ENTERED

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

RECEIVED

SEP 11 2014

NMED
Hazardous Waste Bureau

5 September 2014

DeAnna Rothhaupt
Chief, Holloman AFB Environmental
550 Tabosa Avenue
Holloman AFB NM 88330-8458

Mr. John E. Kieling
Chief, Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East Bldg. 1
Santa Fe NM 87505-6063

SUBJECT: Transmittal of Final Interim Measures Work Plan, Group 1 Former Septic System Site: TU-904 (Building 1194/OT-C534)

Dear Mr. Kieling,

Attached is the Final Interim Measures Work Plan for your review and comment. Included with the hardcopy of the report is a CD that contains native and PDF files of the subject document.

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

If you have any questions regarding this submittal, please contact me at (575) 572-3931.

Sincerely,

DEANNA ROTHHAUPT, GS-12, DAFC

Attachment(s): Final Interim Measures Work Plan, Group 1 Former Septic System Site: TU-904 (Building 1194/OT-C534). Hard copy and CD.

cc: Mr. Brian Salem, NMED HWB (Hard copy and CD)
Mr. Will Moats, NMED HWB (letter only)
C. Hendrickson, EPA, Region 6 (letter and CD)

FINAL
INTERIM MEASURES WORK PLAN

Former Septic System Site TU904

Holloman Air Force Base, New Mexico

Prepared for
Air Force Civil Engineer Center
2261 Hughes Ave, Suite 155
Joint Base San Antonio Lackland, Texas 78236-9853

Contract No.: FA8903-13-C-0008

URS Group, Inc.
Denver, Colorado

September 2014

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

°F	degree Fahrenheit
3DMe	3-D Microemulsion®
AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
AOC	Area of Concern
bgs	below ground surface
CAC	Corrective Action Complete
CFR	Code of Federal Regulations
COC	Contaminant of Concern
CY	cubic yard
DERA	Defense Environmental Restoration Account
DOT	Department of Transportation
DPT	direct-push technology
DRO	diesel range organics
EMI	electromagnetic induction
FPM	FPM Remediations, LLC
ft	foot/feet
GIS	geographic information system
GPR	ground penetrating radar
GRO	gasoline range organics
HSA	hollow stem auger
HASP	Health and Safety Plan
HWA	Hazardous Waste Act
HWB	Hazardous Waste Bureau
IDW	investigation derived waste
IM	Interim Measure
IRP	Installation Restoration Program
MCL	maximum contaminant level
mg/L	milligrams per liter
NM	New Mexico
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
NRCS	Natural Resources Conservation Service
NTU	nephelometric turbidity unit
ORO	oil range organics
PAH	polynuclear aromatic hydrocarbon
PBR	Performance Based Remediation
PID	photoionization detector
PPE	personal protective equipment
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control

RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RSL	Regional Screening Level
SAP	Sampling and Analysis Plan
Shaw	Shaw Environmental & Infrastructure, Inc.
SOP	Standard Operating Procedure
sq ft	square foot/feet
SSL	soil screening levels
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TAT	turn-around time
TCE	trichloroethylene
TCLP	Toxicity Characterization Leachate Procedure
TDS	total dissolved solids
TPH	total petroleum hydrocarbons
URS	URS Group, Inc.
USAF	United States Air Force
USACE	United States Army Corps of Engineers
U.S. Census	United States Census Bureau
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	underground storage tank
VCM	Voluntary Corrective Measures
VOC	volatile organic compound
WMSR	White Sands Missile Range
µg/L	micrograms per liter

1.0 INTRODUCTION

This Interim Measures (IM) Work Plan addresses one former septic system site located at Holloman Air Force Base (AFB) near Alamogordo, New Mexico (NM) (**Figure 1-1**). The site consists of a former septic system, where the septic tank has been decommissioned, but elevated concentrations of chlorinated solvents (i.e., trichloroethylene [TCE]) have been documented in groundwater. The former septic system site discussed in this IM Work Plan is identified as:

- TU904 (Building 1194, formerly OT-C534).

This IM Work Plan has been prepared by FPM Remediations, LLC (FPM)/URS Group, Inc. (URS) on behalf of the United States Air Force Civil Engineer Center (AFCEC), under Contract Number FA8903-13-C-0008, in accordance with Holloman AFB's Resource Conservation and Recovery Act (RCRA) Permit (Permit Number - NM6572124422) (NMED 2004) and a Notice of Deficiency issued by the New Mexico Environment Department (NMED) dated 13 September 2007 (NMED 2007). This site is not currently listed as a Solid Waste Management Unit (SWMU) or Area of Concern (AOC) on the Holloman AFB RCRA Permit (NMED 2004).

As part of a Defense Environmental Restoration Account (DERA) study for AFCEC, this site was evaluated to determine eligibility for cleanup funding under DERA. The DERA Evaluation Report evaluated historical site information and recommended that this site be further investigated (URS 2009).

The site was partially investigated by Shaw Environmental & Infrastructure, Inc. (Shaw, now a part of CB&I) under the Voluntary Corrective Measures (VCM) program. A VCM Request (Shaw 2012a) was prepared by Shaw, on behalf of AFCEC under the Midwest Performance Based Remediation (PBR) Contract (Contract Number FA8903-09-D-8580) and submitted to NMED for review by the United States Air Force (USAF) on 18 January 2012; however, the VCM Request has not yet (as of June 2014) been reviewed by NMED. The technical approach utilized by Shaw closely paralleled that used for several "Group 2" (Shaw 2011) and "Group 3" (Shaw 2012b) underground storage tank (UST) sites at Holloman AFB, and included a provision for conducting a RCRA Facility Investigation (RFI) in conjunction with the VCM under an RFI Work Plan (USACE 2010) approved by NMED in a letter dated 31 January 2010 (NMED 2010). In a letter dated 21 January 2014, NMED approved (NMED 2014) the Group 2 VCM Request (Shaw 2011).

Based on URS' review of the preliminary data collected under the combined VCM/RFI (Shaw 2013a, 2013b), additional investigative and remedial work is necessary at this site to achieve Corrective Actions Complete (CAC). This work can most effectively be accomplished through the use of IM because the site is relatively small, the nature of the contaminant is well understood, and the technologies to remove and/or destroy TCE are well-proven.

1.1 Interim Measures Purpose

The purpose of these IM is to facilitate a timely corrective measure which will minimize or prevent the further migration of contaminants and limit actual or potential human and environmental exposure to contaminants. The ultimate goal of this project is to bring this site to CAC status, with no requirement for further land use controls. The general IM approach for several Holloman AFB environmental sites was discussed with NMED during a meeting on 16 December 2013 between NMED, Holloman AFB, and URS (URS 2013), and in more specific detail during a second meeting on 19 June 2014 (URS 2014c). Minutes for the 19 June 2014 meeting with NMED are provided as Appendix A.

1.2 Interim Measures Objectives

The primary objectives of the IM are to:

- Clearly delineate the nature and extent of TCE in groundwater;
- Remove and/or destroy TCE present in the soil and/or groundwater at concentrations above applicable screening values;
- Provide confirmatory sampling data to demonstrate that the site has achieved regulatory cleanup levels; and
- Provide the necessary data to support a CAC proposal to NMED, although no Class 3 RCRA Permit Modification will be necessary for this site since it is not currently listed as an AOC or SWMU on the Holloman AFB RCRA Permit (NMED 2004).

These IM objectives will be achieved in part through the following field activities, which are described in this Work Plan:

- utility clearance;
- soil and groundwater reconnaissance sampling for contaminants of concern (COCs);
- excavation and disposal of contaminated soil;
- temporary well point and/or monitoring well installation;
- subsurface injection of bioremediation augmentation substrates (if necessary);
- confirmation sampling of soil and/or groundwater;
- surveying; and
- site restoration.

1.3 Regulatory Setting

Pursuant to the RCRA Permit, IM activities conducted at Holloman AFB are performed under the New Mexico Hazardous Waste Act (HWA), the New Mexico Hazardous Waste Management Regulations, and RCRA. The NMED Hazardous Waste Bureau (HWB) has regulatory enforcement authority for the State of New Mexico.

The media of concern for the former septic system site referenced in this document include subsurface soil and groundwater. Pursuant to the RCRA Permit, and with guidance provided by NMED, cleanup levels for impacted soil under these IM will be to the latest revision of NMED and the United States Environmental Protection Agency (USEPA) documents at the time of Work Plan approval and/or execution of associated fieldwork. Currently, these cleanup levels include the residential soil screening levels (SSLs) presented in the *Risk Assessment Guidance for Site Investigations and Remediation* (NMED 2012), or the United States Environmental Protection Agency's (USEPA) *Regional Screening Levels (RSLs)* for residential soil (USEPA 2013), if no SSL has been identified for a specific compound. Additionally, the RCRA Permit requires groundwater cleanup levels (latest revision as of Work Plan approval) to be set at the more conservative of those specified by either the New Mexico Water Quality Control Commission (NMWQCC) as protective of human health (20.6.2.3103 New Mexico Annotated Code [NMAC]), or by USEPA's Maximum Contaminant Levels (MCLs) (USEPA 2013).

The risk associated with vapor intrusion of subsurface contaminants into installation buildings will also be assessed. Preliminary analytical data collected during the VCM (Shaw 2013) indicate no significant risk due to vapor intrusion; however, these data were not satisfactorily reviewed and validated prior to publication.

In addition to the prescribed regulatory guidance, the *Final Background Study Report; Holloman AFB, New Mexico, Revision 3* (NationView 2011), as approved by NMED (NMED 2011a), provides reference data for comparison to metals concentrations in soils and groundwater under these IM. The background levels of metals in soil and groundwater published in that report have been accepted by NMED (NMED 2011) and will be used as secondary screening data to determine whether soil or groundwater have been impacted by metals at the former septic system site. In the event that there are detected metals in excess of established background concentrations, it may be appropriate to further evaluate the data and propose a weight-of-evidence argument for selected values if it appears as though they may be naturally occurring.

1.4 Interim Measures Work Plan Organization

This IM Work Plan is divided into six sections. The sections of this Work Plan include:

- Section 1 - Introduction, purpose, objectives, and regulatory setting;
- Section 2 - Previous Investigations and Background Information;
- Section 3 - The technical approach for implementing IM at the site, including general procedures and typical methods and materials that may be used;
- Section 4 - A brief discussion of the IM Report structure and contents;
- Section 5 - An estimated project schedule for IM implementation and reporting; and
- Section 6 - A list of documents referenced in this Work Plan.

This page intentionally left blank.

2.0 PREVIOUS INVESTIGATIONS AND BACKGROUND INFORMATION

2.1 Previous Investigations

As stated in Section 1.0, initial investigative work was performed and documented in the DERA Evaluation Report (URS 2009). This work mostly involved a review of historical records with a resulting recommendation for further evaluation based on the requirement from NMED for additional investigation (NMED 2007). Subsequent environmental investigation and remediation was conducted under both the USAF's Installation Restoration Program (IRP) and the RCRA Corrective Action Program.

The following section provides a brief description of work performed under the previous VCM/RFI (Shaw 2012b). Shaw performed this VCM, along with additional investigative work approved under a previous RFI Work Plan (USACE 2010); however, the resulting RFI Report was not submitted to NMED for review. Data obtained from these activities were also compiled in a *Sample Completion Report, Group 1 – Septic System Sites* (Shaw 2013a), which has also not been reviewed or commented on by NMED as of the time of preparation of this IM Work Plan (May 2014). There is no indication that the results of the work previously performed will be submitted for review by NMED as a standalone document. The analytical data reported in the Sample Completion Report (Shaw 2013a) will be re-evaluated within the context of the data generated under these IM, and a determination on its appropriateness as either a screening or compliance/confirmation tool will be made at that time. The 2012 investigation data will be submitted for review within the IM Report prepared in accordance with this Work Plan regardless of whether they are used for screening or confirmation purposes. References to the sample locations and results are discussed below, and will be formally presented in the IM Report.

2.1.1 TU904

Records for former septic system site TU904 at Building 1194 (**Figure 2-1**) indicate that the associated septic tank was decommissioned in 2008 (Shaw 2012b, USACE 2010). Historical records report the septic tank was a concrete tank with a capacity of 1,350 gallons. The tank had been in service for 21 years and was unused approximately 10 years prior to closure (USACE 2010, Shaw 2012a) by removal of contents, crushing, and backfilling (North Wind 2008). No environmental sampling was performed during tank decommissioning.

During the 2012 VCM, no soil was excavated from the site. A geophysical survey including electromagnetic induction (EMI), ground penetrating radar (GPR), and magnetic survey instruments was conducted at Building 1194 to locate and identify the former septic tank, leach field, and underground utility lines. (Shaw 2013b)

Twenty-two soil samples were collected from direct-push boreholes at varying depths down to the water table at locations surrounding the former septic tank, leach field, and conveyance piping (Appendix A soil figure). The only parameters exceeding the soil screening criteria were benzo(a)pyrene (in one shallow subsurface sample) and arsenic (in one deeper subsurface sample). No other exceedances of the applicable soil standards have been identified. (Shaw 2013a, 2013b)

Twelve monitoring wells were installed as part of the VCM/RFI (**Figure 2-1**), with water table depth observed at approximately 29 to 33 feet (ft) below ground surface (bgs). Groundwater samples were collected from all twelve site monitoring wells and compared to the NMWQCC water quality standards and the UEPA's MCLs. The only parameters detected above the groundwater screening criteria were:

- antimony in leach field well MW-02 (9.2 micrograms per liter [μg/L], which is above the 6 μg/L MCL criteria);
- iron in cross-gradient wells MW-03 and MW-04 (1,430 μg/L and 1,700 μg/L, respectively which are above the 1,000 μg/L NMWQCC criteria); and,
- TCE in five monitoring wells above the MCL of 5 μg/L, but below the NMWQCC criteria of 100 μg/L: (downgradient well MW-01 at 8.6 μg/L; leach field well MW-02 at 16 μg/L; and cross-gradient wells MW-03, MW-04, and MW-07 at 10.6 μg/L, 7 μg/L, and 9.2 μg/L, respectively). (Shaw 2013b)

2.2 General Background Information

2.2.1 Physical Setting

Holloman AFB is situated in south central New Mexico, in the northwest central part of Otero County, approximately 75 miles north–northeast of El Paso, Texas (USAF 2013). Holloman AFB has a population of 3,054 (U.S. Census 2010) and occupies 59,639 acres in the northeast quarter of Section 1, Township 17 South, Range 8 East. The White Sands Missile Range (WSMR) testing facilities occupy additional land extending northward from the Base. Privately and publicly owned lands border the remainder of Holloman AFB. The major highway servicing Holloman AFB is Highway 70, which runs southwest from the town of Alamogordo, New Mexico, and separates Holloman AFB from publicly owned lands to the south. Alamogordo, which has a population of 30,401 according to (U.S. Census 2010), is located approximately 7 miles east of the Base.

