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 Birmingham AL 35205

DATE MAY 3, 2005	JOB NO 9030024.05.05.01
ATTENTION MR. JOHN HYMER	
RE SS-61 (AOC 1001) HOLLOMAN AFB, NEW MEXICO	

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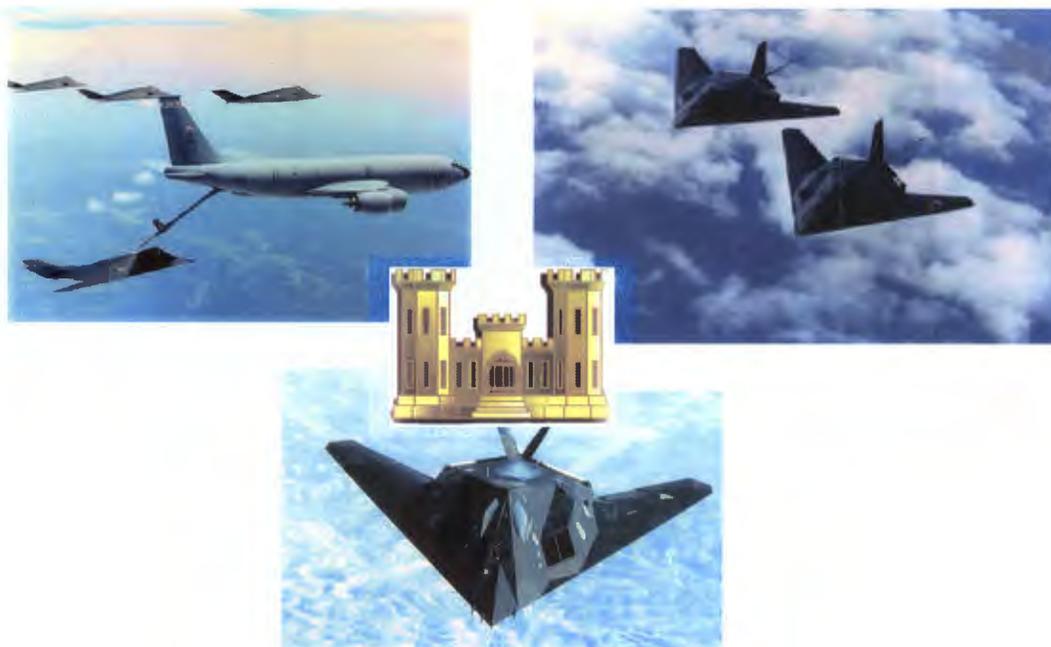
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ADDITIONAL GROUNDWATER MONITORING WORK PLAN FOR SS-61 (AOC 1001)



**Holloman Air Force Base
New Mexico**

May 2005

Contract No.: DACA45-02-D-0012

Task Order No.: 5

Bhate Project No.: 9030024.05.05.01



**Headquarters, Air Combat Command
Langley Air Force Base, Virginia**



**49 CES/CEV
Holloman Air Force Base, New Mexico**

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**ADDITIONAL GROUNDWATER MONITORING
WORK PLAN FOR
SS-61 (AOC 1001)
HOLLOMAN AFB, NEW MEXICO**

Prepared For

**U.S. Army Corp of Engineers
Omaha, Nebraska**

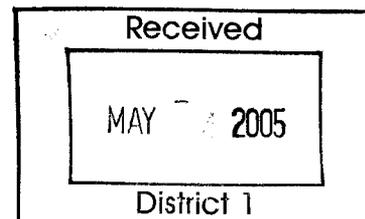
**CONTRACT NO. DACA45-02-D-0012
TASK ORDER NO. 5**

Prepared By

**Bhate Environmental Associates, Inc.
1608 13th Avenue South
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Birmingham, Alabama**

Bhate Project Number: 9030024.05.05.01

May 2005



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ADDITIONAL GROUNDWATER MONITORING
WORK PLAN FOR
SS-61 (AOC 1001)
HOLLOMAN AFB, NEW MEXICO

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Appendix A Letter from the New Mexico Environment Department, dated February 4, 2005

Appendix B Summary of Previous Investigations at SS-61

Foster Wheeler Environmental Corporation, *Final Phase II Remedial Investigation Report for SS-61, Holloman Air Force Base, New Mexico, December 2000.*

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Appendix C Lithologic Logs and Well Construction Diagrams

Foster Wheeler Environmental Corporation, *Final Remedial Investigation Report for Spill Site 61, Holloman Air Force Base, New Mexico*, August 1999.

Foster Wheeler Environmental Corporation, *Final Phase II Remedial Investigation Report for SS-61, Holloman Air Force Base, New Mexico*, December 2000.

Appendix D Quality Assurance Project Plan Addendum for SS-61

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ACRONYMS AND ABBREVIATIONS

AAF	Army Air Field
AOC	Area of Concern
ANSI	American National Standards Institute
AST	Aboveground storage tank
bgs	Below ground surface
Bhate	Bhate Environmental Associates, Inc.
BTEX	Benzene, toluene, ethylbenzene, xylenes
CIH	Certified Industrial Hygienist
COC	Chain-of-custody
DA	Drainage Area
EDC	1,2-Dichloroethane
EDB	1,2-Dibromoethane
E _h	Oxidation reduction potential
EPA	U.S. Environmental Protection Agency
ERPIMS	Environmental Restoration Program Information Management System
°F	Degrees Fahrenheit
ft	Feet or foot
ft/ft	Feet per foot
HAFB	Holloman Air Force Base
HASP	Health and Safety Plan
IDW	Investigation derived waste
IRA	Interim Remedial Action
IRP	Installation Restoration Program
LF	Landfill
mg/L	Milligrams per liter
MS/MSD	Matrix spike/matrix spike duplicate
NAP	Natural attenuation parameter
NFA	No Further Action
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
OSHA	Occupational Safety and Health Administration
OWS	Oil Water Separator
PG	Professional Geologist
PPE	Personal Protective Equipment
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI	Remedial Investigation
SOP	Standard Operating Procedure

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ACRONYMS AND ABBREVIATIONS (continued)

SS	Spill Site
SVOC	Semi-volatile organic compounds
SWMU	Solid Waste Management Unit
SWPPP	Storm Water Pollution Prevention Plan
TCE	Trichloroethene
TDS	Total dissolved solids
TNT	2,4,6-Trinitrotoluene
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TRPH	Total recoverable petroleum hydrocarbons
USACE	United States Army Corps of Engineers
VOC	Volatile organic compounds
WRCC	Western Regional Climate Center
WSMR	White Sands Missile Range

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1 INTRODUCTION

Bhate Environmental Associates, Inc., (Bhate) has been retained by the U.S. Army Corps of Engineers (USACE), under contract DACA45-02-D-0012, Task Order No. 5, to prepare an *Additional Groundwater Monitoring Work Plan for SS-61 (AOC 1001)* located at Holloman Air Force Base (HAFB), New Mexico. The objectives of this Work Plan are outlined in correspondence dated February 4, 2005, from the New Mexico Environment Department (NMED), included as Appendix A, and are summarized as follows:

1. A groundwater sampling program must be established. Groundwater samples must be collected from a sufficient number of wells throughout the plume on at least a semi-annual basis.
2. Groundwater samples shall be analyzed for volatile organic compounds (VOCs) [including benzene, toluene, ethylbenzene, and xylenes (BTEX); naphthalene; 1,2-dichloroethane (EDC); and 1,2-dibromoethane (EDB)], semi-volatile organic compounds (SVOCs), and metals [including lead]. Samples from two wells, MW-02 and MW-05, shall also be analyzed for trichloroethene (TCE).
3. Groundwater elevations should be collected from all Spill Site 61 (SS-61) and Landfill 29 (LF-29) wells for the development of groundwater potentiometric surface maps.

In addition, the February 4, 2005, letter from NMED requested two additional items that will be addressed separately from this Work Plan. First, that the natural attenuation data and discussion related to the approved *Feasibility Study Work Plan Spill Site 61* submitted by Bhate and dated November 2003, as presented in the *Interim Final Focused Feasibility Study Spill Site 61*, Bhate, September 2004, be recompiled and the two documents submitted separately. This request will be completed under separate cover. Second, NMED requested an additional investigation of the TCE plume, located to the east and southeast of MW-02. This TCE plume will be designated as a separate Area of Concern (AOC), be set up as an additional site, and receive separate funding. Therefore, additional wells and the TCE plume will not be addressed in this Work Plan.

This Work Plan will serve as the primary working document for the groundwater monitoring at SS-61, and provide the relevant site specific information as it pertains to the requirements as outlined in aforementioned correspondence. The primary objective of this Work Plan is to review available information and to collect groundwater data to fulfill the requirements identified by NMED. The ultimate objective is to achieve approval for site closure from NMED.

This document has been prepared to provide relevant information on the geologic, hydrologic, and other environmental conditions for HAFB and at the site. Information is provided for the entire Base and its surrounding environ as well as SS-61, specifically. Likewise, the procedures encompassing the sampling and waste management are presented.

