraw it from the drum.
7	Check the surroundings of the pile. Place any stray cuttings back onto the cuttings pile.	Place an aliquot of the water into a suitable container for composting.
8	Re-cover the pile of soil cuttings with the PE plastic.	Secure the drum.
9	Decontaminate all sampling equipment following the procedure discussed in Section 4.0 of this IDW Management Plan.	Repeat the above procedure for all decontamination water drums.
10	Repeat procedure for other piles of soil cuttings as necessary.	Thoroughly mix the container that contains the samples from all drums.
11		Carefully transfer the liquid from the container into the appropriate sample container.
12		Decontaminate all sampling equipment following the procedure discussed in Section 4.0 of this IDW Management Plan.

3.3 Quality Assurance / Quality Control

Quality assurance/quality control (QA/QC) procedures and protocols followed for the collection of environmental samples will continue to be practiced for IDW sampling. Refer to the associated work plan for a brief description of QA/QC procedures and protocols to be adhered to during environmental sampling. If IDW characterization samples are collected QA/QC samples (duplicates, rinsate samples, trip blanks) will not be collected, since they are not required.

3.4 Sample Chain of Custody, Packing, and Transportation

All samples collected for analysis are required to be accompanied by a standard WTS chain of custody (COC). Signatures are required on the COC whenever the samples are transferred to another entity (except when transferred to a commercial shipper). Packing samples for shipment requires sufficient ice to maintain a minimum temperature of four degrees Celsius. Packing should also be done in such a way to provide adequate protection of the sample and contain any liquids within the packing container in the event of breakage or melting of the ice. This is typically accomplished by using a cooler provided by the laboratory which has been sealed with duct tape and custody seals. Transportation will be as expedient as possible in order to ensure temperature and holding time requirements are not violated. This may be accomplished either by pick up from a laboratory representative or by using a commercial shipper such as Federal Express.

4.0 EQUIPMENT DECONTAMINATION

Equipment decontamination procedures will include brushing loose soil from surfaces with nylon brushes, cleaning with a solution of Liquinox, and rinsing with distilled water. Decontamination of environmental sample collection equipment will follow the same procedure. In general the decontamination procedure will be as given below. For additional discussion of this process please refer to *Standard Practices for Decontamination of Field Equipment Used at Waste Sites* (ASTM D 5088-02).

1. Liquinox (or other non-phosphate detergent solution) water wash. Debris should be removed with a nylon (or similar non-reactive material) brush.
2. Tap water rinse. This can be followed with an additional Liquinox water wash if deemed necessary.
3. Distilled water rinse
4. Air dry for 24 hours
5. Store in aluminum foil or polyethylene plastic. Smaller sampling equipment may be stored in Ziploc bags.

5.0 HAZARDOUS MATERIALS DETERMINATION

The U.S. Army and NMED will jointly determine if any of the IDW generated at the site falls under the definition of a “hazardous waste.” A waste is considered hazardous if listed in 40 Code of Federal Regulations (CFR) 261.31 – 261.33 or if it exhibits any one of the following characteristics and is not specifically excluded from regulations as a hazardous waste in 40 CFR 261.4:

- Ignitibility: A flash point of less than 140 degrees Fahrenheit (° F) [60 degrees Celsius (° C)]. None of the IDW generated is expected to exhibit this potential, and will not be analyzed for this characteristic.

- Corrosivity: A pH of less than or equal to 2.0 or greater than or equal to 12.5, or corrodes steel at a rate greater than 6.35 millimeters per year at 55 ° C (131 ° F). None of the IDW generated is expected to exhibit this potential, and will not be analyzed for this characteristic.

- Reactivity: Unstable, reacts violently with water, is sufficiently cyanide or sulfide bearing to produce toxic gas, is capable or detonation, or forms potentially explosive mixtures with water. None of the IDW generated is expected to exhibit this potential, and will not be analyzed for this characteristic.