2.2.2 Holloman AFB History

Holloman AFB was first established in 1942 as Alamogordo Army Air Field. From 1942 through 1945, Alamogordo Army Air Field served as the training grounds for over 20 different flight groups, flying primarily B-17s, B-24s, and B-29s. After World War II, most operations had ceased at the Base. In 1947, Air Material Command announced that the air field would be its primary site for the testing and development of unmanned aircraft, guided missiles, and other research programs (USAF 2013). On 13 January 1948, the Alamogordo installation was renamed in honor of the late Colonel George V. Holloman, a pioneer in guided missile research. In 1968, the 49th Tactical Fighter Wing arrived at Holloman AFB and has remained there since. Today, Holloman AFB also serves as the German Air Force's Tactical Training Center.

2.2.3 Physiography and Topography

Holloman AFB is located within the Basin and Range Province physiographic province in the Sacramento Section on the western edge of the Sacramento Mountains at a mean elevation of 4,093 ft above mean sea level (USGS 2003). The region is characterized by high tablelands with rolling summit plains, cuesta-formed mountains dipping eastward, and west-facing escarpments with the wide bracketed basin forming the basin and range complex. Holloman AFB is within the Tularosa Basin, which is part of the Central Closed Basins (NMED 2004). The bordering mountains rise abruptly to altitudes of 7,000 to 12,000 ft above mean sea level. The San Andres Mountains are approximately 30 miles to the west and bound the basin to the west, with the Sacramento Mountains approximately 10 miles to the east (**Figure 1-1**). At its widest, the basin is approximately 60 miles east to west and stretches approximately 150 miles north to south.

2.2.4 Climate

As a whole, New Mexico has a mild, arid to semiarid continental climate characterized by light precipitation totals, abundant sunshine, relatively low humidity, and relatively large annual and diurnal temperature ranges (Western Regional Climate Center 2013). The climate of the Central Closed Basins varies with elevation. The Base is located in the lower elevation areas, characterized by warm temperatures and dry air. Daytime temperatures often exceed 100 degrees Fahrenheit (°F) in the summer months and are in the middle 50°F range in the winter. A preponderance of clear skies and relatively low humidity permits rapid cooling resulting in average diurnal temperature ranges of 25° to 35°F. Potential evapotranspiration, at 73 inches per year, significantly exceeds annual precipitation, usually less than 10 inches. Arid conditions resulting from very low rainfall amounts, coupled with topographically induced wind patterns and combined with sparse vegetation, tend to cause localized “dust devils.” The annual rainfall for Alamogordo is 12 inches per year. Much of the precipitation falls during the mid-summer monsoonal period (July and August) from brief, yet frequent, intense thunderstorms culminating in 30 to 40 percent of the total annual rainfall.

2.2.5 Regional Geology and Soils

2.2.5.1 Regional Geology

The sedimentary rocks, which make up the adjacent mountain ranges, are between 500 and 250 million years old (Weir, Jr. 1965). During the period when the area was submerged beneath the shallow intracontinental sea, the layers of limestone, shale, gypsum, and sandstone were deposited. In time, these layers were pushed upward through various tectonic forces, forming a large bulge on the surface. Approximately 10 million years ago, the center began to subside, resulting in a vertical drop of thousands of feet leaving the edges still standing (the present-day Sacramento and San Andres mountain ranges). In the millions of years following, rainfall, snowmelt, and wind eroded the mountain sediments, depositing them in the valley (i.e., Tularosa Basin). Water carrying eroded limestone, dolomite, gravel, and other materials continued to flow into the basin.

As the Tularosa Basin is a bolson-type basin, which is a basin with no surface drainage outlet, sediments carried by surface water into a closed basin are bolson deposits. The overlying alluvium generally consists of unconsolidated gravels, sands, and clays. Soils in the basin are derived from the adjacent ranges as erosional deposits of limestone, dolomite, and gypsum. A fining sequence from the ranges towards the basin’s center characterizes the area with the near surface soils being alluvial, eolian, and lacustrine deposits. The alluvial fan deposits are laterally discontinuous units of interbedded sand, silt, and clay, while the eolian deposits consist primarily of gypsum sands. The eolian and alluvial deposits are usually indistinguishable due to the reworking of the alluvial sediment by eolian processes. The playa, or lacustrine deposits, consist of clay containing gypsum and are contiguous with the alluvial fan and eolian deposits throughout the Base. Stiff caliche layers, varying in thickness, have been identified at different areas of the Base.

2.2.5.2 Soils

The United States Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service) has identified two soil associations in the vicinity of Holloman AFB—the Holloman-Gypsum Land-Yesum Complex and the Mead silty clay loam (Derr 1981) (**Figure 2-2**). The hydraulic conductivity of these horizons ranges from 4×10^{-4} to 1×10^{-3} centimeters per second.

The Holloman-Gypsum Land-Yesum Complex (0 to 5 percent slopes) consists of larger areas of shallow and deep, well-drained soils and areas of exposed gypsum. The Holloman soil makes up about 35 percent of the complex. Typically, the surface layer is light brown, very fine sandy loam approximately 3 inches thick. The upper 13 inches of the substratum is pink, very fine sandy loam that is very high in gypsum. Below that, the substratum is white gypsum to a depth of more than 60 inches. This soil is calcareous and mildly alkaline to moderately alkaline throughout. Permeability is moderate, and available water capacity is very low.

Gypsum Land makes up approximately 30 percent of the Holloman-Gypsum Land-Yesum Complex (0 to 5 percent slopes). Typically less than 1 inch of very fine sandy loam overlies soft to hard, white gypsum. The deeper Yesum horizon consists of very fine sandy loam that makes up approximately 20 percent of the complex. Typically, the surface layer is light brown, very fine sandy loam approximately 3 inches thick. The upper 9 inches of the substratum is light brown, fine sandy loam that is very high in gypsum. Below that, the substratum is pink, very fine sandy loam to a depth of more than 60 inches. The soil is calcareous throughout and is mildly alkaline. Permeability is moderate, and available water capacity is moderate. Many fine gypsum crystals are found throughout the profile.

The soil type found across the main drainage area for the Base is Mead silty clay loam (0 to 1 percent slopes). This deep, poorly drained, nearly level soil occurs on outer fringes of alluvial fans. This soil formed in fine-textured alluvium over lacustrine lake sediment. It is very high in salt content because of periodic flooding and poor drainage. Slopes are smooth and concave. Typically, the surface layer is reddish-brown, silty clay loam and clay loam approximately 5 inches thick. The substratum, to a depth of 48 inches, is light reddish-brown clay that has a high salt content. Below that, the substratum is lacustrine material of variable texture and color to a depth of more than 60 inches. Included within this soil are areas of Holloman and Gypsum Land along the margins of the unit of steep, short gully sides and knolls.

These inclusions make up approximately 15 percent of the map unit for this soil type. Individual areas are generally smaller than 10 acres. This soil is moderately calcareous throughout and is moderately to strongly alkaline. It has a layer of salt that is more soluble than gypsum. Permeability is very low, and available water capacity is low (URS 2009).

2.2.5.3 Regional Hydrogeology

Groundwater occurs as an unconfined aquifer in the unconsolidated deposits of the central basin, with the primary source of recharge as rainfall percolation and minor amounts of stream runoff along the western edge of the Sacramento Mountains (Basabilvazo, Myers, and Nickerson 1994). Surface water/rainfall migrates downward into the alluvial sediments at the edge of the shallow aquifer near the ranges and flows downgradient through progressively finer-grained sediments towards the central basin. Because the Tularosa Basin is a closed system, water that enters the area leaves either through evaporation or percolation. This elevated amount of percolation results in a fairly high water table. Beneath Holloman AFB, groundwater ranges from 5 to 50 ft bgs. Flow for the Base is generally towards the southwest with localized influences from variations in topography (**Figure 2-3**). In the northern and western portions of the Base, groundwater flows more to the west towards the Ritas Draw, Malone Draw, and Lost River drainages. Groundwater flow is affected by local topography in areas immediately adjacent to arroyos, where groundwater flows directly toward the drainages regardless of the regional flow pattern.

Groundwater in the Tularosa Basin is of potable quality at the recharge areas in close proximity to the Sacramento Mountains and becomes increasingly mineralized toward the central portion of the basin and discharge areas. The majority (over 70 percent) of the IRP sites located across Holloman AFB have groundwater monitoring wells containing water with an average total dissolved solids (TDS) concentration greater than 10,000 mg/L. These TDS data support the hypothesis that TDS concentrations below 10,000 mg/L at Holloman AFB are caused by dilution of natural groundwater quality from leaking water lines and surface irrigation from the domestic water supply. TDS concentrations greater than 10,000 mg/L exceed the NMWQCC limit for potable water, and therefore, the groundwater beneath Holloman AFB has been designated as unfit for human consumption. Likewise, USEPA guidelines have identified the groundwater as a Class IIIB water source, characterized by TDS concentrations exceeding 10,000 mg/L and a low degree of interconnection with adjacent surface water or groundwater of a higher class. Groundwater at Holloman AFB does not discharge or connect to any adjacent aquifers because the Tularosa Basin is a closed basin. Adjacent surface waters include Lost River and Lake Holloman, which also have high concentrations of TDS and are not considered potential drinking water sources.

2.2.5.4 Surface Water Hydrology

The Tularosa Basin contains all of the surface flow in its boundaries (NMWQCC 2006). The nearest inflow of surface waters to the Base comes from the Lost River, located in the north central region of the Base. The upper reaches of the Three Rivers and Sacramento River are perennial in the basin. Holloman AFB is dissected by several southwest-trending arroyos that control surface drainage. Hay Draw arroyo is located in the far north. Malone and Ritas draws, which drain into the Lost River and Dillard Draw arroyos, are located along the eastern perimeter of the Base. Indications are that the climate was much wetter approximately 10,000 years ago. The present-day Lake Otero formerly encompassed a much larger area, possibly upwards of several hundred square miles. Its remains are the Alkali Flat and Lake Lucero. Lake Lucero is a temporary feature merely a few inches deep during the rainy season. Ancient lakes and streams deposited water-bearing deposits over older bedrock basement materials. Fractures, cracks, and fissures in the Permian and Pennsylvanian bedrock yield small quantities of relatively good quality water in the deeper periphery. Potable water is only found in wells near the edges of the basin with more saline water found towards the center. Two of the principal sources of potable water are a long narrow area on the upslope sides of Tularosa and Alamogordo and another area in the far southwestern part of the basin. A portion of the city of Alamogordo's water, as well as the Holloman AFB's water, was formerly supplied from Bonito Lake (which is in the Pecos River Basin) prior to the Little Bear Fire, in 2012.

2.2.5.5 Current and Future Land Use

The land surrounding Holloman AFB consists of residential areas to the east and northeast (city of Alamogordo), rangeland to the south, White Sands National Monument to the west, and areas where military activities are conducted to the north. The desert terrain immediately surrounding Holloman AFB has limited development, Mesa Verde Ranch operates along the eastern border, and there are no residential communities, or large industrial operations located adjacent to the Base. Holloman AFB is an active military installation and is expected to remain active for the foreseeable future. No transfer of military property to the public is anticipated, and public access to the Base is restricted (Foster Wheeler 2002). Future land use is not expected to differ significantly from current land use practices (Foster Wheeler 2002).

Building 1194 has historically been used for industrial purposes. There is no indication that the USAF will modify land use at the TU904 site.

2.2.5.6 Current and Future Water Use

Currently, there are no potable supplies of groundwater or surface water located on the Base (Foster Wheeler 2002). Holloman AFB obtains its water supply from the city of Alamogordo and Holloman AFB wells in the Boles, San Andres, and Douglas well fields at the Base of the Sacramento Mountains. No water supply wells are located on or near the Base because of poor groundwater quality with TDS concentrations greater than 10,000 mg/L. There are no potable or irrigation wells near or immediately downgradient of the Base.

3.0 PROCEDURES FOR IMPLEMENTATION

This section includes general procedures for implementing the delineation and remedial action activities to be undertaken. Several supporting project-related plans have also been prepared as a Technical Memorandum to supplement this IM Work Plan and provide a more thorough framework for URS to conduct these IM (URS 2014d)::

- A site-specific Sampling and Analysis Plan (SAP) / Quality Assurance Project Plan (QAPP) establishes the overarching analytical and data collection protocols and documentation requirements so that data are generated, reviewed, and analyzed in a consistent manner, for the investigation and remediation activities performed in the scope of work presented in this Work Plan.
- A site-specific Health and Safety Plan (HASP defines the health and safety guidelines developed to protect URS personnel, subcontractors, and government personnel involved in the IM.
- URS Standard Operating Procedures (SOPs) outline the general procedures used to conduct various activities associated with IM implementation.

The following specific tasks will be applied to the former septic system site subject to IM under this Work Plan:

- Pre-mobilization activities;
- Mobilization/site setup;
- Exploratory soil and groundwater sampling;
- Excavation/soil removal;
- Confirmation soil sampling;
- Subsurface injection (if necessary);
- Monitoring well installation and development;
- Confirmation groundwater sampling;
- Waste management;
- Site restoration;
- Site surveying; and
- Reporting.

URS has evaluated the VCM approach proposed by Shaw (Shaw 2012a), the Draft RFI Report (Shaw 2013b), and the RFI Work Plan (USACE 2010), and prepared this IM Work Plan with recognition of the work previously performed, but with proposed changes to more effectively achieve the goals of IM. The primary changes between the previous VCM Request (Shaw 2012a) and this IM Work Plan are:

- Removal of the 40 cubic yards (CY) excavation limit contained within the VCM Request, which was a contractual limitation for that work. Impacted soil with COC concentrations above the applicable cleanup levels will be removed (or otherwise remediated), whenever feasible, with no fixed limit on the volume of excavation at a given site.

- Modification of the previous monitoring well installation plan which stipulated only three wells per site. Instead, additional monitoring wells and/or temporary well points will be installed as necessary to achieve objectives of the IM including delineation of the nature and extent of contamination. At the site, at least three properly constructed monitoring wells will be used to perform site delineation, remediation performance monitoring, and/or compliance monitoring. Although the previous monitoring well installation plan stipulated the installation of three monitoring wells at TU904, twelve wells were actually installed.
- Pursuant to Part 4, Section F of the Holloman AFB RCRA Permit, planned IM activities at the former septic system site are not limited to remediation of impacted soil. IM will be implemented to “mitigate any current or potential threat(s) to human health or the environment and [are] consistent with and integrated into any long-term solution at the facility” (NMED 2004), including the remediation of impacted groundwater and soil vapor intrusion. Following identification of the nature and extent of contamination at the site, soil removal and bioremediation will be utilized to remediate contaminated soil and groundwater, if necessary.