1.1 HAFB Site Description

HAFB is located in southeastern New Mexico in Otero County, New Mexico, approximately 100 miles north-northeast of El Paso, Texas and six miles west of Alamogordo, New Mexico (Figure 1). HAFB was first established in 1942 as Alamogordo Army Air Field (AAF). From 1942 through 1945, Alamogordo AAF served as the training grounds for over 20 different flight groups, flying primarily B-17s, B-24s, and B-29s. After World War II, most operations had ceased at the base. In 1947, Air Material Command announced the air field would be its primary site for the testing and development of un-manned aircraft, guided missiles, and other research programs. On January 13, 1948, the Alamogordo installation was renamed Holloman Air Force Base, in honor of the late Col. George V. Holloman; a pioneer in guided missile research. In 1968, the 49th Tactical Fighter Wing arrived at HAFB and has remained since. Today, HAFB also serves as the training center for the German Air Force's Tactical Training Center.

1.2 SS-61 Site Description

SS-61 is located in an industrial area in the central part of HAFB. The site is located north of two hangars, Buildings 1079 and 1080, and is divided into two study sections by DeZonia Drive (Figure 2). The northern section of the site consists of a concrete pad, located east of Building 1001, which may have been used for dispensing fuel. North of this pad was a debris pile that covered approximately 1,500 square feet. The pile contained concrete pieces, asphalt rubble, and some piping. Northeast of the concrete pad and debris pile were two aboveground storage tanks (ASTs) that had been removed. The ground surface rises approximately 10 feet toward the former AST area. A partial outline of the containment berm in the area of the northern AST is still visible. The circular berm is approximately 180 feet in diameter, rising approximately 8 feet above grade, and approximately 10 feet wide at the base. No remnant of a berm is visible for the southern AST. A 12-inch diameter steel pipe emerges from the ground at a 45° angle, oriented north to south. The piping was traced to an apparent T-junction located 450 feet south of the AST area. A geophysical survey, conducted during the Phase I Remedial Investigation (RI), traced one branch of the piping west from the junction to an area directly north of the concrete pad to two concrete valving vaults (Foster Wheeler and Groundwater Technology Government Services, December 1997). The other piping branch runs south toward the hangar area.

The southern portion of SS-61, south of DeZonia Drive, consists of two hangars, Building 1079 and Building 1080. South of the hangars is the tarmac. The eastern hangar, Building 1080, is the newer of the two buildings. The western hangar, Building 1079, dates to the 1940s. A concrete sump is located outside the northwest entrance to the hangar. A shallow surface depression, approximately 100 feet (ft) x 70 ft by 3 ft deep, is located in the north parking lot to Building 1079. It was used as a stormwater collection basin. The piping traced from the former ASTs is located underneath Building 1087, east of Building 1079.

1.3 Summary of Previous Investigations

In 1994, during a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) of Solid Waste Management Unit (SWMU) 104, the Former Army Landfill used for the disposal of waste munitions, contamination was detected in samples collected from monitoring well MW-29-05 (Foster Wheeler Environmental Corporation (Foster Wheeler) and Radian Corporation (Radian), July 1994). VOCs detected in the groundwater included benzene, EDC, 2,4,6-trinitrotoluene (TNT), and 1,3,5-trinitrobenzene. Water levels collected from SWMU 104, also designated as Installation Restoration Program (IRP) Site LF-29, indicated a hydraulic gradient to the north-northwest. Monitoring well MW-29-05 was determined as being upgradient of the former landfill; therefore, the source of the contamination was located south-southeast of the former landfill. Based on the results of MW-29-05, a No Further Action (NFA) status was requested for SWMU 104. The area south-southeast of IRP Site LF-29 was designated AOC 1001, due to its location in the vicinity of Building 1001.

1.3.1 Phase I RI

A Phase I and Phase II RFI were conducted at AOC 1001 in 1996 and 1997 (Foster Wheeler and Groundwater Technology Government Services, December 1997). Soil vapor samples, soil samples, and groundwater samples were collected across the area. At this time, results from the investigations designated this area as SS-61.

A Phase I RI was conducted at SS-61 in 1999 (Foster Wheeler, August 1999). The investigation area included two former ASTs, underground piping, debris pile, and a concrete pad that may have been a fuel dispensing area. These are located north of DeZonia Drive. Information of the area is limited because part of the area was used for classified operations conducted by the Strategic Air Command. Aerial photographs indicated that operations at the concrete pad and ASTs began after 1945 and had ended by 1972. Soil samples collected during the Phase I RI indicated the presence of total recoverable petroleum hydrocarbons (TRPH), BTEX, and two explosive constituents (tetryl and trinitrotoluene) immediately above the water table, in the capillary fringe, at the northeast corner of the concrete pad. Groundwater samples collected indicated elevated levels of BTEX, north of the concrete pad, with lower levels of BTEX, EDC, TCE, and explosives to the south and east of the pad. Free product was not observed in the wells sampled. The Phase I RI confirmed that past releases in the vicinity of the concrete pad resulted in elevated concentrations of groundwater contaminants in a plume that extends north toward SWMU 104. Soil sampling showed that there was no continuing source of groundwater contamination. The risk assessment conducted indicated that there was no unacceptable risk to either human or ecological receptors; therefore, the Phase I RI concluded that no remediation was required in the northern section of SS-61.

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1.3.2 Phase II RI

The Phase II RI was conducted in 2000 and investigated the southern portion of SS-61, in the vicinity of two hangars, Building 1079 and 1080 (Foster Wheeler, December 2000). Phase II investigated the area of the two hangars, the outlying areas around the two hangars, an area southeast of Building 1080 where suspected fuel spills occurred during past operations, and in the former stormwater overflow basin north of Building 1079, directly south and upgradient of the concrete pad. Soil sampling results from Phase II indicated the same as results from the Phase I study. There did not appear to be a continuing source of groundwater contamination. An elevated level of TRPH was detected in one soil sample, collected from 1 foot to 2 feet below ground surface (bgs), at the southwest corner of Building 1079. Groundwater sampling results indicated the presence of low-level cross-gradient and upgradient contamination that the Phase II RI report attributed to multiple sources in the vicinity of Building 1079. It was reported that Building 1079 had an oil/water separator (OWS) formerly located at the southeast corner of the building. BTEX constituents were not as prevalent in the samples collected in the southern portion of SS-61; however, low concentrations of chloroform, EDC, and TCE were detected in samples collected from the eastern and western boundaries. The Phase II report attributed these solvents to likely released cleaning fluids used in aircraft maintenance in the area. The Phase II RI presented a discussion of the extent of contamination. For reference purposes, Sections 1.2, 5.0, and the data summary tables of the Phase II RI (Foster Wheeler, December 2000) are attached as Appendix B. Based in the results, no significant risk to human or ecological receptors was found and the Phase II RI recommended NFA.

1.4 Physiography

HAFB is located within the Sacramento Mountains Physiographic Province on the western edge of the Sacramento Mountains (Figure 3). The region is characterized by high tablelands with rolling summit plains; cuesta-formed mountains dipping eastward and of west-facing escarpments with the wide bracketed basin forming the basin and range complex. HAFB is approximately 59,600 acres in area, and is located at a mean elevation of 4,093 feet above sea level. The Base is located in the Tularosa Sub-basin which is part of the Central Closed Basins. The San Andreas Mountains bound the basin to the west (about 30 miles) with the Sacramento Mountains approximately 10 miles to the east. At its widest, the basin is about 60 miles east to west and stretches approximately 150 miles north to south.

SS-61 is located north of the main base area straddling DeZonia Drive. Except for a former stormwater retention pond located north of Building 1079, the surface of SS-61 slopes gently to the southwest. The primary area of the northern portion of SS-61 is a sparsely vegetated area. The southern portion of the site is primarily paved.

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1.5 Surface Water

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

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

SS-61 is located within Drainage Area 12 (DA-012), as described in the *Draft Storm Water Pollution Prevention Plan* (SWPPP), prepared by CH₂M Hill and dated September 2003. Storm water flow in this 79-acre DA is generally to the southwest (Bhate, January 2005).

1.6 Groundwater

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

At SS-61, the hydraulic gradient varies from approximately 0.0071 feet per foot (ft/ft) to 0.002 ft/ft. Localized groundwater flow is to the west-northwest (Figures 4 and 5), which is different than the general flow direction for HAFB. Groundwater was encountered at SS-61 during

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drilling activities conducted during the RI and Phase II RI at depths ranging from 11 to 30 feet bgs. Well completion logs from the RI and Phase II RI are included in Appendix C.

The New Mexico Water Quality Control Commission (NMWQCC) Regulations are published groundwater quality standards for aquifers with total dissolved solids (TDS) concentrations less than or equal to 10,000 milligrams per liter (mg/L) [20.6.2.3101 New Mexico Administrative Code (NMAC)]. TDS concentrations in samples collected in January 2005 from MW-01, MW-03, and MW-06 were above 10,000 mg/L; however, concentrations in samples collected from MW-04 and MW-08 had TDS concentrations below 10,000 mg/L. These samples were collected under the Feasibility Study Work Plan (Bhate, November 2003b).