- Toxicity: The TCLP extract contains concentrations of contaminants at or above the levels listed in Appendix A. Waste containing contaminants above the levels shown in Appendix A will be considered “hazardous.”

Soil or water disposal will be based on a comparison of analytical results to the regulatory levels stated in Appendix A of this IDW Management Plan. If associated analytical results for a particular IDW are above regulatory limits, then that IDW must be disposed of as hazardous waste. It will be properly labeled, manifested, documented, and disposed as a hazardous waste. If analytical results do not show significant quantities of hazardous constituents the associated IDW will be disposed of as non-hazardous

industrial waste. Disposal of PPE will be based on a review of the associated analytical results from the environmental investigation. If results indicate hazardous materials are present, then the PPE will be handled and disposed as a hazardous waste. If analytical results do not indicate the presence of hazardous materials, PPE will be disposed as non-hazardous industrial waste. Disposal of any decontamination pad material will be based on the decontamination water disposal practice (i.e. if the decontamination water is considered non-hazardous, then the pad will in turn be considered non-hazardous; and vice-versa).

6.0 TRANSPORT AND DISPOSAL PRACTICES

WSMR proposes to stage all containers of IDW onsite until analytical results of environmental sampling are complete. Containers may also require additional characterization sampling. "Onsite" refers to the bounded area of SWMU 65, as shown in Figure 2 of the associated work plan. Once characterization of the waste is complete, WSMR will determine disposal options for each IDW. The following three options are proposed for disposal of all IDW: 1) onsite, 2) offsite as a non-hazardous industrial waste, or 2) offsite as a hazardous waste. Disposal of IDW will adhere to the most current versions of applicable State of New Mexico ARARs and EPA laws and regulations. WSMR and NMED will jointly review and approve of all disposal actions. If offsite disposal is necessary the status of the offsite disposal facility will be verified through the EPA, Region VI Offsite Disposal Coordinator. All material disposal actions will be coordinated through WSMR's Hazardous Waste Minimization Center (contact Ms. Deborah King, 505-678-7635).

6.1 Disposal of Non-Hazardous Material

6.1.1 Soil Cuttings

Soil cuttings that are determined to be non-hazardous will be spread on the surface near the associated soil boring from which they came. Plastic sheeting used to initially collect the soil cuttings will be disposed of at an approved RCRA subtitle D facility.

6.1.2 Water

Water that is determined to be non-hazardous will be disposed onsite (i.e. within the site boundaries of SWMU 65, but not directly over the landfill area). If approved by NMED, non-hazardous well development, purge water, and decontamination water may be disposed near the location of the associated well. All monitoring wells are proposed to be located outside the boundary of SWMU 65.

6.1.3 Personal Protective Equipment and Miscellaneous Waste

After review of analytical results from environmental sampling, all PPE and associated miscellaneous waste that is determined to be non-hazardous will be disposed in either a municipal refuse container or in a municipal landfill (RCRA subtitle D facility).

6.2 Disposal of Hazardous Material

6.2.1 Soil Cuttings

Soil cuttings that are determined to be hazardous waste, based on analytical results from the environmental sampling, will be labeled, manifested, and transported to a RCRA subtitle D facility approved by NMED and the EPA, Region VI Offsite Disposal Coordinator. PE plastic used to initially collect the soil cuttings will also be disposed of with the soil cuttings.

6.2.2 Water

After review of analytical results from environmental sampling; water that is determined to be hazardous will be will be properly labeled as hazardous waste. NMED and WSMR will determine if additional characterization sampling is necessary to quantify specific Landfill Disposal Restrictions (LDR).

The containers of water will be manifested and transported to the RCRA subtitle D facility approved by NMED and the EPA. Stabilization of the liquids will take place at the subtitle D facility. The Region VI Offsite Disposal Coordinator will be consulted prior to final disposal of the waste.