3.1 Applicable Regulations and Standards

Federal and state regulations and standards that may be applicable to these IM include the following:

- Holloman AFB RCRA Permit No. NM6572124422, February 2004 (NMED 2004).
- New Mexico Liquid Waste Disposal And Treatment Regulations (20.7.3.307 NMAC).
- NMED residential SSLs (NMED 2012).
- USEPA residential RSLs (USEPA 2013).
- NMWQCC groundwater cleanup levels protective of human health (20.6.2.3103 NMAC).
- USEPA MCLs (USEPA 2013).
- New Mexico HWA (NMSA 1978, §74-4-1).
- New Mexico Hazardous Waste Management Regulations, (20.4.1.100 NMAC).
- RCRA, 40 Code of Federal Regulations (CFR) 260-268, Management of Hazardous Waste. In the event that investigation derived waste (IDW) sampling and analysis indicate the presence of constituents of potential concern at concentrations rendering them hazardous, storage and disposal protocols will be followed in accordance with RCRA hazardous waste regulations, as adopted by NMED.
- United States Department of Transportation (DOT) 49 CFR 172, 173, and 178: Applies to packaging IDW for removal off site and addresses hazard-class diamond labeling.

The latest revision of NMED and USEPA documents at the time of Work Plan approval and/or execution of the fieldwork will be used.

3.2 Pre-mobilization Activities

Prior to mobilization of equipment, subcontractors (e.g., drilling subcontractor, New Mexico-licensed surveyor, and approved analytical laboratory) will be procured. All necessary permits (e.g., digging permits) will be initiated. All site activities will be coordinated with appropriate Holloman AFB personnel.

Prior to initiating intrusive activities, a completed and approved Air Force Form 332 will be obtained for authorization of construction work at Holloman AFB. A request for locating underground utilities in the area will be submitted to the local one-call utility notification center, as applicable. Additionally, Air Force Form 103 will be submitted to request that the location of underground utilities be marked at the specific sites. Drilling and excavation locations will be identified with paint, flags, or stakes, as appropriate to the surface material. Utility clearance approvals will be completed by the appropriate Holloman AFB utility office (e.g., telephone, sewer, water, natural gas, etc.).

3.3 Mobilization Setup

Personnel, equipment, and resources necessary to implement this IM Work Plan will be mobilized to the site. Site setup will occur at the former septic system site. Warning signs and safety fencing may be used, where necessary, to indicate the danger of entering a work zone and to keep the work area clear of obstructions such as facility-worker vehicles. Setup will also include establishing a location for material storage and other equipment staging areas.

Site work at TU904 is anticipated to be performed in conjunction with other IM to be implemented at Holloman AFB Group 2 and 3 UST sites discussed in separate IM Work Plans (URS 2014a, 2014b).

3.4 Exploratory Soil and Groundwater Sampling

Exploratory (pre-remediation) soil and groundwater sampling are intended to be utilized as a screening tool; therefore, the protocols for exploratory delineation sampling may differ from the more stringent requirements of confirmatory and compliance sampling that will be conducted following remedial activities. The sample collection and preparation procedures utilized during delineation will be implemented to provide guidance for excavation and subsurface injection, if needed, and will not provide analytical data to be relied upon as a boundary condition or to achieve site closure directly. The results of exploratory sampling may also be used to determine placement of more formal confirmation and compliance sample locations. As opposed to confirmatory sampling, exploratory samples may be analyzed in the field by a screening test or in a setting other than a fully-accredited laboratory and will not be required to adhere to criteria specified in the QAPP or SOPs.

The main types of sampling that will be conducted during implementation of this IM Work Plan include:

- Pre-remediation delineation soil and groundwater sampling for chemical contamination;

- Performance monitoring sampling, as warranted, during any ongoing remedial actions; and
- Post-remediation confirmation sampling for contaminated soil and groundwater.

The more formal confirmatory sampling activities are described in greater detail in **Section 3.6** (Confirmation Soil Sampling) and **Section 3.9** (Confirmation Groundwater Monitoring). Exploratory samples will be clearly identified as exploratory, delineation, or with similar wording to avoid confusion with confirmation samples.

To differentiate exploratory from confirmatory samples, an exploratory sample is defined as a field-screening tool to be used for determining more precise application of the IM, whereas a confirmation sample is defined as a representative sample that has been collected, analyzed, and validated in accordance with the QAPP and applicable SOPs, and is subsequently used to document that the concentrations of COCs in soil or groundwater are below the applicable cleanup levels. Pre-excavation exploratory sample data will not be validated; however, the data will be included in the IM Report for reference.

At the former septic system site, exploratory sampling will be conducted using direct-push technology (DPT), trenching, or other appropriate methods. In addition to standard vertical DPT drilling methods, angled and/or horizontal soil borings may be utilized to access otherwise obstructed areas such as beneath building foundations. Subsurface investigation will be conducted to determine the horizontal and vertical extent of soil and groundwater contamination, as required. During trenching or DPT drilling, soil screening will be conducted using a photoionization detector (PID), visual and olfactory observations, and collection of screening samples (as described above) to guide the exploration and identify the extent of soil contamination.

The maximum extent of accessible soil contamination will be determined based on field observation, site conditions, and physical restrictions. Visual observation of stained soil; field and/or laboratory soil screening; and proximity of existing underground utilities, surface structures, and building foundations may also define the limits of accessible contamination.

Exploratory samples will be analyzed for total petroleum hydrocarbons (TPH)- gasoline range organics (GRO), -diesel range organics (DRO), and -oil range organics (ORO) using Modified USEPA Method 8015. Target Analyte List (TAL) metals, polynuclear aromatic hydrocarbons (PAHs), and volatile organic compounds (VOCs) will also be analyzed. The QAPP (URS 2014d) indicates the sampling and analytical method requirements for confirmation soil and groundwater samples; however, not all elements of the QAPP are applicable to exploratory sample collection and analysis. The SOPs (URS 2014d) describe the general methods and equipment to be used in the collection and handling of environmental samples; exploratory sampling for soil and groundwater will be in general accordance with the applicable SOPs.

Proposed delineation sample locations were discussed between URS, Holloman AFB, and NMED during a meeting on 19 June 2014 (URS 2014c). The meeting minutes presented in **Appendix A** include an excerpted summary table of estimated monitoring well installations, soil, and groundwater samples, as well as planning figures showing approximate proposed sample locations and historical analytical data.

3.5 Excavation/Soil Removal

Once contamination in site soil has been delineated, removal of contaminated soil may be performed using a backhoe or hydraulic excavator. Should the soil removal require access to areas completed in concrete or asphalt, the surface covering will be removed prior to excavation and replaced following backfill and compaction.

If contaminated soil appears to extend past the expected excavation limits, excavation will continue until soil is no longer considered to be potentially contaminated, based on visual evidence, field- or laboratory-screening, or other appropriate screening methods. However, excavation may be limited by the presence of buildings and/or utilities. Once the screening inspection indicates that soil is not potentially contaminated, confirmation samples will be collected in accordance with the QAPP and SOPs (URS 2014d). Confirmation samples will be collected at a frequency of one from each side wall of the excavation per 20 linear ft along the area of contamination within the excavation. This applies to excavations with less than 50,000 CY of soil. For excavations greater than 50,000 CYs, the frequency of sampling will be every 50 linear ft. A minimum of one excavation floor sample will be collected and for larger excavations floor samples will be collected at intervals of approximately 500 square feet (sq ft). Excavation activities and subsequent sampling and analysis will continue until confirmation sampling and analysis indicate that concentrations of COCs do not exceed the applicable NMED residential SSLs (NMED 2012).

Following removal of contaminated soil and confirmation sampling, the excavations will be backfilled with clean fill material (verified clean by analytical results, or other appropriate certification) and compacted by methods appropriate to fulfill Holloman AFB requirements. There is no pre-defined limit to the volume, depth, or horizontal extent of excavation.

The excavated soil will be placed in appropriate roll-off containers (lined and covered, if necessary) for off-site disposal, or on 20-mil plastic sheeting for temporary stockpiling. Waste characterization samples may be collected to facilitate off-site transport and disposal of IDW at an appropriate permitted disposal facility. Management of IDW is further described in **Section 3.10**.

Open trenches will be lined with plastic sheeting to prevent contact between rainwater and contaminated soil. When necessary, soil berms or other appropriate methods may be used to control storm water. Rainwater may be pumped out of open trenches to the ground surface or to the storm water drainage system. Groundwater encountered in an excavation will be pumped from the excavation and contained as IDW for treatment/disposal prior to backfilling.

3.6 Confirmation Soil Sampling

Following discussion with NMED, confirmation soil samples will be analyzed for TPH-GRO, -DRO, and -ORO using Modified USEPA Method 8015. TAL metals, PAHs, and VOCs will also be analyzed. The QAPP (URS 2014d) indicates the sampling and analytical method requirements for confirmation soil samples.

Pursuant to the Holloman AFB RCRA Permit, soil analytical results will be compared with the corresponding NMED residential SSLs (NMED 2012), or USEPA RSLs (USEPA 2013) if no SSL has been designated. Excavation activities and subsequent sampling and analysis will continue until confirmation sampling and analysis indicate that COC concentrations do not exceed the applicable cleanup levels.

If a confirmation soil sample result exceeds the applicable screening levels, then an additional amount of wall or floor material will be excavated, and one additional confirmation soil sample (wall or floor) will be collected. This process will continue until the confirmation soil samples indicate concentrations are below applicable cleanup levels.

All samples will be collected and delivered to the laboratory under chain-of-custody protocol with request for expedited turn-around time (TAT) for analytical results. These samples will be collected, handled, and analyzed according to the QAPP and SOPs (URS 2014d).

Quality Assurance (QA)/Quality Control (QC) samples will be collected for the appropriate COCs so that sample results can be properly validated and eventually used as confirmation samples. The QA/QC samples will be collected at the following frequencies, per matrix, as detailed in the QAPP (URS 2014d):

- Trip Blanks: one for every 20 field samples analyzed for TPH-GRO and/or VOCs;
- Field Duplicates: one for every 20 field samples;
- Matrix Spike, Matrix Spike Duplicate pairs: one for every 20 field samples; and
- Rinsate (Equipment) Blanks: one for every 20 field samples collected with non-disposable/non-dedicated equipment.

3.7 Subsurface Injection

Due to the relatively small size of the site, the generally straightforward nature of hydrocarbon remediation, and the established effectiveness of bioremediation for chlorinated hydrocarbons, selected bioremediation augmentation substrates will be injected into the subsurface where COC concentrations in the vadose zone or groundwater exceed the applicable screening levels following any remedial excavation. The appropriateness of remedial injections under IM was confirmed in the 19 June 2014 meeting between NMED, Holloman AFB, and URS (URS 2014c and Appendix A). The injection locations will be spaced at appropriate horizontal and vertical intervals, and are anticipated to be set on approximate 10- to 20-ft centers, with injection depths ranging from approximately 25 to 45 ft bgs, with specific injection details to be determined in the field.

The optimum method to deliver bioremediation augmentation substrates into the subsurface is to inject the material through direct push rods using hydraulic mixing and pumping equipment. This approach increases the spreading and mixing of substrates into the aquifer. Upon completion of injection, each direct-push hole will be properly sealed to the surface.

The quantity of substrate dosing required at the site will be based on the results of exploratory soil and groundwater sample analysis, and consultation with the selected substrate manufacturer, among other pertinent factors.

Bioremediation augmentation substrates under consideration for these IM (e.g., 3-D Microemulsion [3DMe]® and Hydrogen Release Compound [HRC]®) are non-toxic and proven remediation technologies that have been used successfully by both URS and the USAF at multiple sites. These bioremediation augmentation substrates are also suitable for use in groundwater with elevated TDS concentrations.

3.8 Monitoring Well Installation and Development

3.8.1 Monitoring Well Installation

Additional monitoring wells may be installed in the vicinity of the former septic tank and leach field location to determine the impact to groundwater. As discussed in **Section 2.1.1**, the site already has twelve monitoring wells in place. Additional monitoring wells will be installed as necessary to fulfill the objectives of the IM. At least three properly constructed monitoring wells will be utilized at the site to perform compliance monitoring.

Well-drilling activities will be performed by an individual with a current and valid well driller license issued by the State of New Mexico. Monitoring wells will be installed using the hollow-stem auger (HSA) drilling technique in accordance with NMED Ground Water Quality Bureau Monitoring Well Construction and Abandonment Guidelines (NMED 2011b). The boreholes will be advanced into the water table using HSAs such that the borehole diameter will be at least 4 inches larger than the outside diameter of the well casing to allow for proper placement of the filter pack and sealant. Care will be taken so that the completed monitoring wells are sufficiently straight and plumb to allow passage of measuring and sampling devices.

During drilling, a URS Geologist will document the following information for each boring:

- Boring or well identification (this identification will be unique, and ensure it has not been used previously at the Base);
- Purpose of the boring (e.g., soil sampling, monitoring well);
- Location in relation to an easily identifiable landmark;
- Names of drilling subcontractor and logger;
- Start and finish dates and times;
- Drilling method;
- Diameters of surface casing, casing type, and methods of installation;
- Depth at which saturated conditions were first encountered;
- Lithologic descriptions and depths of lithologic boundaries;
- Sampling-interval depths; and
- Other pertinent field observations.

Field forms including soil boring logs for documentation of field activities are provided in SOPs. Well installation equipment will be decontaminated according to the specifications of the Decontamination SOP (URS 2014d).

Approximately two to three soil samples will be collected from split-spoons during the advancement of each well boring at the 0 to 2 ft interval and the interval with the highest PID field screen result, or the interval immediately above groundwater if no elevated PID readings are observed. Soil samples collected from the well borings will be analyzed for the same parameters as the exploratory soil samples described in **Section 3.4**; however, well boring soil samples will be treated as confirmatory/compliance samples, and will be subject to the protocols established in the QAPP and SOPs (URS 2014d).

Well borings will be advanced approximately 8 ft into the water table and completed such that the well screen intersects the water table. The wells will be constructed of 2-inch diameter Schedule 40 polyvinyl chloride (PVC) riser and screen. The screened section of the wells will consist of 10 ft of 0.010-inch slotted screen (or other field determined slot size). A silica sand filter pack will be placed around the screen to approximately 2 ft above the top of the screen. A 2-ft thick bentonite seal will be placed above the filter pack. The remaining annular space will be grouted with neat cement.

For wells that will be finished aboveground ("stick-up"), the casing will extend from the top of the screen to approximately 2 to 3 ft above ground surface. The top of the casing will be fitted with a removable cap, and the exposed casing will be protected by a locking steel protective casing. The protective casing will be large enough in diameter to allow easy access for removal of the cap. A concrete pad (2-ft minimum radius, 4-inch minimum thickness) will be installed around the protective casing and wellhead. The concrete and surrounding soil will be sloped to direct rainfall and runoff away from the wellhead. Protective steel posts (bollards) will be installed around the wells, where needed, to protect the wellhead from damage by vehicles or equipment.

Monitoring wells that are completed as "flush-mounted" will be constructed with water-tight well vaults that are rated to withstand traffic loads and fitted with locking, expandable well plugs. Concrete pads (2-ft minimum radius, 4-inch minimum thickness) will be poured around the well vaults. Vault covers will be secured with bolts. Additionally, the vault cover will indicate that the wellhead of a monitoring well is contained within the vault. The concrete and surrounding soil must be sloped to direct rainfall and runoff away from the well vault.