1.7 Climate

As a whole, New Mexico has a mild, arid to semi-arid continental climate characterized by light precipitation totals, abundant sunshine, relatively low humidity, and relatively large annual and diurnal temperature range (Western Regional Climate Center (WRCC), 2003). The climate of the Central Closed Basins varies with elevation. The Base is found in the low areas and is characterized by warm temperatures and dry air. Daytime temperatures often exceed 100 degrees Fahrenheit (°F) in the summer months and are in the middle 50s in the winter. A preponderance of clear skies and relatively low humidity permits rapid night time cooling resulting in average diurnal temperature ranges of 25 to 35°F. Potential evapotranspiration, at 67 inches per year, significantly exceeds annual precipitation, usually less than 10 inches (Foster Wheeler/Radian, 1995). The very low rainfall amounts resulting in the arid conditions, which with the topographically induced wind patterns combining with the sparse vegetation, tend to cause localized “dust devils”. Much of the precipitation falls during the mid-summer monsoonal period (July and August) as brief, yet frequent, intense thunderstorms culminating to 30 – 40% of the annual total rainfall.

1.8 Geology

The sedimentary rocks which make up the adjacent mountain ranges are between 500 and 250 million years old (White Sands Missile Range (WSMR), 2003). During the period when the area was submerged under the shallow intra-continental sea, the layers of limestone, shale, gypsum, and sandstone were deposited. In time, these layers were pushed upward through various tectonic forces forming a large bulge on the surface. Approximately 10 million years ago the center began to subside resulting in a vertical drop of thousands of feet leaving the edges still standing (the present day Sacramento and San Andreas mountain ranges). In the millions of years following, rainfall, snowmelt, and wind eroded the mountain sediments depositing them in the valley (i.e. Tularosa Basin). Water carrying eroded gypsum, gravel, and other matter continues to flow into the basin.

As the Tularosa Basin is a bolson, 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 as alluvial, eolian, and lacustrine deposits. The alluvial fan deposits are laterally discontinuous units of interbedded sand, silt, and clay while the eolian deposits consist primarily of gypsum sands. The eolian and alluvial deposits are usually indistinguishable due to the reworking of the alluvial sediment by eolian processes. The playa, or lacustrine deposits, consist of clay containing gypsum and are contiguous with the alluvial fan and eolian deposits throughout HAFB. There has been the identification of stiff caliche layers, varying in thickness, at different areas of the Base. At the site, soils are predominantly silty sands and interbedded clays.

Based on review of boring logs from previous investigations, the SS-61 area is primarily underlain by silts, silty sands, silty clays, and clays with gypsum present. It should be noted that previous subsurface investigations conducted in the vicinity of SS-61 reported a caliche layer at depths ranging from approximately 11 to 13 feet below ground surface (bgs). Soil boring logs and well construction diagrams from the RI (Foster Wheeler, August 1999) and Phase II RI (Foster Wheeler, December 2000) are included in Appendix C.

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2 GROUNDWATER MONITORING ACTIVITIES

The objective of the groundwater monitoring activities at SS-61 is to fill data gaps identified by NMED in correspondence dated February 4, 2005 (Appendix A). Specifically, groundwater samples will be collected from selected wells on a semi-annual basis. The groundwater monitoring will be conducted in accordance with State of New Mexico requirements. Upon conclusion of the monitoring activities, a report will be developed in accordance with Section 3 of this Work Plan.

2.1 Groundwater Sampling

Eleven existing monitoring wells will be sampled under this Work Plan. These wells include MW-02, MW-03, MW-05, MW-06, MW-08, MW-09, MW-29-02, MW-29-04, MW-20-05, and MW-29-08 and are shown on Figure 5. Monitoring well MW-04 was not on the NMED list, but will be added to the monitoring program. The monitoring wells will be sampled twice per year for a period of 2 years. A total of 13 groundwater samples, including two field duplicate samples and a matrix spike/matrix spike duplicate (MS/MSD), will be submitted to the laboratory for analysis from each sampling event. All samples for VOC analysis will require a trip blank. The samples will be placed on ice and shipped under strict chain-of-custody to Associated Labs in Orange, California.

2.2 Groundwater Elevations

During the sampling of monitoring wells under this Work Plan, groundwater elevations will be measured. Elevations will be measured for those wells listed in Section 2.1, and also from monitoring wells MW-01, MW-07, MW-10, MW-12, MW-29-01, MW-29-03, MW-29-06, and MW-29-07.

2.3 Laboratory Analyses

Each groundwater sample (including the field duplicates) will be analyzed for their respective analytes in accordance with Table 2-1. Groundwater samples will be analyzed for VOCs by Environmental Protection Agency (EPA) Method 8260B, SVOCs by EPA Method 8270C, and RCRA metals (arsenic, barium, chromium, cadmium, lead, mercury, selenium, and silver) by EPA Method 6010B, with the exception of mercury which will be analyzed by EPA Method 7470A. Field filtration will be performed for the fraction of groundwater samples submitted for metals analysis.

Groundwater samples will additionally be analyzed for TDS by Method 160.1 and natural attenuation parameters (NAPs). Those parameters that are analyzed by the laboratory are also listed in Table 2-1.

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Table 2-1. Sample Analytes and Methodologies

Parameters	Method
VOCs	EPA Method 8260B
SVOCs	EPA Method 8270C
RCRA Metals	EPA Methods 6010B/7470A
Total Dissolved Solids	EPA Method 160.1
Methane, ethene, and ethane	EPA Method RSK 175
Chloride	EPA Method 300.0
Total Organic Carbon (TOC)	EPA Method 9060
Alkalinity	EPA Method 310.1

Appendix D details the method detection limits by method for chemical constituents indicated for SS-61. Table 2-2 is a matrix indicating the analytical requirements for SS-61.

Table 2-2. Summary of Analytical Parameters for SS-61

Analytical Constituents	Water Samples
Volatile Organic Compounds EPA Method 8260B	15 samples (including 2 duplicates, 2 Trip blanks and 1 MS/MSD)
Semi-Volatile Organic Compounds EPA Method 8270C	13 samples (including 2 duplicates and 1 MS/MSD)
RCRA Metals EPA Methods 6010B and 7470A (mercury)	13 samples (including 2 duplicates and 1 MS/MSD)
Total Dissolved Solids EPA Method 160.1	13 samples (including 2 duplicates and 1 MS/MSD)
Methane, ethane, and ethane EPA Method RSK 175	12 samples (including 2 duplicates)
Chloride EPA Method 300.0	13 samples (including 2 duplicates and 1 MS/MSD)
Total Organic Carbon EPA Method 9060	13 samples (including 2 duplicates and 1 MS/MSD)
Alkalinity EPA Method 310.1	13 samples (including 2 duplicates and 1 MS/MSD)

2.4 Field Analyses

In addition to the laboratory analyses, some NAPs will be field analyzed. Along with pH, temperature, oxidation reduction potential (E_h), dissolved oxygen, and conductivity, the parameters listed in Table 2-3 will be measured and recorded.

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Table 2-3. Field Parameters and Methodologies

Parameters	Method
Nitrate	HACH Method 8039
Ferrous Iron	HACH Method 8146
Total Iron	HACH Method 8008
Sulfate	HACH Method 8051

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3 GROUNDWATER MONITORING REPORT

A summary report of the work conducted under this Work Plan for SS-61 will be submitted that will summarize the field activities, sample analyses, and other pertinent information.

The report will present a discussion of field activities and summarize field measurements. Analytical data will be presented in discussion, table, and figure format. A potentiometric surface map indicating the direction of groundwater flow will also be included.

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4 HEALTH AND SAFETY REQUIREMENTS

Health and safety practices during the monitoring activities at SS-61 will adhere to the *Basewide Health and Safety Plan* (HASP) (Bhate, December 2003). It is anticipated that no greater than modified Level D personal protective equipment (PPE) will be required to complete the monitoring activities. This includes: Occupational Safety and Health Administration (OSHA) approved safety shoes, American National Standards Institute (ANSI) approved safety glasses (Z87.1) and hard hat (Z89.1-1997: Type I), sleeved shirt and long pants, and as required, hearing protection, leather work gloves, and/or nitrile gloves during sampling.

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5 DECONTAMINATION AND IDW MANAGEMENT

Investigation derived waste (IDW) generated by the activities of this monitoring program (Table 5-1) will be managed and characterized according to the following guidelines. Liquid wastes, such as decontamination rinses, are anticipated to be non-hazardous and as such, can be disposed of through the Base wastewater treatment facility. PPE and other site non-hazardous debris/waste shall be disposed in standard trash receptacles.