6.2.3 Personal Protective Equipment and Miscellaneous Waste

After review of analytical results from environmental sampling, all PPE and associated miscellaneous waste that is determined to be hazardous will be properly labeled, manifested, and transported to the RCRA subtitle D facility approved by the NMED and the EPA. The Region VI Offsite Disposal Coordinator will be consulted prior to disposal of the waste.

REFERENCES

40 Code of Federal Regulations, Part 261. *Identification and Listing of Hazardous Waste*. July 1, 2003.

ASTM Standard Practices for Decontamination of Field Equipment Used at Waste Site (D 5088-02). ASTM International. April 2002.

U.S. Environmental Protection Agency, 1991. *Management of Investigation-Derived Wastes During Site Inspections* (EPA/540/G-91/009). May 1991.

U.S. Environmental Protection Agency, 1992. *Guide to Management of Investigation-Derived Wastes* (Publication # 9345.3-03FS). April 1992.

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ATTACHMENT

INVESTIGATION DERIVED WASTE TOXICITY CONCENTRATION LIMITS

Maximum Concentration of Contaminants for the Toxicity Characteristic
(Table 1 of 40 Code of Federal Regulations Part 261.24(b))

EPA Hazardous Waste Number[1]	Contaminant	Chemical Abstract Number[2]	Regulatory Level (mg/L)
D004	Arsenic	7440-38-2	5.0
D005	Barium	7440-39-3	100.0
D018	Benzene	71-43-2	0.5
D006	Cadmium	7440-43-9	1.0
D019	Carbon tetrachloride	56-23-5	0.5
D020	Chlordane	57-74-9	0.03
D021	Chlorobenzene	108-90-7	100.0
D022	Chloroform	67-66-3	6.0
D007	Chromium	7440-47-3	5.0
D023	o-Cresol	95-48-7	200.0[4]
D024	m-Cresol	108-39-4	200.0[4]
D025	p-Cresol	106-44-5	200.0[4]
D026	Cresol	N/A	200.0[4]
D016	2,4-D	94-75-7	10.0
D027	1,4-Dichlorobenzene	106-46-7	7.5
D028	1,2-Dichloroethane	107-06-2	0.5
D029	1,1-Dichloroethylene	75-35-4	0.7
D030	2,4-Dinitrotoluene	121-14-2	0.13[3]
D012	Endrin	72-20-8	0.02
D031	Heptachlor (and its epoxide)	76-44-8	0.008
D032	Hexachlorobenzene	118-74-1	0.13[3]
D033	Hexachlorobutadiene	87-68-3	0.5
D034	Hexachloroethane	67-72-1	3.0
D008	Lead	7439-92-1	5.0
D013	Lindane	58-89-9	0.4
D009	Mercury	7439-97-6	0.2
D014	Methoxychlor	72-43-5	10.0
D035	Methyl ethyl ketone	78-93-3	200.0
D036	Nitrobenzene	98-95-3	2.0
D037	Pentrachlorophenol	87-86-5	100.0
D038	Pyridine	110-86-1	5.0[3]
D010	Selenium	7782-49-2	1.0
D011	Silver	7440-22-4	5.0
D039	Tetrachloroethylene	127-18-4	0.7
D015	Toxaphene	8001-35-2	0.5
D040	Trichloroethylene	79-01-6	0.5
D041	2,4,5-Trichlorophenol	95-95-4	400.0
D042	2,4,6-Trichlorophenol	88-06-2	2.0
D017	2,4,5-TP (Silvex)	93-72-1	1.0
D043	Vinyl chloride	75-01-4	0.2

Notes:
1: Hazardous waste number.
2: Chemical abstracts service number.
3: Quantitation limit is greater than the calculated regulatory level. The quantitation limit therefore becomes the regulatory level.
4: If o-, m-, and p-Cresol concentrations cannot be differentiated, the total cresol (D026) concentration is used. The regulatory level of total cresol is 200 mg/l.