To document specific details of the monitoring well installations, the URS Geologist will prepare drilling logs and as-built well construction diagrams in the field as the activity is taking place. Specific procedures and example forms for installing monitoring wells are provided in SOPs (URS 2014d). The monitoring wells will be constructed in accordance with NMED guidance (NMED 2011b).

3.8.2 Monitoring Well Development

The newly installed monitoring wells will be developed to create an effective filter pack around the well screen, remove fine particles from the formation near the borehole, and assist in restoring the natural water quality of the aquifer in the vicinity of the well. All newly installed monitoring wells will be developed no sooner than 48 hours after installation to allow for grout curing.

Monitoring wells will be developed using surge blocks, bailers, or pumps to achieve effective well development.

During well development, documentation of the activity will take place in accordance with SOPs (URS 2014d) and will include recording of water level and depth-to-bottom measurements, water quality parameters, discharge water color, water volume, and time period.

Well development will continue until the following criteria are met:

- Water that has been removed from the well is visually clear, and the turbidity measures less than or equal to 10 nephelometric turbidity units (NTUs); and
- The pH, temperature, and specific conductance parameters have stabilized (less than 10 percent variation for three successive readings).

In the event that fine-grained deposits are present in the subsurface, it may be difficult to achieve a turbidity of 10 NTUs during well development. This is primarily a concern when a well has been screened in a formation that contains a high level of fine material (silt and clay). Silt and clay can occasionally travel through filter packs on properly constructed wells, resulting in turbid water. While selection of proper filter pack and screen materials minimizes turbidity, fine-grained particles may still flow through. Proper well construction and development procedures will be followed to reduce measured turbidity in monitoring wells. If turbidity remains greater than 10 NTUs after 4 hours of continuous well development, well development will cease. If the well is pumped dry, it will be allowed to recharge and be re-pumped as much as practical within the 4-hour time limit.

3.9 Confirmation Groundwater Monitoring

Following remedial actions taken at the site, confirmation groundwater samples will be collected based on recommendations in the IM Report. It is estimated that quarterly sampling for a period of 1 year will be required.

Following discussion with NMED, confirmation groundwater samples will be analyzed for TPH-GRO, -DRO, and -ORO using Modified USEPA Method 8015. TAL metals, PAHs, and VOCs will also be analyzed. The QAPP (URS 2014d) indicates the sampling and analytical method requirements for confirmation soil samples.

Groundwater samples will be collected from site monitoring wells in accordance with the procedures provided in QAPP and SOPs (URS 2014d). If groundwater at the site exceeds NMED water quality standards, the TDS levels from nearby monitoring wells will be used to develop a TDS survey to determine if the present-day groundwater in the immediate vicinity of the site is above the NMED 10,000-mg/L TDS potable water threshold. The Groundwater Bureau does not regulate groundwater that has a TDS over this threshold. However, if contaminant concentrations exceed regulatory thresholds, it may be necessary to assess potential risks associated with vapor intrusion and/or ecological receptors.

Groundwater sampling will occur no sooner than 2 days following monitoring well development at any monitoring well. Groundwater monitoring wells will be purged and samples will be collected using low-flow sampling techniques in accordance with the QAPP and SOPs (URS 2014d). Field parameters (e.g., temperature, conductivity, pH, and turbidity) will be measured during well purging. Groundwater samples will be collected when the field parameters stabilize with minor fluctuation between consecutive readings. Groundwater samples collected from monitoring wells will be analyzed for the same parameters as the exploratory groundwater samples described in **Section 3.4**; however, monitoring well groundwater samples will be treated as confirmatory/compliance samples, and will be subject to the protocols established in the QAPP and SOPs (URS 2014d). Groundwater samples for metals analysis will be submitted to the analytical laboratory for both total and dissolved metals analyses; samples for dissolved metals analysis will be field filtered prior to submittal.

QA/QC samples will be collected for the appropriate COCs so that sample results can be properly validated and eventually used as confirmation samples. The QA/QC samples will be collected at the following frequencies, per matrix, as detailed in the QAPP (URS 2014d):

- Trip Blanks: one for every 20 field samples analyzed for TPH-GRO and/or VOCs;
- Field Duplicates: one for every 20 field samples;
- Matrix Spike, Matrix Spike Duplicate pairs: one for every 20 field samples; and
- Rinsate (Equipment) Blanks: one for every 20 field samples collected with non-disposable/non-dedicated equipment. Dedicated/disposable equipment is anticipated to be used for groundwater sampling.

3.10 Waste Management

Waste management options in order of preference are reuse, recycling, treatment, and disposal. Waste may be classified as non-investigative waste or investigative waste:

- Non-investigative waste, such as trash and office garbage, will be collected on an as-needed basis to maintain the site in a clean and orderly manner. This waste will be accumulated in plastic garbage bags and transported to a designated sanitary landfill or collection bin.
- IDW generated during these IM will be segregated into the following categories:
    - Suspected contaminated soil
    - Concrete or asphalt rubble
    - Decontamination, well development, seepage water in excavations, and purge water
    - Personnel protective equipment (PPE), sampling debris, and plastic sheeting

IDW will be properly containerized and temporarily stored at a location specified by Holloman AFB prior to disposal. Depending on the COCs, fencing or other special marking may be required. Acceptable waste containers include sealed, DOT-approved, steel 55-gallon drums; small dumping bins with lids; or roll-off boxes with liners and covers. The containers will be transported in such a manner as to prevent spillage or particulate loss to the atmosphere. When required, sampling of drums or roll-off boxes will be done in accordance with SOPs (URS 2014d).

The IDW will be segregated at the site according to the specified categories. Each waste container will be properly labeled with site identification, matrix, date of generation, and other pertinent information for handling.

3.11 Site Restoration

Following delineation and remedial action activities at the former septic system site, site conditions will be restored to similar states as initial conditions. Direct-push boreholes will be filled with appropriate materials, and the surfaces will be finished to match the surrounding area (e.g., soil, asphalt cold patch, concrete, etc.). Excavations will be backfilled with clean fill and compacted with a vibratory compactor, backhoe, or other appropriate methods. The area will be graded to maintain positive drainage to conform to site conditions. The ground covering will then be restored to surrounding site conditions or other covering as directed by Holloman AFB.

3.12 Surveying

Surveying of the locations (northing, easting, and elevation coordinates) of excavations, confirmation soil sampling locations, new and existing monitoring well locations, and other pertinent site features will be conducted by a State of New Mexico-licensed surveyor. Elevation data for monitoring wells will include the top of the PVC riser and ground surface elevation at the well locations. Surveying data will be provided in a spreadsheet format for import into the geographic information system (GIS), and the data will also be incorporated into the report figures.

Horizontal coordinates will be referenced to the New Mexico Central State Plane Coordinate System, and surveyed to an accuracy of ±1.0 ft. Vertical elevations will be referenced to North American Datum 1983 coordinate system to an accuracy of ±0.01 ft.

Geospatial information will also be submitted as a separate deliverable to the USAF. All applicable federal, U.S. Department of Defense, and USAF geospatial data standards will be followed. Spatial data will be compliant with the Spatial Data Standards for Facilities, Infrastructure, and Environment v2.6.

Each geospatial data set will be accompanied by metadata that conforms to the Spatial Data Facilities, Infrastructure, and Environment standards. The horizontal accuracy of any geospatial data created will be tested and reported in accordance with the National Standard for Spatial Data Accuracy, and the results will be recorded in the metadata.

3.13 Reporting

The details of reporting related to this IM Work Plan are discussed in **Section 4.0** (Interim Measures Report).

This page intentionally left blank.

4.0 INTERIM MEASURES REPORT

Documentation of the project will be maintained, including field notes/forms, photographs, analytical, and survey data. An IM Report detailing the delineation and remedial action activities will be prepared and submitted to NMED for review. The IM Report will include the following elements:

- A description of IM implemented, including:
    - Purpose of the IM;
    - A summary of the delineation and remedial action activities conducted at the site as part of the overall IM;
    - Descriptions of field operations, including quantity of soil removed, quantity of soil backfilled, number of soil borings or monitoring wells installed, quantities of materials injected into the subsurface, and quantity of wastes generated;
    - Documentation of disposal volumes, manifests, and bills of lading;
    - Maps with surveyed excavation footprints and locations of surveyed confirmation samples, including monitoring wells; and
    - Photographs showing site conditions and/or typical operations.
- Summaries of results, including:
    - A discussion of the chemical sampling efforts, including the results of all delineation sampling, and associated maps and tables; and
    - Explanation of data validation efforts.
- Summaries of problems encountered, including:
    - Explanation and description of any modifications to the IM Work Plan, and why the modification was necessary.
- Summaries of accomplishments and/or effectiveness of IMs, including:
    - A discussion of the confirmation/compliance sample analytical results; and
    - Recommendations, as appropriate, for disposition of the site under the Holloman AFB RCRA Part B Permit, or other applicable New Mexico regulations (e.g., NMAC 20.7.3.307).
- Copies of relevant laboratory/monitoring data, etc., including:
    - Pertinent field data, sampling sheets, and laboratory results in appendices.

This page intentionally left blank.

5.0 PROJECT SCHEDULE

A preliminary project schedule for the overall anticipated sequence of IM activities is presented in **Figure 5-1**. The schedule is dependent on many independent factors including, but not limited to, USAF and NMED review and comment, subcontractor availability, weather, and site conditions.

USAF and NMED will be notified 30 days prior to the start of IM field activities. Additionally, during IM implementation, brief daily status reports may be submitted to Environmental representatives at Holloman AFB by electronic mail. These reports will summarize the previous day's activities, the planned activities for the following day, and other pertinent information.

As a general rule, IM will proceed quickly from site delineation to remediation within the same mobilization, if feasible. The IM implementation schedule will allow for evaluation of screening-level data collected during delineation to formulate a more detailed remedial approach specific to the site. Following implementation of the site-specific IM remedy, compliance and confirmation sample collection will begin. Post-remedy groundwater sample collection (e.g., monthly or quarterly) may be conducted to monitor IM effectiveness at the site and augment the implemented remedial actions with additional remediation if deemed necessary to achieve the IM objectives.

Upon successful completion of the IM, the IM Report will be submitted for review and approval of CAC without controls status.

This page intentionally left blank.

6.0 REFERENCES

Basabilvazo, G.T., Myers, R.G., and Nickerson, E.L. 1994. Geohydrology of the High Energy Laser System Test Facility Site, White Sands Missile Range, Tularosa Basin, south- central New Mexico: U.S. Geological Survey Water-Resources Investigations Report 93-4192, 59 p.

Derr, Phillip S. *Soil Survey of Otero Area, New Mexico, Parts of Otero, Eddy, and Chaves Counties.* Soil Conservation and Forest Service incooperation with the New Mexico State University Agricultural Experiment Station, 1981.

Foster Wheeler Environmental Corporation (Foster Wheeler). 2002. Draft Report for the Remedial Investigation of DP-63—Disposal Pit 63, Holloman Air Force Base, New Mexico. December.

NationView/Bhate JV III, LLC (NationView). 2011. Basewide Background Study Report, Holloman Air Force Base, New Mexico. Contract No. W9128F-07-D-0022. Task Order No. 0003. July.

New Mexico Administrative Code (NMAC). 2013a. Title 20 Environmental Protection. Chapter 6. Water Quality. Part 2. Ground and Surface Water Protection. 20.6.2. Standards for Ground Water of 10,000 mg/l TDS Concentration or Less.

NMAC. 2013b. Title 20 Environmental Protection. Chapter 7 Waste Water and Water Supply Facilities. Part 3. Liquid Waste Disposal and Treatment. 20.7.3.307 Standards; Abandoned Sewers and On-Site Liquid Waste Systems.

NMAC. 2013c. Title 20 Environmental Protection. Chapter 4. Hazardous Waste. Part 1. Hazardous Waste Management Regulations. 20.4.1. Adoption of 40 CFR Part 260.

NMED. 2004. Holloman Air Force Base RCRA Permit No. NM6572124422. February.

NMED. 2007. "Notice Of Deficiency On Swmu Assessment Report, Holloman Air Force Base Septic Tanks, April 2007, Holloman Air Force Base, NM6572124422, HWB-HAFB-07-005," letter to D. Hartell, Chief, Environmental Flight, Holloman Air Force Base from J.P. Bearzi, Chief, Hazardous Waste Bureau, New Mexico Environment Department, September 13.

NMED, 2010. "Approval of the Response to the Notice of Disapproval Basewide Septic Tank Solid Waste Management Units, RCRA Facility Investigation Work Plan, November 2, 2009, Holloman Air Force Base, EPA ID# NM6572124422, HWB-HAFB-09-003," letter to D. Scruggs, Chief, Environmental Restoration Program, Holloman Air Force Base from J.E. Kieling, Program Manager, Permits Management Program, Hazardous Waste Bureau, New Mexico Environment

Department, January 13, 2010.NMED. 2011a. "Partial Approval, Basewide Background Study Report, January 2009, Holloman Air Force Base, USEPA ID# NM6572124422, HWB-HAFB-09-004," letter to D. Scruggs, Chief, Environmental Restoration Program, Holloman Air Force Base from J.E. Kieling, Acting Chief, Hazardous Waste Bureau, New Mexico Environment Department, August 12.

NMED. 2011b. Monitoring Well Construction and Abandonment Guidelines. Ground Water Quality Bureau. Santa Fe, New Mexico. March.

NMED. 2012. Risk Assessment Guidance for Site Investigations and Remediation, Volume 1, Tier 1: Soil Screening Guidance Technical Background Document. Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program. Santa Fe, New Mexico. February.

NMED. 2014. "Approval, Voluntary Corrective Measure Request Group 2, Five Former Underground Storage Tank Sites, Holloman Air Force Base, EPA ID# NM6572124422, HWB-HAFB-12-004," letter to D. Rothhaupt, Chief, Compliance and Restoration, Holloman Air Force Base from J.E. Kieling, Chief, Hazardous Waste Bureau, New Mexico Environment Department, January 21.

New Mexico Statutes Unannotated (NMSA).1983. Chapter 74 Environmental Improvement. Article 4. Hazardous Wastes. 74-4-1. Hazardous Waste Act.

New Mexico Water Quality Control Commission (NMWQCC). 2006. 2004-2006 State of New Mexico Integrated Clean Water Act §303(D)/§305(B) Report.

Shaw Environmental & Infrastructure, Inc. (Shaw). 2011. Working Copy Voluntary Corrective Measures Request, Group 2 - Five Former Underground Storage Tank Sites, Holloman Air Force Base, Contract No. FA8903-09-D-8580, Task Order No. 0013, Project No. 144106, Rev. 0, December 2011.

Shaw. 2012a. Final Voluntary Corrective Measures Request, Septic System Sites, Holloman Air Force Base, Contract No. FA8903-09-D-8580, Task Order No. 0013, Project No. 144106, Rev. 0, January 2012.

Shaw. 2012b. Final Voluntary Corrective Measures Request, Group 3 - Nine Former Underground Storage Tank Sites, Holloman Air Force Base, Contract No. FA8903-09-D-8580, Task Order No. 0013, Project No. 144106, Rev. 0, February 2012.