Table 5-1. Proposed Waste Streams for SS-61

Activity	Waste Stream	
	PPE	Water
Equipment Decontamination	X	X
Purged Groundwater	X	X

5.1 General Decontamination Procedures

All equipment, inclusive of small hand and sampling tools and downhole tooling will require decontamination. Small items can be decontaminated in five-gallon buckets and the like at the site (Bhate, November 2003a). The larger equipment will be decontaminated at the subcontractor staging area using high temperature – high pressure water cleaner and scrub brushes.

5.2 PPE

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

5.3 Hazardous and Special Waste

There is not expected to be any hazardous or special waste generated during the completion of this project.

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6 QAPP ADDENDUM

The laboratory performing the groundwater sample analysis will follow the *Final Quality Assurance Project Plan (QAPP) Addendum* provided as Appendix D to this Work Plan.

6.1 Sample Identification

Each environmental sample will be identified on the sample label and chain-of-custody (COC) records, regardless of type. USACE duplicates will be paired with another random sample and will be blind samples. The duplicate samples will appear in sequence with the regular samples. The identifier nomenclature will adhere to the procedures and guidelines established in the *Basewide Quality Assurance Project Plan* (Bhate, November 2003a).

6.2 Standard Operating Procedures

Applicable Standard Operating Procedures (SOPs) for completing this sampling are located in Appendix A of the *Basewide QAPP* (Bhate, November 2003a).

6.3 Sample Documentation

Sample documentation, identification, and tracking will adhere to the prescribed methods found in the *Basewide QAPP* and/or its respective project specific addendum. All sampling activities will include documentation of significant activities, sampling activities, and sample identification information. At a minimum, field log books will be utilized to record dates and times, sampling protocols, project numbers, and sampler's name. Other pertinent information will include COC numbers and air-bill tracking number. COC forms will be completed and included with each sample shipment; one COC per cooler.

6.4 Data Reporting

Data obtained during the sample collection will be reported according to the *Basewide QAPP* and/or its respective project specific addendum. An Environmental Restoration Program Information Management System (ERPIMS) submittal is not required for this project.

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7 ORGANIZATION

During the monitoring activities at SS-61, Mr. John Hymer will serve as the Bhatte Site Manager overseeing and directing all sampling activities. Mr. Hymer will also provide on-site management of any sub-contractor for the project. Mr. Frank Gardner is the Bhatte Program Manager and will ensure required project documents, permits, contractual agreements and other program tasks are completed. Key project personnel and their responsibilities are listed in Table 7-1.

Table 7-1. Key Personnel and Responsibilities

Name	Project Title/ Assigned Role	Phone Numbers
Mr. John Hymer	Field Team Leader/SHSO	Work: (505) 679-2100
To Be Determined	Field Samplers	To Be Determined
Mr. John Hymer	First Aid Personnel (Note-all onsite personnel are required to be trained in CPR and first aid)	Work: (505) 679-2100
Other Project Personnel		
Mr. Frank Gardner, PG	Bhatte Program Manager	Work: (970) 216-7819
Mr. Eric Lehnertz, CIH	Health and Safety Specialist	Work: (205) 918-4000
Mr. Michael D'Auben	Data Quality Control Analyst	Work: (205) 918-4000

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8 REFERENCES

Air Force Center for Environmental Excellence, March 1999. *Technical Protocol for Implementing Intrinsic Remediation with Long-Term Monitoring for Natural Attenuation for Fuel Contamination Dissolved in Groundwater.*

CH₂M Hill, September 2003. *Draft Storm Water Pollution Prevention Plan for Holloman Air Force Base, New Mexico.*

Bhate Environmental Associates, Inc., December 2003. *Basewide Health and Safety Plan, Holloman Air Force Base, New Mexico.*

Bhate Environmental Associates, November 2003a. *Basewide Quality Assurance Project Plan, Holloman Air Force Base, New Mexico.*

Bhate Environmental Associates, Inc., January 2005. *Draft Compliance Evaluation Report Annual Compliance Inspection Storm Water Multi-Sector General Permit for Industrial Activity, Holloman AFB, New Mexico.*

Bhate Environmental Associates, November 2003b. *Feasibility Study Work Plan Spill Site 61, Holloman Air Force Base, New Mexico.*

Bhate Environmental Associates, September 2004. *Interim Final Focused Feasibility Study Spill Site 61, Holloman Air Force Base, New Mexico.*

Foster Wheeler Environmental Corporation, March 1999. *Work Plan Addendum Field Sampling and Analysis Plan and Quality Assurance Plan for the Remedial Investigation of SS-61.*

Foster Wheeler Environmental Corporation, August 1999. *Final Remedial Investigation Report for Spill Site 61, Holloman Air Force Base, New Mexico.*

Foster Wheeler Environmental Corporation, December 2000. *Final Phase II Remedial Investigation Report for SS-61, Holloman Air Force Base, New Mexico.*

Foster Wheeler Environmental Corporation and Groundwater Technology Government Services, December 1997. *Phase I and Phase II RCRA Facility Investigation Report Site AOC-1001, Holloman AFB, New Mexico.*

Foster Wheeler Environmental Corporation and Radian Corporation, July 1994. *Phase I RCRA Facility Investigation Report, Table 2 Solid Waste Management Units, Holloman AFB, New Mexico.*

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**ADDITIONAL GROUNDWATER MONITORING
WORK PLAN FOR SS-61 (AOC 1001)**

**HOLLOMAN AFB,
NEW MEXICO**

Foster Wheeler Environmental Corporation and Radian Corporation, June 1995. *Draft Final Phase II RCRA Facility Investigation Report, Table 1 Solid Waste Management Units*, Holloman Air Force Base, New Mexico, Volume I.

HACH Company 1999, *DR/820-DR/850-DR/890 Datalogging Colorimeter Handbook*.

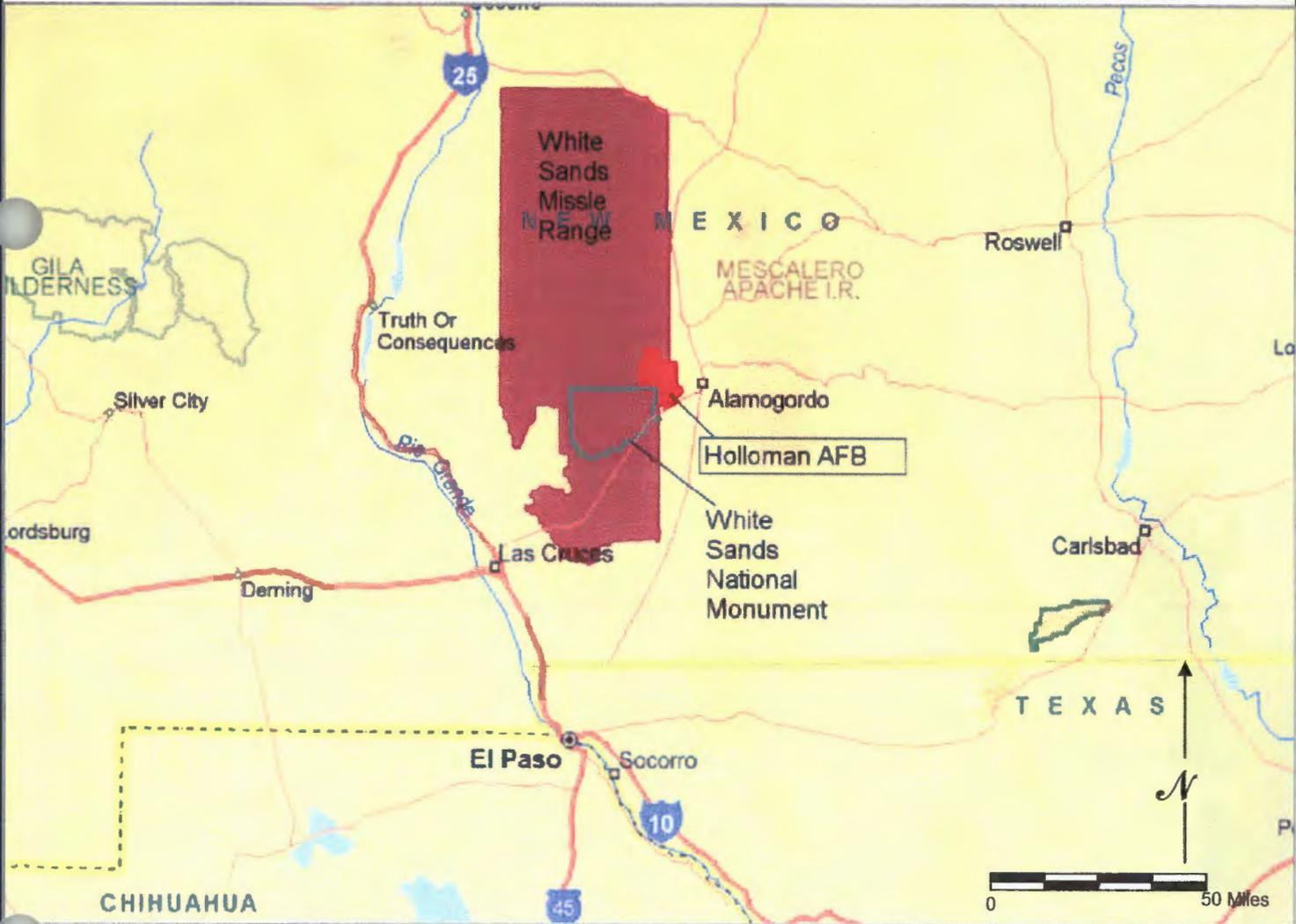
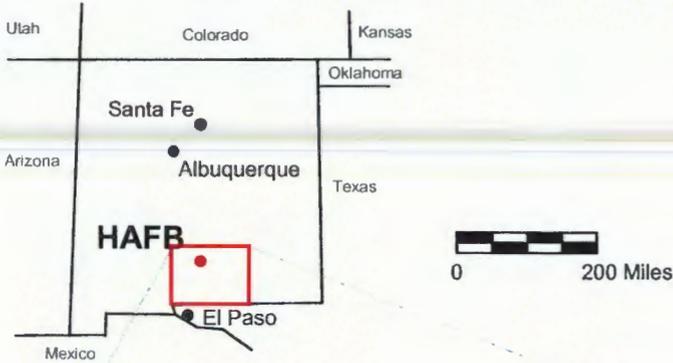
Western Regional Climate Center (WRCC), 2003. Desert Research Institute State Narrative Web Page, <http://www.wrcc.dri.edu/narratives/NEWMEXICO.htm>.