Shaw. 2013a. *Sample Completion Report, Group 1 – Septic System Sites, Holloman Air Force Base, New Mexico*, Contract No. FA8903-09-D-8580, Task Order No. 0013, Project No. 144106, Rev. 0. March.

Shaw. 2013b. Draft RCRA Facility Investigation Report, Group 1 Septic System Sites, Building 1194 (OT-C534), Holloman Air Force Base, New Mexico, Contract No. FA8903-09-D-8580, Task Order No. 0013, Project No. 144106, Rev. 0, December 2012.

United States Air Force (USAF). 2013. Holloman Air Force Base official website. http://www.holloman.af.mil/. Accessed 12/3/2013.

United States Army Corps of Engineers (USACE), 2010. Basewide Septic Tank Solid Waste Management Units RCRA Facility Investigation Work Plan, Holloman AFB, New Mexico, Final.

United States Census Bureau (U.S. Census). 2010. Census 2010 using American FactFinder. http://factfinder2.census.gov. Accessed 12/3/2013.

U.S. Environmental Protection Agency (USEPA). 2013. USEPA Regional Screening Level (RSL) Chemical-specific Parameters Supporting Table. November. Accessed online at: http://www.epa.gov/region9/superfund/prg/.

United States Geological Survey (USGS). 2003. Geologic map of New Mexico.

URS Group, Inc. (URS). 2009. Volume II, Final Evaluation Report, Holloman Air Force Base, Identification and Evaluation of Defense Environmental Restoration Account Eligibility. Contract No. W912QR-04-D-0025, Task Order DS03. September.

URS, 2013. Meeting Minutes: Project Kickoff with NMED. 16 December.

URS. 2014a. Draft Final Interim Measures Work Plan - Group 3 Former Underground Storage Tank Sites: AOC-UST-221 (TU503), AOC-UST-298 (TU508), AOC-UST-901 (TU506), and AOC-UST-7003 (TU518), Holloman Air Force Base, New Mexico. Contract No.: FA8903-13-C-0008. March 2014.

URS. 2014b. Draft Interim Measures Work Plan - Group 2 Former Underground Storage Tank Site: AOC-UST-889 (TU515), Holloman Air Force Base, New Mexico. Contract No.: FA8903-13-C-0008. April 2014.

URS. 2014c. Meeting Minutes: Interim Measures at TU-Sites. 19 June.

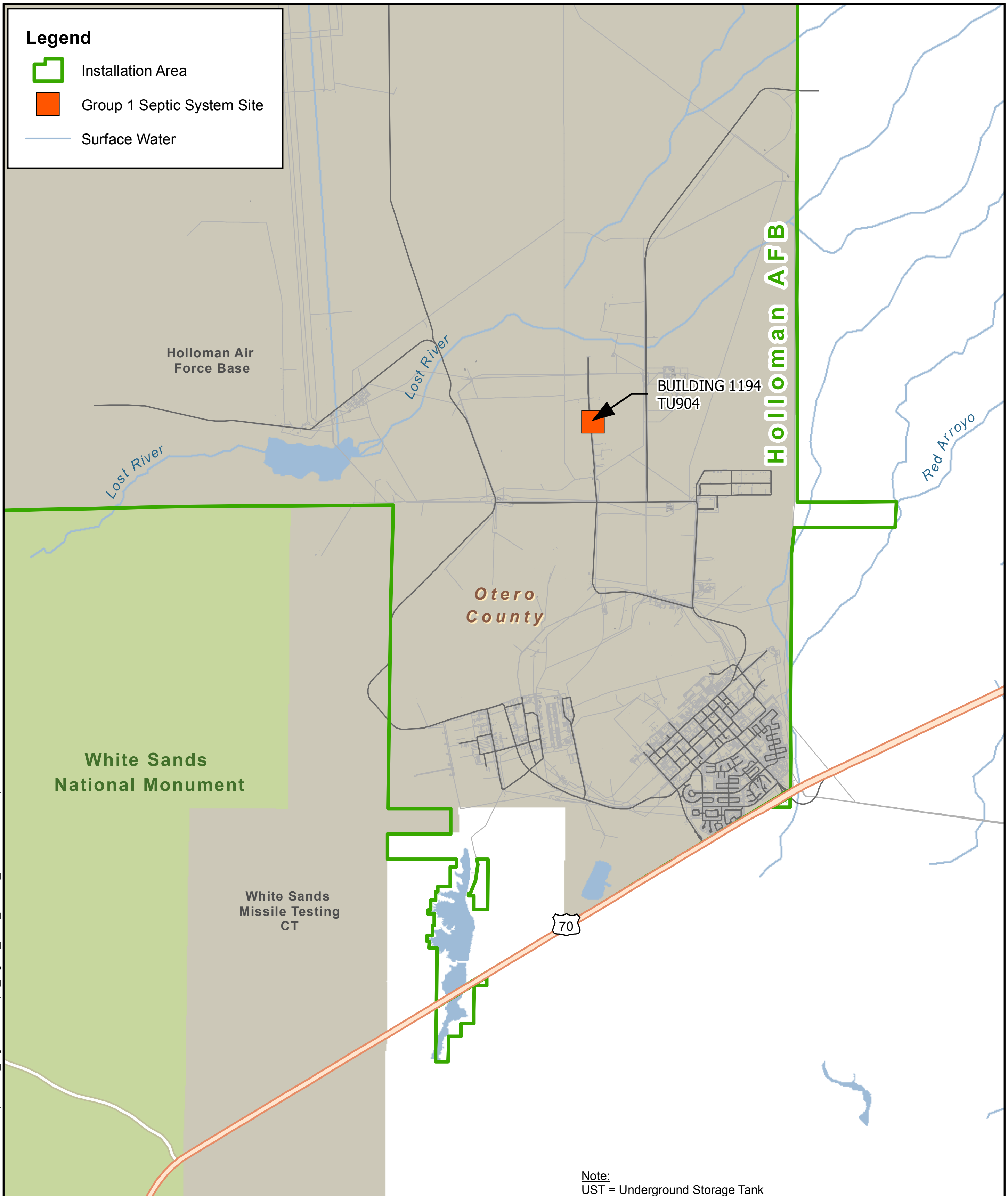
URS. 2014d. Technical Memorandum – Interim Measures Supplemental Plan Documents For TU-Sites. Holloman Air Force Base, New Mexico. Contract No.: FA8903-13-C-0008. *{In Progress}*

Weir, Jr., James E. 1965. *Geology and Availability of Ground Water in the Northern Part of the White Sands Missile Range and Vicinity New Mexico.* U.S Geological Survey and U.S. Department of Interior.

Western Regional Climate Center. 2013. Desert Research Institute State Narrative Web Page, http://www.wsmr.army.mil/paopage/Pages/WU%2360.htm. Accessed 12/3/2013.

This page intentionally left blank.

Figures



N S W E

0 3,500 7,000 10,500

Scale in Feet

1 inch = 7,000 feet

Coordinate System:
NAD 1983 State Plane, New Mexico Central Zone, Feet

Designed	JDM
Drawn	LED
Checked	DAE
Peer Review	DAE
Project Manager	BGP
Project Number	23446543

Figure 1-1

Location Map

Holloman Air Force Base

USAF

April 10, 2014

E:\GIS\Projects\AZNM_PBR_HollomanAFB\Site Maps\Draft_Figures\Group1_Fig1-1_Hafb_TU904_Location.mxd April 10, 2014

Note:

Sources:
HAFB, CBI, ULS Services Corp.

Coordinate System:
NAD 1983 State Plane,
New Mexico Central Zone, Feet

N W E S

0 20 40 60 120
Scale in Feet
1 inch = 60 feet

URS

Designed	JDM
Drawn	LED
Checked	DAE
Peer Review	DAE
Project Manager	BGP
Project Number	23446543

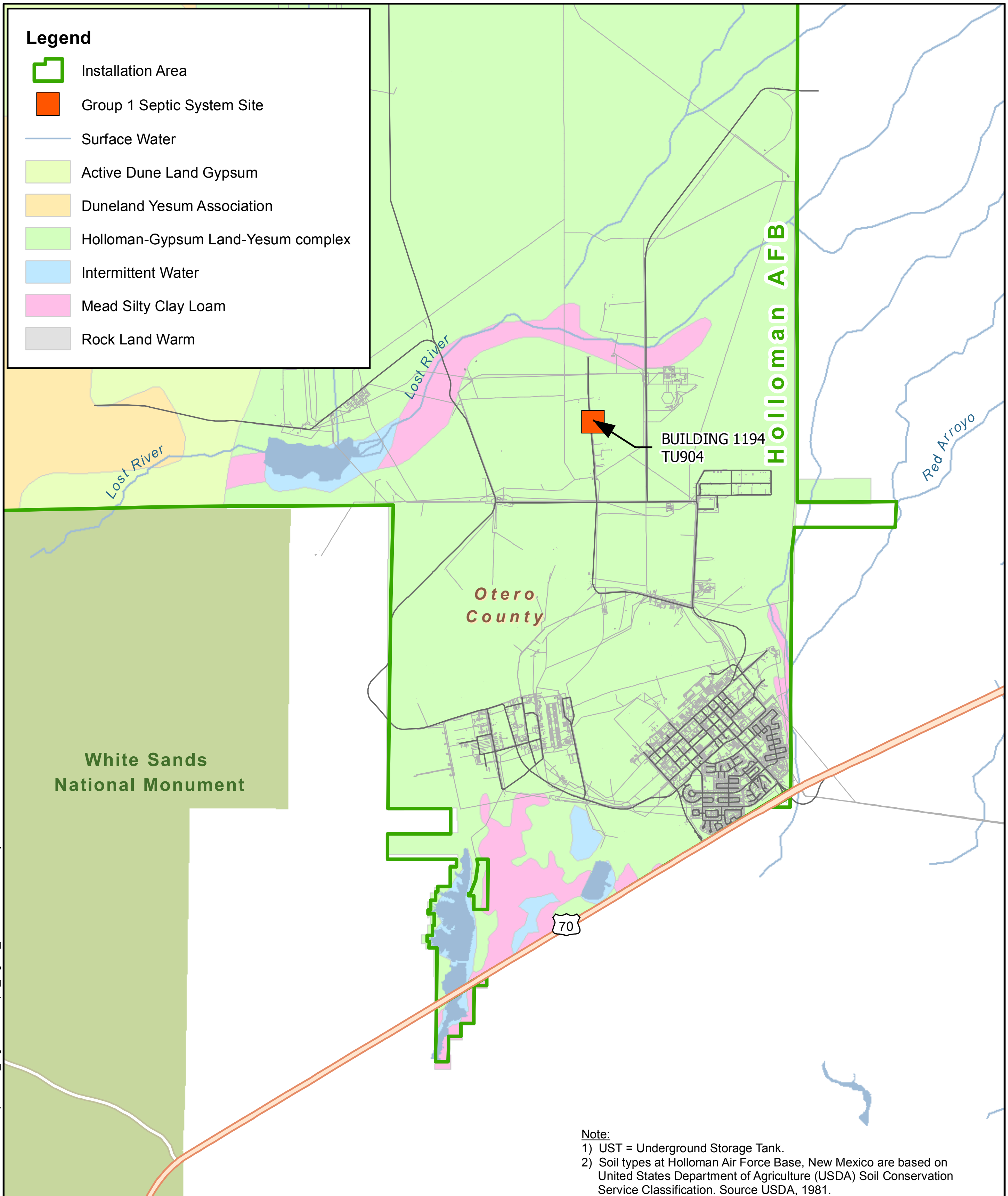
Figure 2-1

Building 1194
TU904 Site Map

Holloman Air Force Base
USAF

May 2, 2014

E:\GIS\Projects\AZNM_PBR_HollomanAFB\Site Maps\Draft_Figures\Group1_Fig2-1_TU904_SiteMap.mxd



Note:
1) UST = Underground Storage Tank.
2) Soil types at Holloman Air Force Base, New Mexico are based on United States Department of Agriculture (USDA) Soil Conservation Service Classification. Source USDA, 1981.

N S W E

0 3,500 7,000 10,500
Scale in Feet
1 inch = 7,000 feet

URS

Coordinate System:
NAD 1983 State Plane, New Mexico Central Zone, Feet

Designed	JDM
Drawn	LED
Checked	DAE
Peer Review	DAE
Project Manager	BGP
Project Number	23446543

Figure 2-2

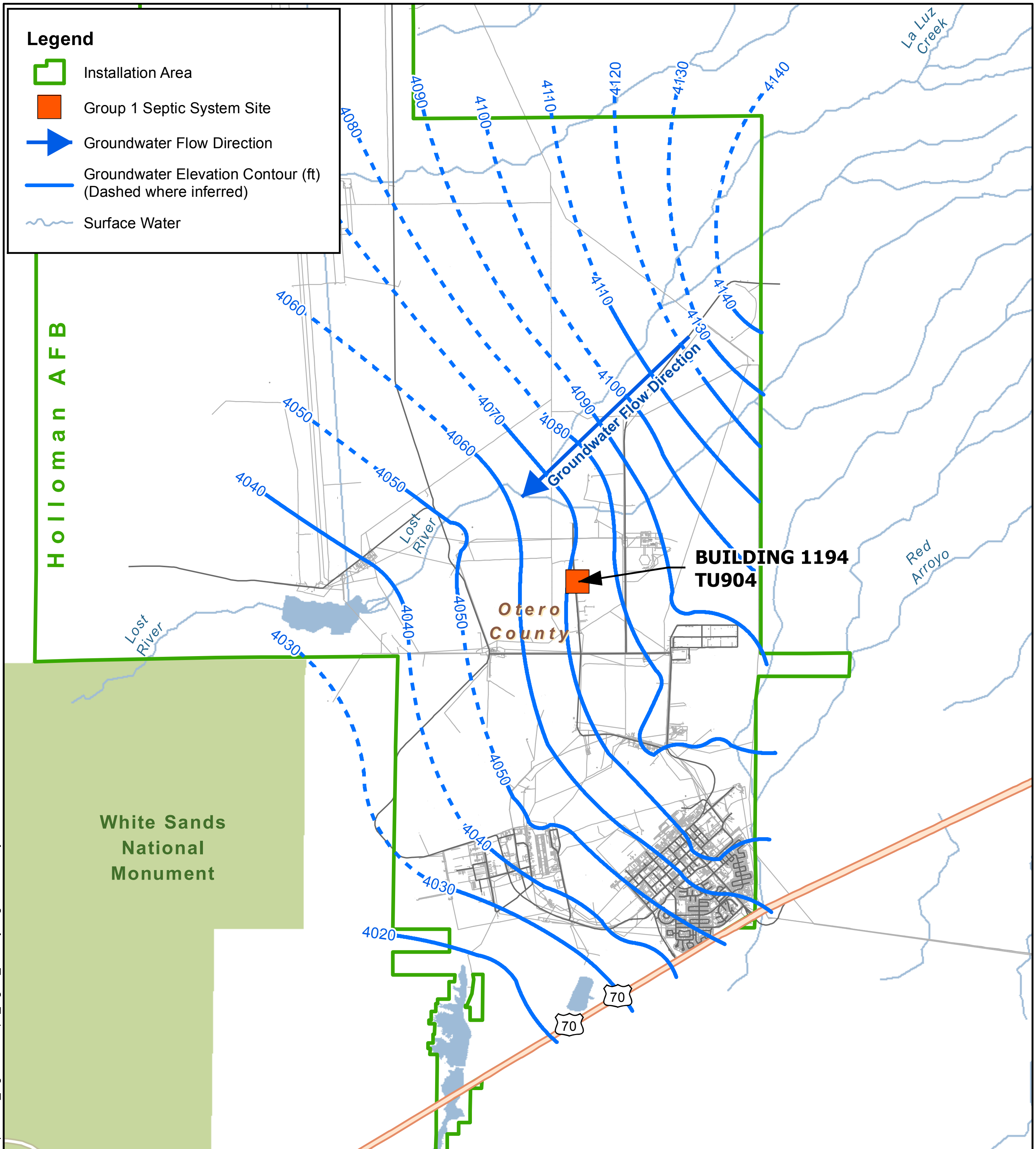
Regional Soils

Holloman Air Force Base

USAF

May 2, 2014

E:\GIS\Projects\AZNM_PBR_HollomanAFB\Site Maps\Draft_Figures\Group1_Fig2-2_HafbSoils.mxd May 2, 2014



Note:
1) Groundwater contour map showing groundwater elevation contours across Holloman Air Force Base, New Mexico, are based on 2002 measurements taken from the shallow aquifer.
2) Source: Holloman AFB GIS, 2002 LTM.

N / E / S / W

0 4,000 8,000 12,000

Scale in Feet
1 inch = 8,000 feet

URS

Coordinate System:
NAD 1983 State Plane, New Mexico Central Zone, Feet

Designed	JDM
Drawn	LED
Checked	DAE
Peer Review	DAE
Project Manager	BGP
Project Number	23446543

Figure 2-3

Regional Hydrogeology

Holloman Air Force Base
USAF

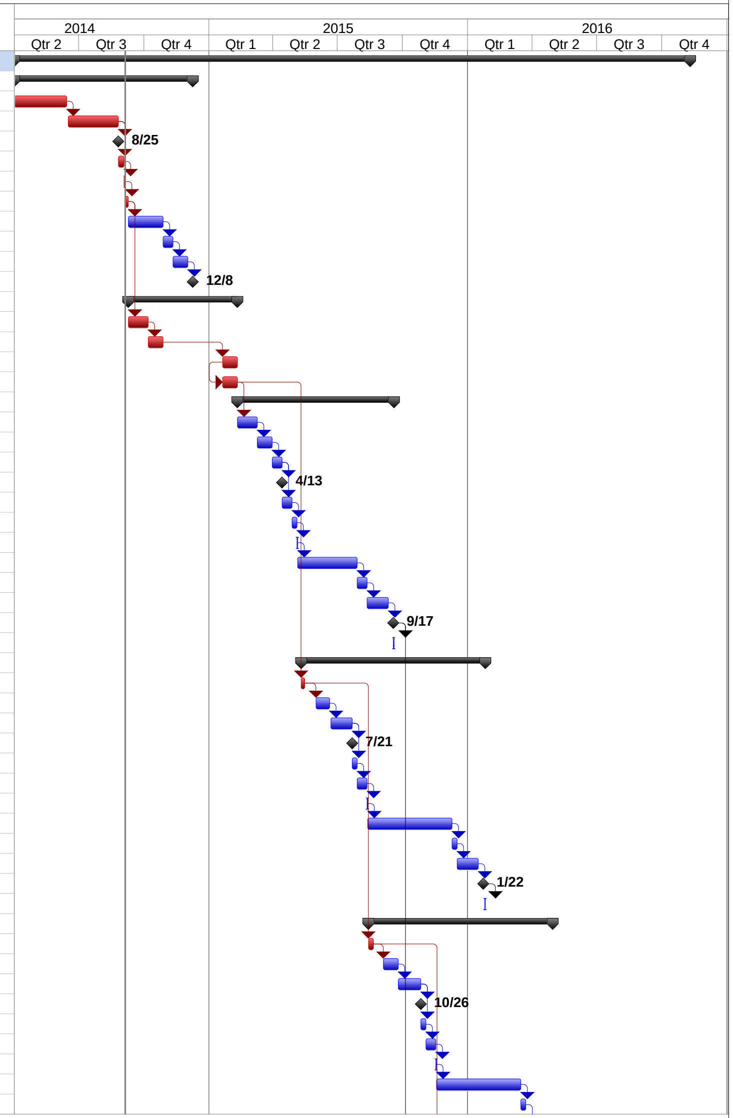
May 2, 2014

E:\GIS\Projects\AZNM_PBR_HollomanAFB\Site Maps\Draft_Figures\Group1_Fig2-3_HafbHydrogeo.mxd May 2, 2014

FA8903-12-R-0050

Proposed Schedule for Interim Measures - Group 1 Septic Site TU904
New Mexico-Arizona Group
Holloman AFB, New Mexico
Performance Based Remediation

ID	Name	Duration	Start	Finish	Predecessors
1	**TU904**	**682 days**	**Tue 4/1/14**	**Wed 11/9/16**	
2	**IM Work Plan**	**180 days**	**Tue 4/1/14**	**Mon 12/8/14**	
3	Prepare & Submit Draft IM Work Plan to AF	54 days	Tue 4/1/14	Fri 6/13/14	
4	Air Force Review of Draft / Provide Comments	51 days	Mon 6/16/14	Mon 8/25/14	3
5	AF Approval of Draft IM Work Plan Milestone	0 days	Mon 8/25/14	Mon 8/25/14	4
6	Respond to Comments (AF) / Prepare & Submit Draft Final to AF	6 days	Tue 8/26/14	Tue 9/2/14	4
7	AF Review & Approval of Draft Final IM Work Plan	2 days	Wed 9/3/14	Thu 9/4/14	6
8	Submit Draft Final IM Work Plan for Regulator Review	2 days	Fri 9/5/14	Mon 9/8/14	7
9	Regulator Review of Draft Final / Provide Comments	35 days	Tue 9/9/14	Mon 10/27/14	8
10	Respond to Comments (Regulator) / Prepare & Submit Final	10 days	Tue 10/28/14	Mon 11/10/14	9
11	AF and Regulator Review of Final IM Work Plan	15 days	Tue 11/11/14	Mon 12/1/14	10
12	AF and Regulator Approval of Final IM Work Plan Milestone	0 days	Mon 12/8/14	Mon 12/8/14	11FS+5 days
13	**IM Field Work**	**110 days**	**Tue 9/9/14**	**Mon 2/9/15**	
14	Dig Permits & Utility Clearance	20 days	Tue 9/9/14	Mon 10/6/14	8
15	Supplemental Characterization Field Work	15 days	Tue 10/7/14	Mon 10/27/14	14
16	Excavation, Confirmatory Sampling, and Site Restoration	15 days	Tue 1/20/15	Mon 2/9/15	15FS+60 days
17	Groundwater Remediation (injection)	15 days	Tue 1/20/15	Mon 2/9/15	16SS
18	**IM Report**	**159 days**	**Tue 2/10/15**	**Fri 9/18/15**	
19	Prepare & Submit Draft IM Report	20 days	Tue 2/10/15	Mon 3/9/15	17
20	Air Force Review of Draft / Provide Comments	15 days	Tue 3/10/15	Mon 3/30/15	19
21	Respond to Comments	10 days	Tue 3/31/15	Mon 4/13/15	20
22	Air Force Approval of Draft IM Report Milestone	0 days	Mon 4/13/15	Mon 4/13/15	21
23	Prepare & Submit Draft Final to AF	10 days	Tue 4/14/15	Mon 4/27/15	21
24	AF Review & Approval of Draft Final / Revise as needed	5 days	Tue 4/28/15	Mon 5/4/15	23
25	Submit Draft Final IM Report for Regulatory Review	1 day	Tue 5/5/15	Tue 5/5/15	24
26	Regulator Review of Draft Final / Provide Comments	60 days	Wed 5/6/15	Tue 7/28/15	25
27	Respond to Regulator Comments on Draft Final and Prepare Final	10 days	Wed 7/29/15	Tue 8/11/15	26
28	AF and Regulator Review of Final / Revise as needed	22 days	Wed 8/12/15	Thu 9/10/15	27
29	Regulatory and AF Approval of Final IM Report Milestone	0 days	Thu 9/17/15	Thu 9/17/15	28FS+5 days
30	ERPIMS Submission	1 day	Fri 9/18/15	Fri 9/18/15	29
31	**1Q Groundwater Monitoring Report**	**186 days**	**Mon 5/11/15**	**Mon 1/25/16**	
32	Groundwater Monitoring Field Work	5 days	Mon 5/11/15	Fri 5/15/15	17FS+90 edays
33	Prepare & Submit Draft to AF 4Q 2015 Groundwater Monitoring Report	15 days	Mon 6/1/15	Fri 6/19/15	32FS+10 days
34	Air Force Review of Draft / Provide Comments	22 days	Mon 6/22/15	Tue 7/21/15	33
35	AF Approval of Draft 4Q 2015 Groundwater Monitoring Report Milestone	0 days	Tue 7/21/15	Tue 7/21/15	34
36	Respond to Comments (AF) / Prepare & Submit Draft Final to AF	5 days	Wed 7/22/15	Tue 7/28/15	34
37	AF Review & Approval of Draft Final 4Q 2015 Groundwater Monitoring Report	10 days	Wed 7/29/15	Tue 8/11/15	36
38	Submit Draft Final for Regulator Review	1 day	Wed 8/12/15	Wed 8/12/15	37
39	Regulator Review of Draft Final / Provide Comments	85 days	Thu 8/13/15	Wed 12/9/15	38
40	Respond to Comments (Regulator) / Prepare & Submit Final	5 days	Thu 12/10/15	Wed 12/16/15	39
41	AF and Regulator Review of Final 4Q 2015 Groundwater Monitoring Report	22 days	Thu 12/17/15	Fri 1/15/16	40
42	AF and Regulator Approval of Final 4Q 2015 Groundwater Monitoring Report Milestone	0 days	Fri 1/22/16	Fri 1/22/16	41FS+5 days
43	ERPIMS Submission	1 day	Mon 1/25/16	Mon 1/25/16	42
44	**2Q Groundwater Monitoring Report**	**186 days**	**Fri 8/14/15**	**Fri 4/29/16**	
45	Groundwater Monitoring Field Work	5 days	Fri 8/14/15	Thu 8/20/15	32FS+90 edays
46	Prepare & Submit Draft to AF 1Q 2016 Groundwater Monitoring Report	15 days	Fri 9/4/15	Thu 9/24/15	45FS+10 days
47	Air Force Review of Draft / Provide Comments	22 days	Fri 9/25/15	Mon 10/26/15	46
48	AF Approval of Draft 1Q 2016 Groundwater Monitoring Report Milestone	0 days	Mon 10/26/15	Mon 10/26/15	47
49	Respond to Comments (AF) / Prepare & Submit Draft Final to AF	5 days	Tue 10/27/15	Mon 11/2/15	47
50	AF Review & Approval of Draft Final 1Q 2016 Groundwater Monitoring Report	10 days	Tue 11/3/15	Mon 11/16/15	49
51	Submit Draft Final for Regulator Review	1 day	Tue 11/17/15	Tue 11/17/15	50
52	Regulator Review of Draft Final / Provide Comments	85 days	Wed 11/18/15	Tue 3/15/16	51
53	Respond to Comments (Regulator) / Prepare & Submit Final	5 days	Wed 3/16/16	Tue 3/22/16	52



Project: Group 1 Septic Site IM
Date: Fri 9/5/14
File: zFigure 5-1 Preliminary Project S

Task; Split; Milestone; Summary; Project Summary; External Tasks; External Milestone; Inactive Task; Inactive Milestone; Inactive Summary; Manual Task; Duration-only; Manual Summary Rollup; Manual Summary; Start-only; Finish-only; Critical; Critical Split; Progress; Deadline

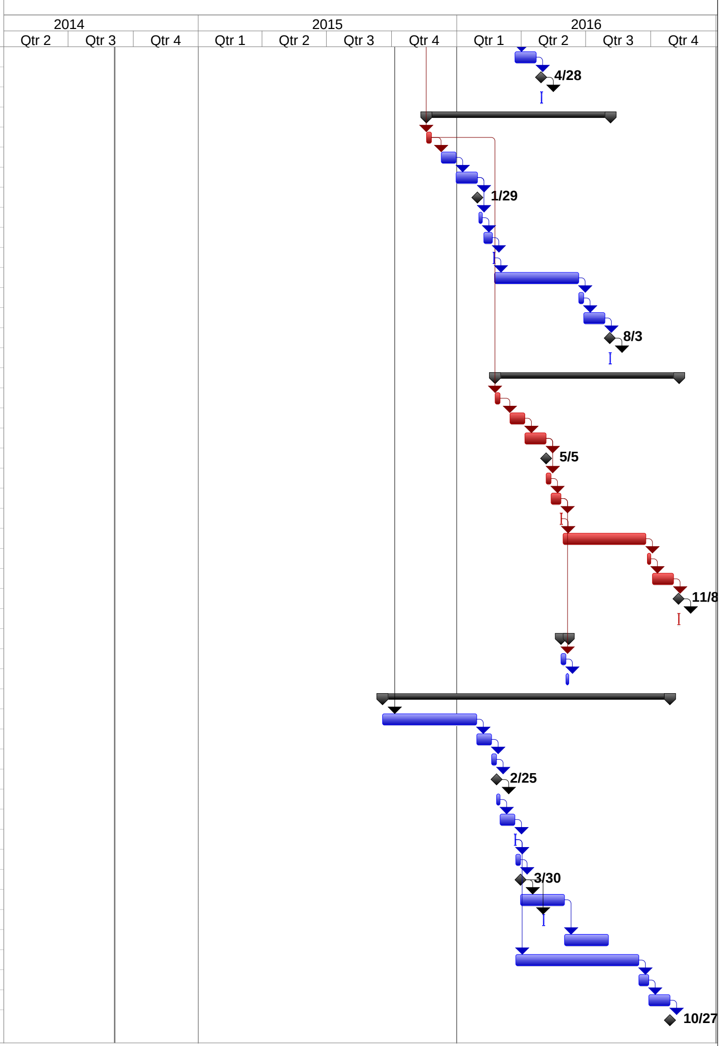
June 12, 2014

Figure 5-1. Preliminary Project Schedule

Proposed Schedule for Interim Measures - Group 1 Septic Site TU904
New Mexico-Arizona Group
Holloman AFB, New Mexico
Performance Based Remediation