White Sands Missile Range (WSMR), 2003. Public Affairs Office, Site Informational Web Page, <http://www.wsmr.army.mil/paopage/Pages/WU%2360.htm>.

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FIGURES

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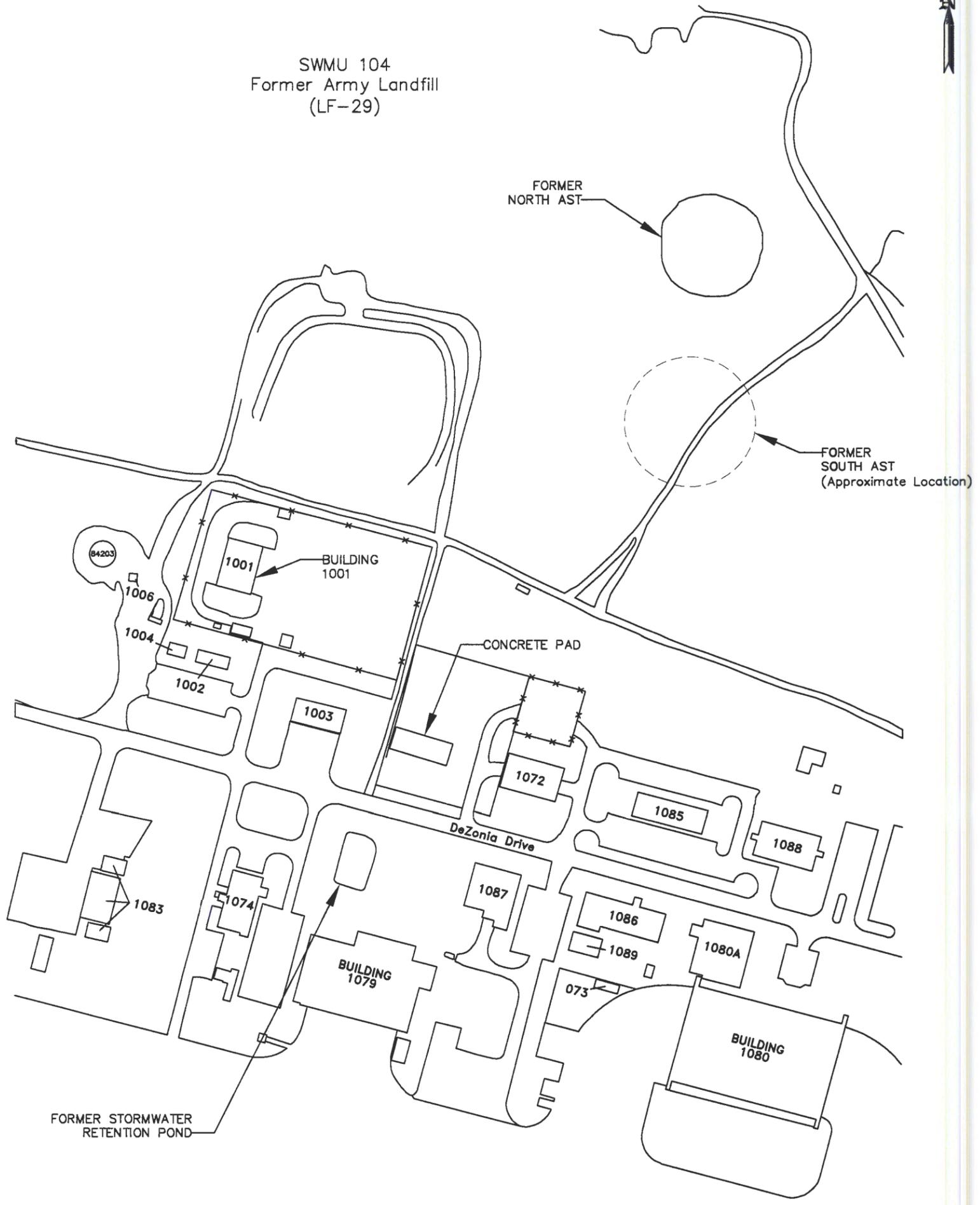
LOCATION MAP

PROJECT NO:	SCALE:	DATE:	DRAWN BY:
9030024	SHOWN	4/26/05	SSD/MRM
			FILE:
			9030024-01

Additional Groundwater Monitoring Work Plan SS-61
Holloman AFB, New Mexico

Figure 1

SWMU 104
Former Army Landfill
(LF-29)



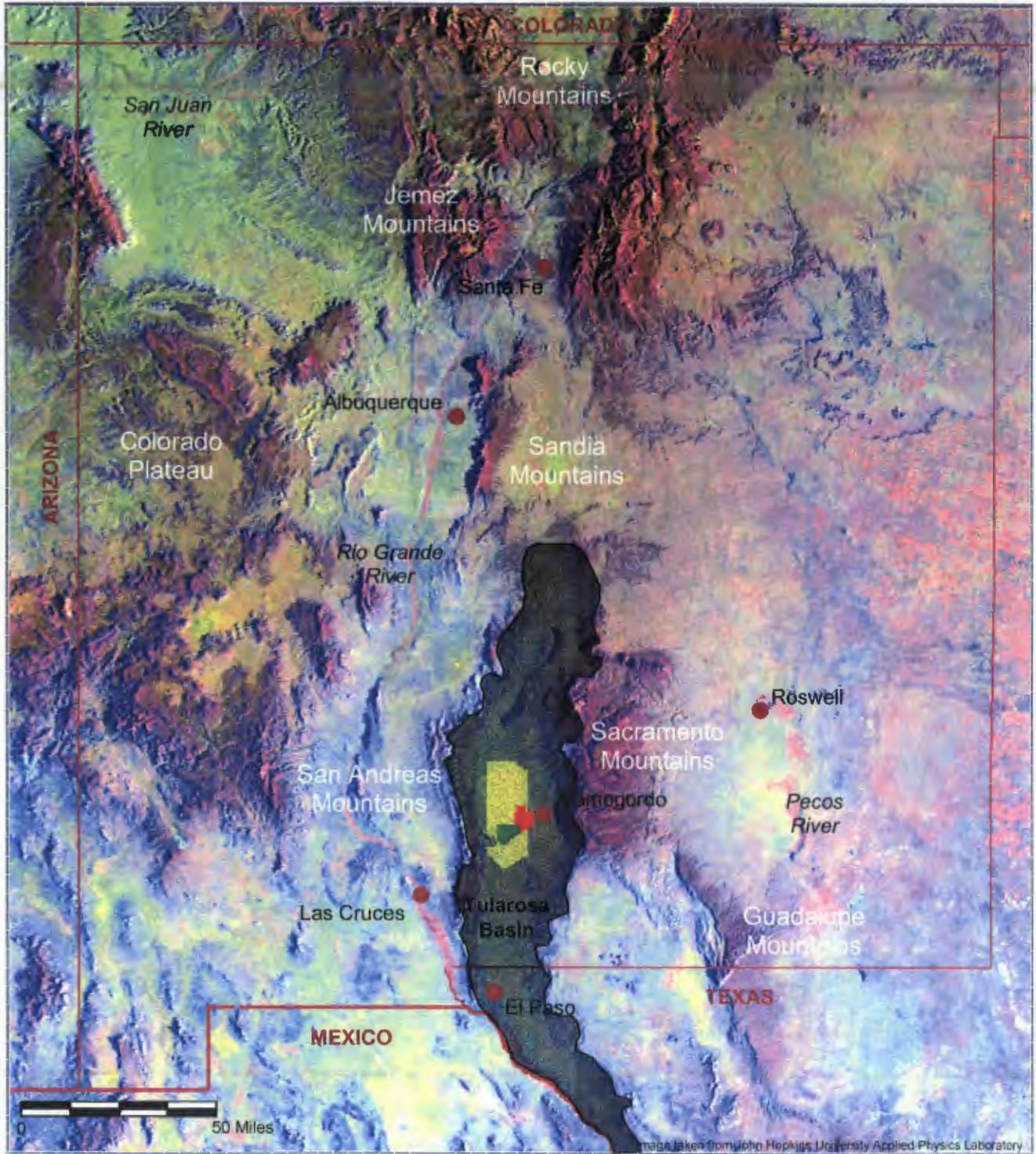
NOTES:
Information depicted was taken from Foster Wheeler Environmental Corporation drawing entitled, "Extent of Groundwater Contamination During the RI", dated September 17, 2000.