URS

ID	Name	Duration	Start	Finish	Predecessors
54	AF and Regulator Review of Final 1Q 2016 Groundwater Monitoring Report	22 days	Wed 3/23/16	Thu 4/21/16	53
55	AF and Regulator Approval of Final 1Q 2016 Groundwater Monitoring Report Milestone	0 days	Thu 4/28/16	Thu 4/28/16	54FS+5 days
56	ERPIMS Submission	1 day	Fri 4/29/16	Fri 4/29/16	55
57	**3Q Groundwater Monitoring Report**	**186 days**	**Thu 11/19/15**	**Thu 8/4/16**	
58	Groundwater Monitoring Field Work	5 days	Thu 11/19/15	Wed 11/25/15	45FS+90 edays
59	Prepare & Submit Draft to AF 2Q 2016 Groundwater Monitoring Report	15 days	Thu 12/10/15	Wed 12/30/15	58FS+10 days
60	Air Force Review of Draft / Provide Comments	22 days	Thu 12/31/15	Fri 1/29/16	59
61	AF Approval of Draft 2Q 2016 Groundwater Monitoring Report Milestone	0 days	Fri 1/29/16	Fri 1/29/16	60
62	Respond to Comments (AF) / Prepare & Submit Draft Final to AF	5 days	Mon 2/1/16	Fri 2/5/16	60
63	AF Review & Approval of Draft Final 2Q 2016 Groundwater Monitoring Report	10 days	Mon 2/8/16	Fri 2/19/16	62
64	Submit Draft Final for Regulator Review	1 day	Mon 2/22/16	Mon 2/22/16	63
65	Regulator Review of Draft Final / Provide Comments	85 days	Tue 2/23/16	Mon 6/20/16	64
66	Respond to Comments (Regulator) / Prepare & Submit Final	5 days	Tue 6/21/16	Mon 6/27/16	65
67	AF and Regulator Review of Final 2Q 2016 Groundwater Monitoring Report	22 days	Tue 6/28/16	Wed 7/27/16	66
68	AF and Regulator Approval of Final 2Q 2016 Groundwater Monitoring Report Milestone	0 days	Wed 8/3/16	Wed 8/3/16	67FS+5 days
69	ERPIMS Submission	1 day	Thu 8/4/16	Thu 8/4/16	68
70	**4Q Groundwater Monitoring Report**	**186 days**	**Wed 2/24/16**	**Wed 11/9/16**	
71	Groundwater Monitoring Field Work	5 days	Wed 2/24/16	Tue 3/1/16	58FS+90 edays
72	Prepare & Submit Draft to AF 3Q 2016 Groundwater Monitoring Report	15 days	Wed 3/16/16	Tue 4/5/16	71FS+10 days
73	Air Force Review of Draft / Provide Comments	22 days	Wed 4/6/16	Thu 5/5/16	72
74	AF Approval of Draft 3Q 2016 Groundwater Monitoring Report Milestone	0 days	Thu 5/5/16	Thu 5/5/16	73
75	Respond to Comments (AF) / Prepare & Submit Draft Final to AF	5 days	Fri 5/6/16	Thu 5/12/16	73
76	AF Review & Approval of Draft Final 3Q 2016 Groundwater Monitoring Report	10 days	Fri 5/13/16	Thu 5/26/16	75
77	Submit Draft Final for Regulator Review	1 day	Fri 5/27/16	Fri 5/27/16	76
78	Regulator Review of Draft Final / Provide Comments	85 days	Mon 5/30/16	Fri 9/23/16	77
79	Respond to Comments (Regulator) / Prepare & Submit Final	5 days	Mon 9/26/16	Fri 9/30/16	78
80	AF and Regulator Review of Final 3Q 2016 Groundwater Monitoring Report	22 days	Mon 10/3/16	Tue 11/1/16	79
81	AF and Regulator Approval of Final 3Q 2016 Groundwater Monitoring Report Milestone	0 days	Tue 11/8/16	Tue 11/8/16	80FS+5 days
82	ERPIMS Submission	1 day	Wed 11/9/16	Wed 11/9/16	81
83	**Well Abandonment Field Work**	**7 days**	**Fri 5/27/16**	**Mon 6/6/16**	
84	Dig Permits & Utility Clearance (if applicable)	5 days	Fri 5/27/16	Thu 6/2/16	76
85	Well Abandonment	2 days	Fri 6/3/16	Mon 6/6/16	84
86	**Corrective Action Complete (CAC) Proposal**	**290 days**	**Fri 9/18/15**	**Thu 10/27/16**	
87	Prepare and Submit Draft CAC Proposal	95 days	Fri 9/18/15	Thu 1/28/16	29
88	Air Force Review of Draft/Provide Comments	15 days	Fri 1/29/16	Thu 2/18/16	87
89	Respond to Comments	5 days	Fri 2/19/16	Thu 2/25/16	88
90	Air Force Approval Draft CAC Proposal	0 days	Thu 2/25/16	Thu 2/25/16	89
91	Prepare and Submit Draft Final CAC Proposal	3 days	Fri 2/26/16	Tue 3/1/16	90
92	Air Force and MSG Review of Draft Final/Revise as Needed	15 days	Wed 3/2/16	Tue 3/22/16	91
93	Submit Draft Final for Regulatory Review	1 day	Wed 3/23/16	Wed 3/23/16	92
94	Prepare Newspaper Notice	5 days	Thu 3/24/16	Wed 3/30/16	93
95	Publish Approved Newspaper Notice and Submit it to Stakeholders and NMED	0 days	Wed 3/30/16	Wed 3/30/16	94
96	Public Comment Period	44 days	Thu 3/31/16	Tue 5/31/16	95
97	Public Meeting	1 day	Mon 5/2/16	Mon 5/2/16	95FS+22 days
98	Assist with Responses to Public Comment (if any)	44 days	Wed 6/1/16	Mon 8/1/16	96
99	Regulator Review of Draft Final / Provide Comments	124 days	Thu 3/24/16	Tue 9/13/16	93
100	Respond to Regulator Comments on Draft Final (if necessary) and Prepare Final CAC Proposal	10 days	Wed 9/14/16	Tue 9/27/16	99
101	Air Force and Regulator Review of Final CAC Proposal/Revise as needed	22 days	Wed 9/28/16	Thu 10/27/16	100
102	Regulatory Approval of Final CAC Proposal (Administratively Completeness Letter) and Achieve SC (finished with all AF requirements to Permit Mod)	0 days	Thu 10/27/16	Thu 10/27/16	101



Project: Group 1 Septic Site IM
Date: Fri 9/5/14
File: zFigure 5-1 Preliminary Project S

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Critical	
Split	External Tasks	Inactive Summary	Manual Summary	Critical Split	
Milestone	External Milestone	Manual Task	Start-only	Progress	
Summary	Inactive Task	Duration-only	Finish-only	Deadline	

June 12, 2014

Figure 5-1. Preliminary Project Schedule

Appendix A
Meeting Minutes
Interim Measures at TU-Sites. 19 June 2014

PURPOSE: Meeting with New Mexico Environment Department (NMED), Holloman Air Force Base (HAFB), and HAFB's Contractor, URS Group, Inc. (URS) to discuss Interim Measures (IM) at Group 3 UST Sites TU-503, TU-506, TU-508 and TU-518, Group 2 UST Site TU-515, and Group 1 Septic System Site TU-904.

LOCATION: New Mexico Environment Department (NMED), 5500 San Antonio Dr. NE, Albuquerque, NM

DATE: 19 June 2014

TIME: 1:00 p.m. Mountain Time

MEETING ATTENDEES:

Name	Organization	Phone Number	Email Address
Brian Salem	NMED	505-222-9576	Brian.Salem@state.nm.us
David Strasser	NMED	505-222-9526	David.Strasser@state.nm.us
David Rizzuto	HAFB	575-572-5395	David.Rizzuto.Ctr@holloman.af.mil
Brian Powers	URS	303-740-3924	Brian.Powers@urs.com
Jon Mallonee	URS	303-740-3967	Jon.Mallonee@urs.com
Steven Geiger	URS	505-672-2107	Steve.Geiger@urs.com

INTRODUCTIONS AND SITE OVERVIEW

Brian Powers (BP) and Dave Rizzuto (DR) provided an overview of meeting objectives and site histories.

General Items:

- The rationale for splitting up the reports (Group 3 – TU 503; TU-508; TU-506 and TU-518; Group 2 – TU-515; and separately, TU-904) was discussed. DR described these as the sites that prior contractor did not finish under a previous Performance-Based Remediation (PBR) contract.

- Brian Salem (BS) and Dave Strasser (DS) discussed Interim Measure vs. a full Corrective Measures Studies (CMS) approach. NMED stated that we can proceed with Interim Measures if we use presumptive and 'simple' remediation approaches (e.g., injections, soil vapor extraction (SVE), etc.); however, if the remediation is expected to take longer than 2 years without steadily improving conditions, then we would need to step back and go through a formal Resource Conservation and Recovery Act (RCRA) CMS process. The stated 2-year timeframe is not absolute, and positive results could allow extension of that timeline.
- NMED agreed that based on the limited nature and extent of contamination at the former UST sites, we can proceed with IM that are limited to such straightforward activities as investigation, excavation, injections of reagents or amendments, and SVE. NMED would prefer to remove as much contamination as possible via soil excavations; however, they recognize that other measures may be needed if the contamination extends underneath immovable structures (e.g., buildings and/or utilities).
- NMED said that using the prior contractor's data in the IM final reports is acceptable if the data quality is good. A preference was also stated that subsequent site investigation/remediation reports be consolidated into a single deliverable, as applicable.
- BS indicated that the IM Work Plan screening criteria (e.g., PID and confirmatory samples) are appropriate and acceptable.

TU-503

- Resampling the three existing groundwater (GW) monitoring wells before taking additional actions was discussed. Well MW-01 is downgradient of the former UST location and was not sampled previously due to "poor water yield". URS will determine if there is now sufficient water to collect a sample.
- NMED recommended adding another GW sampling location on the east-southeast side of Bldg. 221 (other side of building from excavation) to address potential data gaps in groundwater.
- NMED indicated peristaltic pumps are unacceptable for VOCs and bailers should be used.

TU-506

- The absence of soil contamination at TU-506 and the presence of limited GW contamination at one well located adjacent and slightly upgradient of the UST excavation was discussed. Contamination consists of diesel-range organics (DRO) and a low level of manganese (Mn). It was acknowledged that a downgradient well and an upgradient well are needed to confidently delineate the contamination. Existing wells will also be resampled. NMED concurred with the proposed approach.

- Regarding the slightly elevated Mn concentration in GW (0.205 milligrams/liter (mg/l) vs. a standard of 0.2 mg/l), NMED agreed that these levels of Mn are not unusual for HAFB, likely represent background, and shouldn't be an obstacle for closing the site.

TU-508

- Challenges regarding the colocation of TU-508 and SS-018, and commingling of contaminants were discussed. The general consensus is that TU-508 is not the source of the solvents plume and a relatively minor site compared to the larger impacts of the SS-018 site. NMED indicated that we could conceivably close TU-508 and roll the GW contamination into SS-018.
- BP described prior soil sample results for Arsenic and a single detection of Cobalt. NMED asked if the previous contractor had analyzed soils using 8260/8270 and Jon Mallonee (JM) confirmed and explained that the current figures only show analytes with values greater than screening levels.
- URS is proposing 4 soil samples, 4 new wells and/or GW samples, and 6 GW samples from existing wells adjacent to the TU-508 site.
- BS asked if URS could sample three additional unspecified SS-018 wells as part of the TU-508 action as part of a synoptic data collection effort to help with SS-018 planning, and to help determine if the edge of the SS-018 plume could be better defined with additional wells. These additional SS-018 delineation wells would presumably be part of the additional SS-018 investigation and response.
- NMED recommended that URS move the newly proposed downgradient MW location to within the yellow hatched anomaly area (presumed source area) as depicted on the figures. URS agreed this would be a more definitive area and will relocate the proposed well accordingly.
- NMED concurred with the proposed scope of work for TU-508.

TU-515

- The plan for additional soil samples, one new MW, and sampling of three existing GW wells was discussed. It is anticipated that soil excavation is all that is needed to achieve closure for this site.
- NMED concurred with the proposed scope of work for TU-515 and there was consensus that the site should be "closeable" with the current proposed plan.

TU-518

- DR indicated this was the RATSCAT site at White Sands Missile Range (WSMR) and the site will be transferring to the Army, but the Air Force retains responsibility for closure. WSMR has moved operations from these buildings and there's uncertainty as to what the Army plans for the buildings.

- Evidence suggests that there was a surface spill (i.e., overflow) and likely not a tank leak. NationView, a prior contractor at the site, only excavated to remove the tank and a little soil around it. Another contractor (CB&I) conducted the environmental sampling. There is concern for potential contamination under the buildings. Bldg. 7003 housed a water treatment system and has a substantial below-grade foundation. The other building is likely a slab on grade. It is not possible to get any kind of rig inside the buildings.
- Currently, there is no GW data for the TU-518 site because the previous contractor used Direct Push Technology (DPT) and got refusal in caliche at 8 feet below ground surface. It appears no efforts were made at that time to use other drilling methods (e.g., hollow stem auger). Extremely high total dissolved solids (~ 60,000 parts per million) are present in the groundwater in this area.
- If contamination extends underneath the building, horizontal drilling and/or drilling from inside the buildings would be considered. NMED indicated that if one side of the building has high levels, then take another sample from the other side of the building in that location to be able to approximate the extent of contamination.
- NMED indicated that soil may not need to be removed if it is only impacted by Total Petroleum Hydrocarbons (TPH). If VOCs/SVOCs are clean (i.e., less than regulatory levels), NMED can close the site, but URS will need to establish that there is no risk due to TPH to satisfy USAF. NMED indicated that they could potentially close this site based on risk; however, BP said that we still need to achieve AF closure which includes unrestricted use/unlimited exposure.
- DR clarified that for the HAFB Part B permit, DRO is acceptable for screening but confirmation samples must include compound specific analyses for closure (e.g., 8260/70).

TU-904

- A site overview was provided and the issue at this site is primarily a trichloroethylene (TCE) groundwater plume. No impacted soil has been identified.
- URS plans to sample 4 newly proposed wells, existing wells with previous TCE detections, and those wells that are one step removed from problem area to properly delineate the plume.
- NMED concurred with the approach for TU-904.

General Comments and Discussion

- The proposed timing of the TU sites fieldwork was identified as the latter part of July. NMED stated that the scale of work to be done is appropriate and should generate enough data to close out the UST sites.
- BS said he's ready to approve the Group 3 Work Plan soon (Dave Cobrain is out for 2 more weeks), and reiterated the request to submit a single report for all TU sites in the future. He also indicated that future Work Plan submittals to NMED do not need to contain HASP, QAPP, or SOPs.
- BS stated a desire to visit HAFB during the upcoming field work this July, if possible.

Sidebar Topics:

- SS-018: There was considerable discussion of the solvent plume attributable to SS-018. NMED indicated they want to see plume maps for individual VOC constituents in GW. The source of VOCs needs to be determined and although it's likely from SS-018, it was speculated that there may be multiple sources and/or a definitive source may not be discernable. DR said that there used to be an AGE storage area nearby and they also did fuel storage at that site, so there is a potential for other types of releases exists. NMED indicated that the vapor intrusion pathway for solvent sites (i.e., SS-018 and TU-904) will need to be evaluated, and that indoor air canister sampling in nearby structures may be necessary. There was also awareness that due to the high TDS, it might be possible to leave it in place with regard to the VOC plume(s) at SS-018. DS will be the reviewer on SS-018 and he will retain the regulatory lead on that site.
- SS-059: Per DR, the hush house(s) at the T-38 Test Cell may be removed and new ones reconstructed. This could be of significant benefit to remediation at the SS-059 site. There's uncertainty on the timing but more information will be known in the coming weeks.
- SS-017: The Hospital across the street (1st St.) from SS-017 is slated to be moved into the area of the current parking lot (northeast of current hospital location). This could be in the near future. DR expects that they would keep the current hospital until the new one comes on line and then possibly decommission and demolish the current facility. The empty lot of SS-017 would likely be used for parking and equipment staging during construction activities.
- SD-027: BS said that he is approving the SD-027 Quarterly Sampling report (TetraTech). I believe that BS said that (paraphrase) "he is going to tell them to do dig/haul OR think about using amendments due to the runway issue", "maybe something more active". He said this letter is going out soon. He's also requesting more quarterly sampling on SD-027.

Table X. Estimated Interim Measures Implementation Summary, Holloman AFB, New Mexico {*Excerpted to show TU904 information only* }

Site IDs :	TU904	Totals	
Site Name / Alias	Building 1194 Septic System OT-C534		
AOC/SWMU	n/a		
Soil COCs	benzo(a)pyrene; arsenic		
Groundwater COCs	TCE; iron; antimony; lead		
Soil Borings	15	15	*From Site Figure, includes soil samples collected from water sample / MW locations as well.*
Soil Samples (primary)	30	30	*2x per borehole*
Soil QC Samples (FD/MS/SD)	6	6	*1/20 QC * 3 (FD, MS, SD)*
Soil Samples (TOTAL)	**36**	**36**	
GW Sample Locations	12	12	*From Site Figure, includes grab sample at MW location prior to MW installation.*
GW Grab Samples (primary)	12	12	*1x per location*
GW QC Samples (FD/MS/SD)	3	3	*1/20 QC * 3 (FD, MS, SD)*
GW Grab Samples (TOTAL)	**15**	**15**	
Monitoring Well Installations	4	4	*From Site Figure; each MW will have been previously grab sampled for water*
MW Sample Locations *	*16*	16	** All sites aside from TU518 and TU904 have 3 existing MWs.*
MW QC Samples (FD/MS/SD)	3	3	*1/20 QC * 3 (FD, MS, SD)*
MW Samples (TOTAL)	**19**	**19**	
Excavation (cu. yd, approx.)	200	200	*TU506 will not be excavated.*
Confirmation Samples (Side Wall)	8	8	*1/20 ft*
Confirmation Samples (Floor)	2	2	*1/500 sq ft*
Confirmation QC Samples (FD/MS/SD)	3	3	*1/20 QC * 3 (FD, MS, SD)*
Confirmation Samples (TOTAL)	**13**	**13**	
Injection Locations (Approx.)	100	100	*TU503 and TU515 will not be injected. TU506 and TU518 pending further study.*

Grand Totals	
Soil Samples	**49**
Water Samples	**34**

Example calcs for TU904	
cu ft	5400
sq ft (8 deep)	675
ft (sq.rt.)	25.980762
side samples	8
floor samples	2

Table Y. Estimated Interim Measures Implementation Tasks Holloman AFB, New Mexico {*Excerpted to show TU904 information only* }

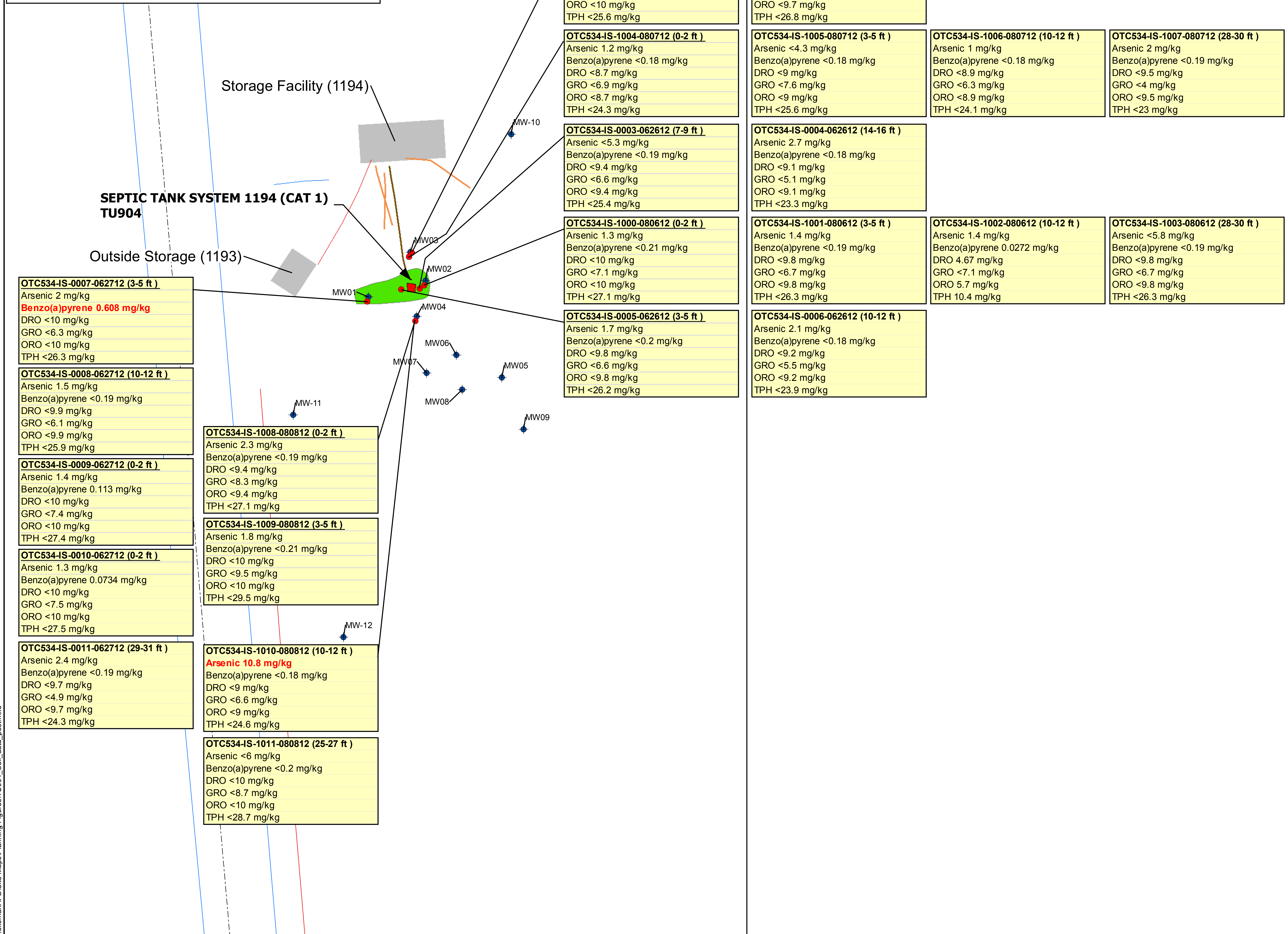
Activity	Quantity	Units	Comments	
Direct-push Sampling (soil/gw)				
TU904 Direct-push (soil/gw)	15	boring	GW Grab Samples	12
Totals:	***15***			
Monitoring Well Installation				
TU904 Well Installation	4	well	Well Depths (ft)	35-40
Totals:	***4***			
Monitoring Well Development				
TU904 MW development	4	well		
Totals:	***4***			
Monitoring Well Sampling				
TU904 MW sampling	16	well		
Totals:	***16***			
Remedial Excavations				
TU904 Excavation	200	cu. yd	TU904 is not paved.	
Totals:	***200***			
Site Restoration				
TU904 Restoration	675	sq. ft	Based on excavation volume & 8 ft depth. TU904 not paved.	
Totals:	***675***			
Remedial Injections				
TU904 Injection	100	points		
Totals:	***100***			
Investigation / Remediation Demobe				
IDW Disposal - ALL SITES	1	event	Includes only IDW (soil/water) drums.	

Note: Grey shading indicates quantities referenced or calculated from Table X (IM Implementation Summary).

Legend

- Installation Area
- Group 1 Septic System Site
- Road Centerline
- Electrical Cable Line
- Water Line
- Existing Structure
- Ground Pentrating Radar (GPR) Anomaly/ Low EM (Leachfield)
- Mag Anomaly (Septic)
- Monitor Well Location
- TU904_Sample_Locs
- potseptic drain
- unknown

Parameter	Criteria	Units	COMMENT
DRO	1000	mg/kg	from TPH Standard
GRO	1000	mg/kg	from TPH Standard
ORO	1000	mg/kg	from TPH Standard
TPH	1000	mg/kg	NMED SSLs Residential Land Use (NMED 2012)
Arsenic	3.9	mg/kg	NMED SSLs Residential Land Use (NMED 2012)
Benzo(a)pyrene	0.148	mg/kg	NMED SSLs Residential Land Use (NMED 2012)



Note:

Sources:
HAFB, CBI, ULS Services Corp.

Coordinate System:
NAD 1983 State Plane,
New Mexico Central Zone, Feet

URS

Designed	JDM
Drawn	LED
Checked	DAE
Peer Review	DAE
Project Manager	BGP
Project Number	23446543

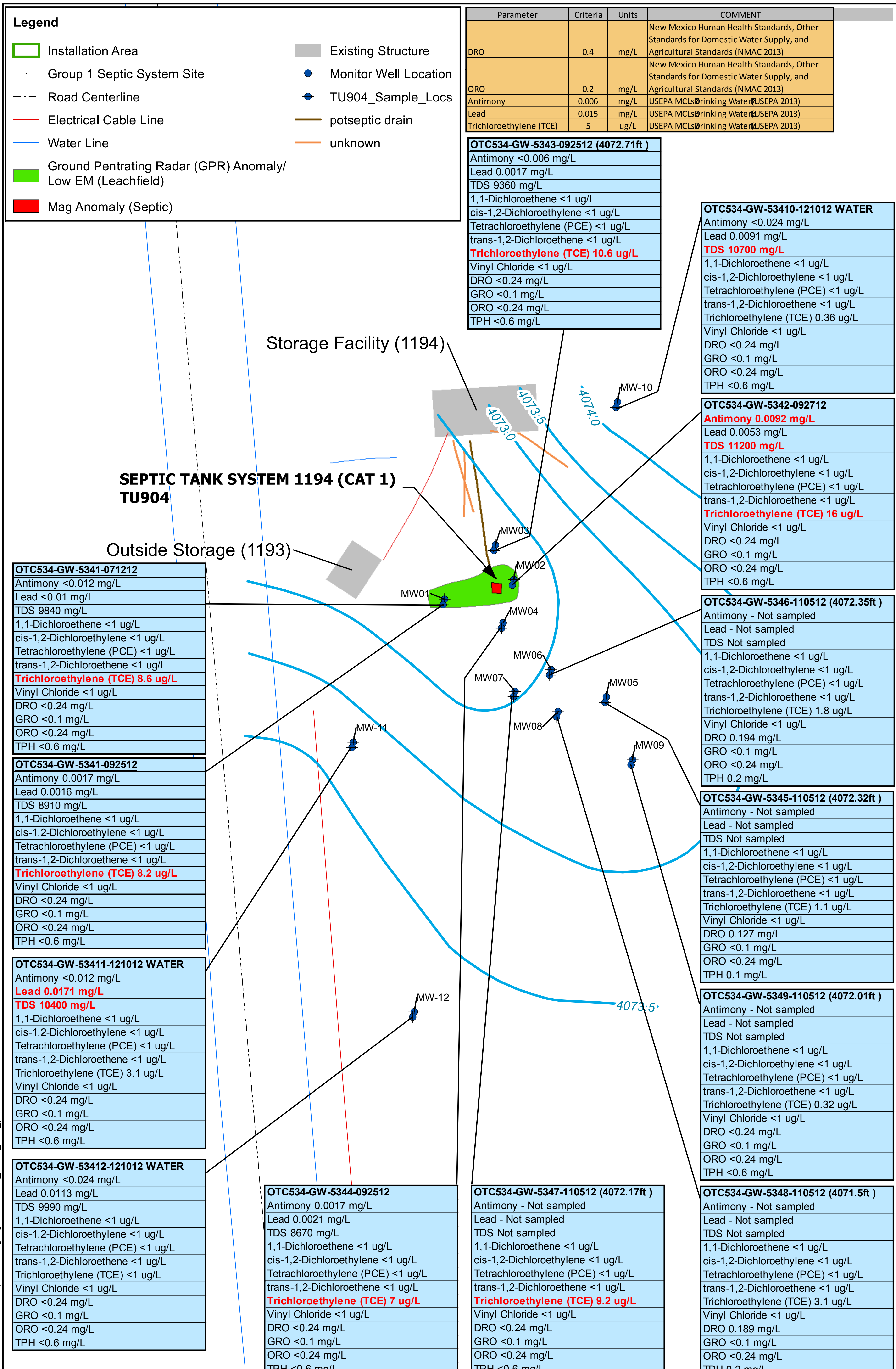
Figure ___

Building 1194
TU904 Soil Data

Holloman Air Force Base

USAF June 10, 2014

E:\GIS\Projects\AZNM_PBR_HollomanAFB\Site Maps\Planning Figures\TU904_Soil_data_post.mxd



Parameter	Criteria	Units	COMMENT
DRO	0.4	mg/L	New Mexico Human Health Standards, Other Standards for Domestic Water Supply, and Agricultural Standards (NMAC 2013)
ORO	0.2	mg/L	New Mexico Human Health Standards, Other Standards for Domestic Water Supply, and Agricultural Standards (NMAC 2013)
Antimony	0.006	mg/L	USEPA MCLs Drinking Water (USEPA 2013)
Lead	0.015	mg/L	USEPA MCLs Drinking Water (USEPA 2013)
Trichloroethylene (TCE)	5	ug/L	USEPA MCLs Drinking Water (USEPA 2013)

Note:

Sources:
HAFB, CBI, ULS Services Corp.

Coordinate System:
NAD 1983 State Plane,
New Mexico Central Zone, Feet

URS

Designed	JDM
Drawn	LED
Checked	DAE
Peer Review	DAE
Project Manager	BGP
Project Number	23446543

Figure ___

Building 1194
TU904 Water Data

Holloman Air Force Base
USAF
June 16, 2014

E:\GIS\Projects\AZNM_PBR_HollomanAFB\Site Maps\Planning Figures\TU904_Water_data_post.mxd