SS-61 SITE PLAN

ADDITIONAL GROUNDWATER MONITORING
WORK PLAN
SPILL SITE 61
U.S. ARMY CORPS OF ENGINEERS,
OMAHA DISTRICT

PROJECT NO. 9030024	SCALE 1"=200'	DATE 4/26/05	DRAWN BY: EP/CEP/MRM	HOLLOMAN AIR FORCE BASE, NEW MEXICO
			DRAWING NO: 9030024.05.01.02-R2	Figure 2



NORTH

-  Holloman AFB
-  White Sands National Monument
-  White Sands Missile Range

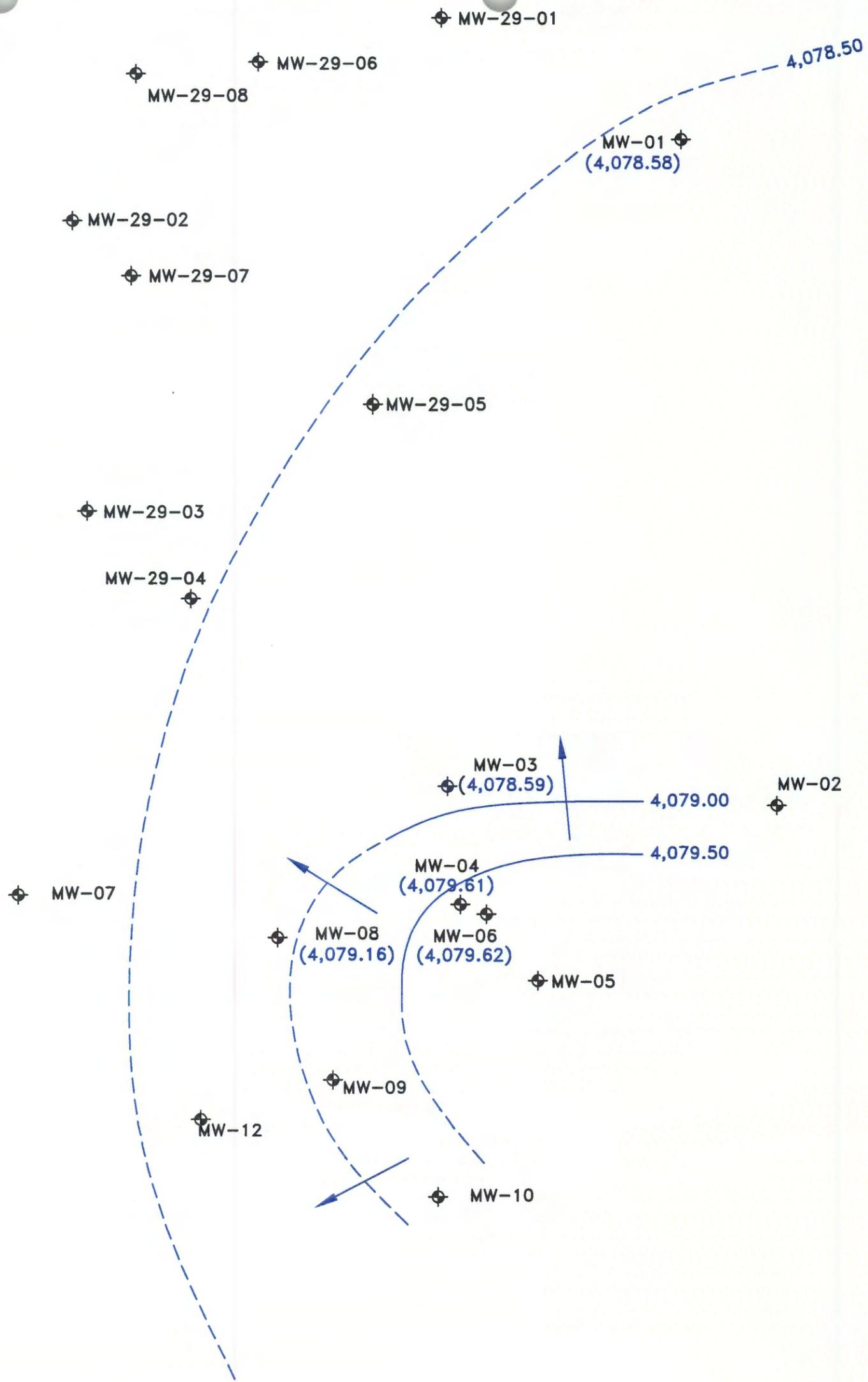


Physiographic Map

PROJECT NO:	SCALE:	DATE:	DRAWN BY:
9030024	SHOWN	4/26/05	SSD/MRM
			FILE:
			9030024-02

Additional Groundwater
Monitoring Work Plan SS-61
Holloman AFB, New Mexico

Figure 3



NOTES:

Information depicted was taken from Foster Wheeler Environmental Corporation drawing entitled, "Extent of Groundwater Contamination During the RI", dated September 17, 2000.

LEGEND:

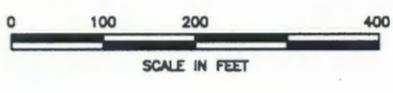
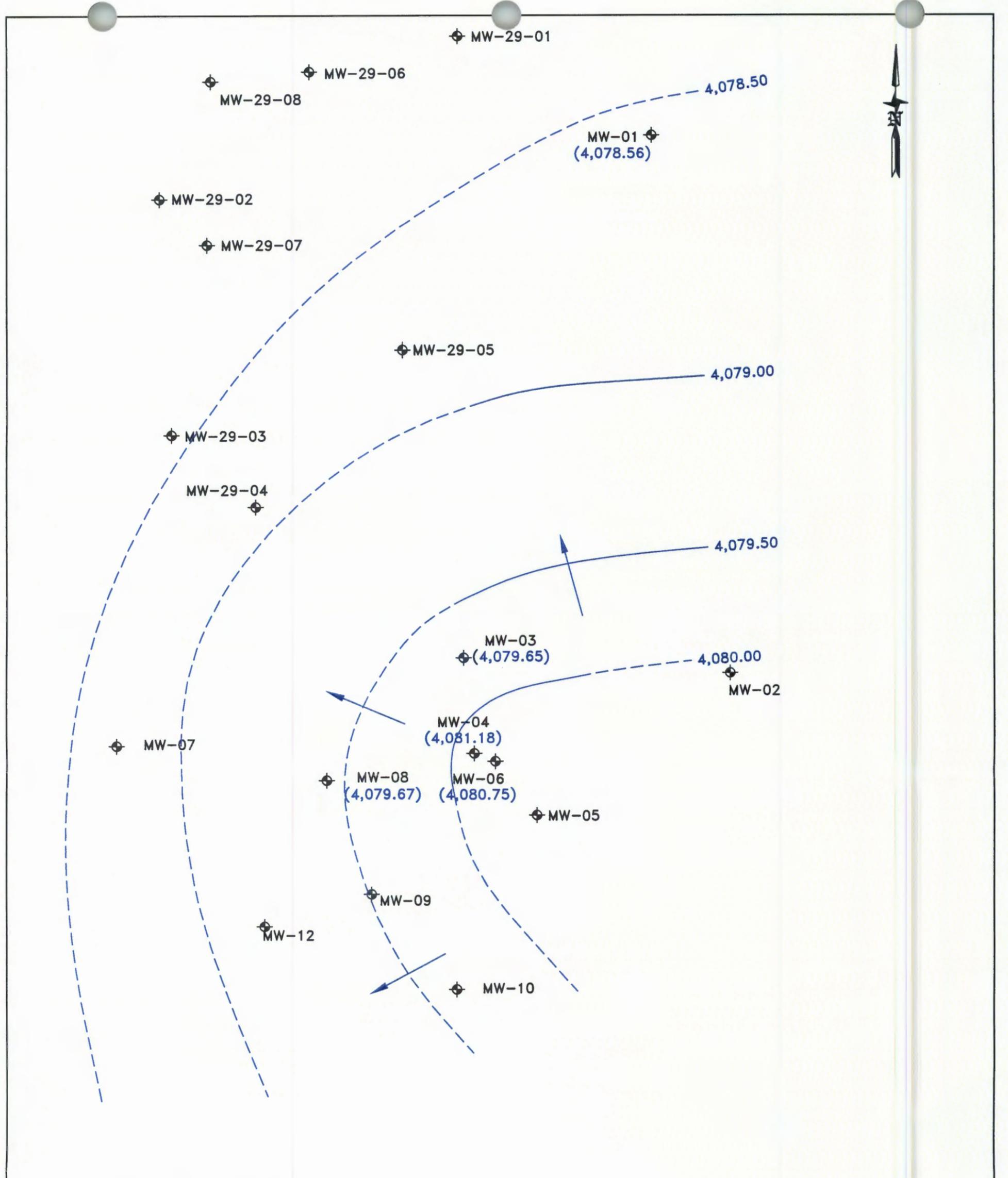
-  MONITORING WELL LOCATION
-  4,079.00 — GROUNDWATER POTENTIOMETRIC CONTOUR (DASHED WHERE INFERRED)
-  (4,079.62) GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL
-  —> DIRECTION OF GROUNDWATER FLOW



GROUNDWATER POTENTIOMETRIC SURFACE MAP (SEPTEMBER 2004)

ADDITIONAL GROUNDWATER MONITORING WORK PLAN
SPILL SITE 61
U.S. ARMY CORPS OF ENGINEERS,
OMAHA DISTRICT

PROJECT NO. 9030024	SCALE 1"=200'	DATE 4/19/05	DRAWN BY: EP/CEP/MRM	HOLLOMAN AIR FORCE BASE, NEW MEXICO
DRAWING NO: 9030024.05.01.02-R4				Figure 4



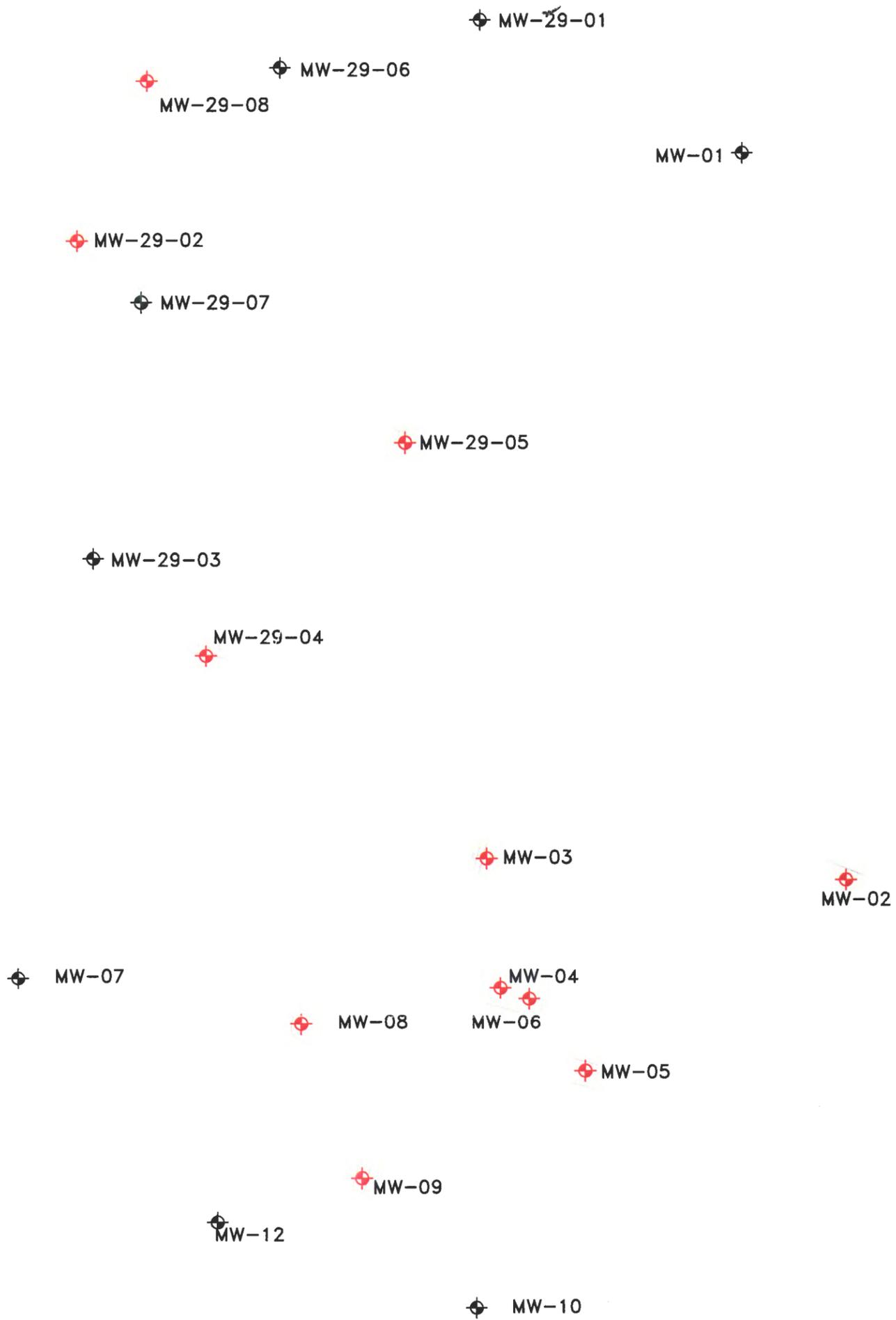
NOTES:
 Information depicted was taken from Foster Wheeler Environmental Corporation drawing entitled, "Extent of Groundwater Contamination During the RI", dated September 17, 2000.

- LEGEND:**
- MONITORING WELL LOCATION
 - 4,079.00 GROUNDWATER POTENTIOMETRIC CONTOUR (DASHED WHERE INFERRED)
 - (4,078.56) GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL
 - DIRECTION OF GROUNDWATER FLOW



GROUNDWATER POTENTIOMETRIC SURFACE MAP (JANUARY 2005)			
PROJECT NO.	SCALE	DATE	DRAWN BY:
9030024	1"=200'	4/19/05	EP/CEP/MRM
			DRAWING NO:
			9030024.05.01.02-R5

ADDITIONAL GROUNDWATER MONITORING WORK PLAN
 SPILL SITE 61
 U.S. ARMY CORPS OF ENGINEERS, OMAHA DISTRICT
 HOLLOWMAN AIR FORCE BASE, NEW MEXICO
 Figure 5



NOTES:

Information depicted was taken from Foster Wheeler Environmental Corporation drawing entitled, "Extent of Groundwater Contamination During the RI", dated September 17, 2000.



LEGEND:

-  MONITORING WELL LOCATION
-  MONITORING WELLS SAMPLED UNDER WORK PLAN



LOCATIONS OF WELLS INCLUDED
IN ADDITIONAL MONITORING

ADDITIONAL GROUNDWATER MONITORING
WORK PLAN
SPILL SITE 61
U.S. ARMY CORPS OF ENGINEERS,
OMAHA DISTRICT

PROJECT NO. 9030024	SCALE 1"=200'	DATE 4/18/05	DRAWN BY: EP/CEP/MRM	HOLLOMAN AIR FORCE BASE, NEW MEXICO
DRAWING NO: 9030024.05.01.02-R6				Figure 6

APPENDIX A

Letter from New Mexico Environment Department

Dated February 4, 2005

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BILL RICHARDSON
GOVERNOR

State of New Mexico
ENVIRONMENT DEPARTMENT

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



RON CURRY
SECRETARY

DEBRITH WATCHMAN-MOORE
DEPUTY SECRETARY

February 4, 2005

Ms. Debbie Hartell
Chief
Environmental Flight
49 CES/CEV
550 Tabosa Ave.
Holloman AFB, NM 88330-8458

**RE: ADDITIONAL GROUND WATER MONITORING REQUIRMENTS FOR SPILL
SITE 61 (AOC 1001)
HOLLOMAN AIR FORCE BASE
EPA ID# NM6572124422
HWB-HAFB-04-005**

Dear Ms. Hartell:

The New Mexico Environment Department (NMED) has performed additional review of the AOC 1001 site investigation history and the Interim Final, Focused Feasibility Study, Spill Site 61 dated September 2004. Based on this review the NMED has additional concerns and requirements regarding this site. NMED believes the additional requirements will prevent future delays for implementation of the anticipated corrective measures study (CMS).

The NMED had previously required continued ground water sampling on an annual basis as part of the NMED's March 2, 2001 correspondence on the review of the Final Phase II Remedial Investigation (RI) Report. This sampling has not been performed.

The NMED also approved a feasibility study work plan that was limited to the collection of additional ground water data from a select number of wells in order to determine whether or not natural attenuation is occurring at the site. In reviewing the interim feasibility study, it is apparent that the proposed study has expanded into a full CMS to evaluate all potential remediation technologies. This approach was not part of the approved work plan. In addition, in order for NMED to adequately review the final CMS report, current ground water conditions

throughout the plume must be established.

NMED has also performed additional review of the Final Phase II RI Report and the following observations have been made.

1. The contaminant plume appears to be migrating in a northerly direction and not with the ground water flow direction. The potentiometric surface maps for May 2000 (Fig 3-3, Final Phase II RI Report) and June 2004 (Interim Final Focused Feasibility Report) indicates a ground water flow direction that is slightly north of west. A detailed plot of the ground water contaminant plume based on data from Figures 5-3, 5-4, and 5-5 of the Phase II RI report, indicates the contaminant plume is migrating in a north-northwest direction.
2. The RI report also concluded that the 1,2 DCA was attributed to a separate solvent plume. This may not be the case. 1,2 DCA is also a fuel additive referred to as ethylene dichloride (EDC). A plot of the benzene and 1,2 DCA plumes appear to indicate one source for both of these plumes.
3. The previous investigations have also identified a TCE contamination in the eastern portion of the site. Ground water samples from MW-02 and DPT locations DP15, DP29, DP47, DP36, and DP56 along the eastern portion of the SS-61 site investigation had detections for TCE. This is in the upgradient portion of the site, based on ground water flow and may represent a distal end of a TCE contaminant plume. If TCE migration is similar to the benzene/EDC plume, then a TCE source may exist south or southeast of MW-02 (possibly from Building 1088 or 1080).

Based on the review of this site, the NMED will require the following actions be taken.

1. NMED will require that the natural attenuation feasibility study associated with the approved work plan and the CMS report be compiled and submitted separately due to the significant differences that these reports entail.
2. Additional investigation of the TCE plume to the east and southeast of MW-02 must be performed.
3. A ground water sampling program must be established. Ground water samples must be collected from a sufficient number of wells throughout the plume on at least a semi-annual basis. NMED suggest that initially the following wells and analysis be included for sampling:
 - i) MW-09 or 10, MW-05, MW-08, MW-06, MW-03, MW-02, MW-29-04, MW-29-05, MW-29-02 and MW-29-08
 - ii) All wells should be analyzed for the following constituents:

Ms. Debbie Hartell
February 4, 2005
Page 3

VOC's (to include BTEX, naphthalene, 1,2 dichloroethane (EDC), 1,2 dibromoethane (EDB)), SVOCs and metals (including lead)
In addition, MW-02 and MW-05 should be analyzed for TCE.

- iii) Ground water elevations should be collected from all SS-61 and LF-29 wells for development of ground water potentiometric surface maps.

A work plan for the above requirements must be reviewed and approved by the NMED before the work is performed. The work plan shall include details on the history of each site, potential contaminants of concern, proposed monitoring well locations and construction details, analytical parameters and methods, quality controls and any other details as determined by the NMED as necessary to properly investigate each site. The work plan shall be submitted within 90 days from receipt of this letter.

If you have any questions, please contact me at (505) 845-5932.

Sincerely,



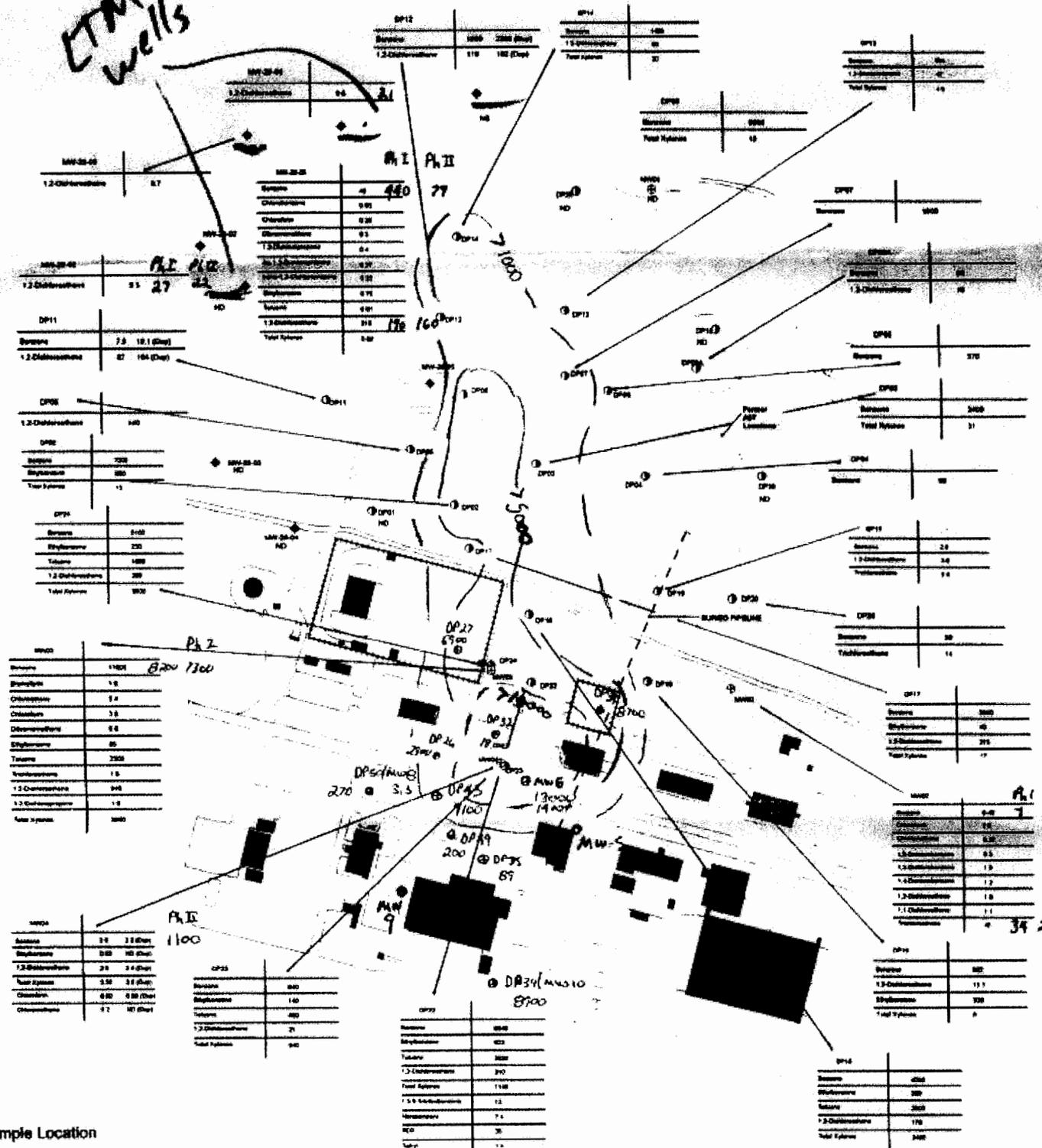
Steve Jetter

HWB Permits Management Program

cc: James Bearzi, NMED HWB
John Kieling, NMED HWB
Cornelius Amindyas, NMED HWB
James Harris, EPA-Region 6
Dan Holmquist, HAFB
File: Reading and HAFB-HSWA 2005

NMED interpretation of Groundwater Data From Phase II RI Report

ETM wells



DP11

Sample	7.5	10.1 (Dist)
1,2-Dichloroethane	87	104 (Dist)

DP12

Sample	4	440	77
Chlorobenzene	0.05		
Chloroform	0.28		
Dibromochloroethane	0.5		
1,2-Dichloroethane	0.4		
1,1,1-Trichloroethane	0.27		
1,1,2-Dichloroethane	0.32		
Benzene	0.71		
Toluene	0.91		
1,2-Dichlorobenzene	0.11		
Total Solvents	3.02		

DP14

Sample	0.10
Styrene	230
Toluene	1400
1,2-Dichloroethane	300
Total Solvents	2000

DP27

Sample	1100	1300
Styrene	1.0	
Chlorobenzene	0.4	
Chloroform	3.0	
Dibromochloroethane	0.8	
Styrene	0.0	
Toluene	2500	
1,2-Dichloroethane	1.0	
1,2-Dichlorobenzene	0.4	
1,1-Dichloroethane	1.0	
Total Solvents	3000	

DP23

Sample	0.8	2.1 (Dist)
Styrene	0.05	10 (Dist)
1,2-Dichloroethane	2.0	3.4 (Dist)
Total Solvents	3.5	3.1 (Dist)
Chlorobenzene	0.02	0.02 (Dist)
Chloroform	0.2	10 (Dist)

DP25

Sample	0.02
Styrene	1.0
1,2-Dichloroethane	2.0
Total Solvents	3.0

DP27

Sample	0.02
Styrene	0.02
1,2-Dichloroethane	0.02
Total Solvents	0.02

DP17

Sample	0.02	0.02
Styrene	0.02	0.02
1,2-Dichloroethane	0.02	0.02
Total Solvents	0.02	0.02

DP14

Sample	0.02
Styrene	0.02
1,2-Dichloroethane	0.02
Total Solvents	0.02

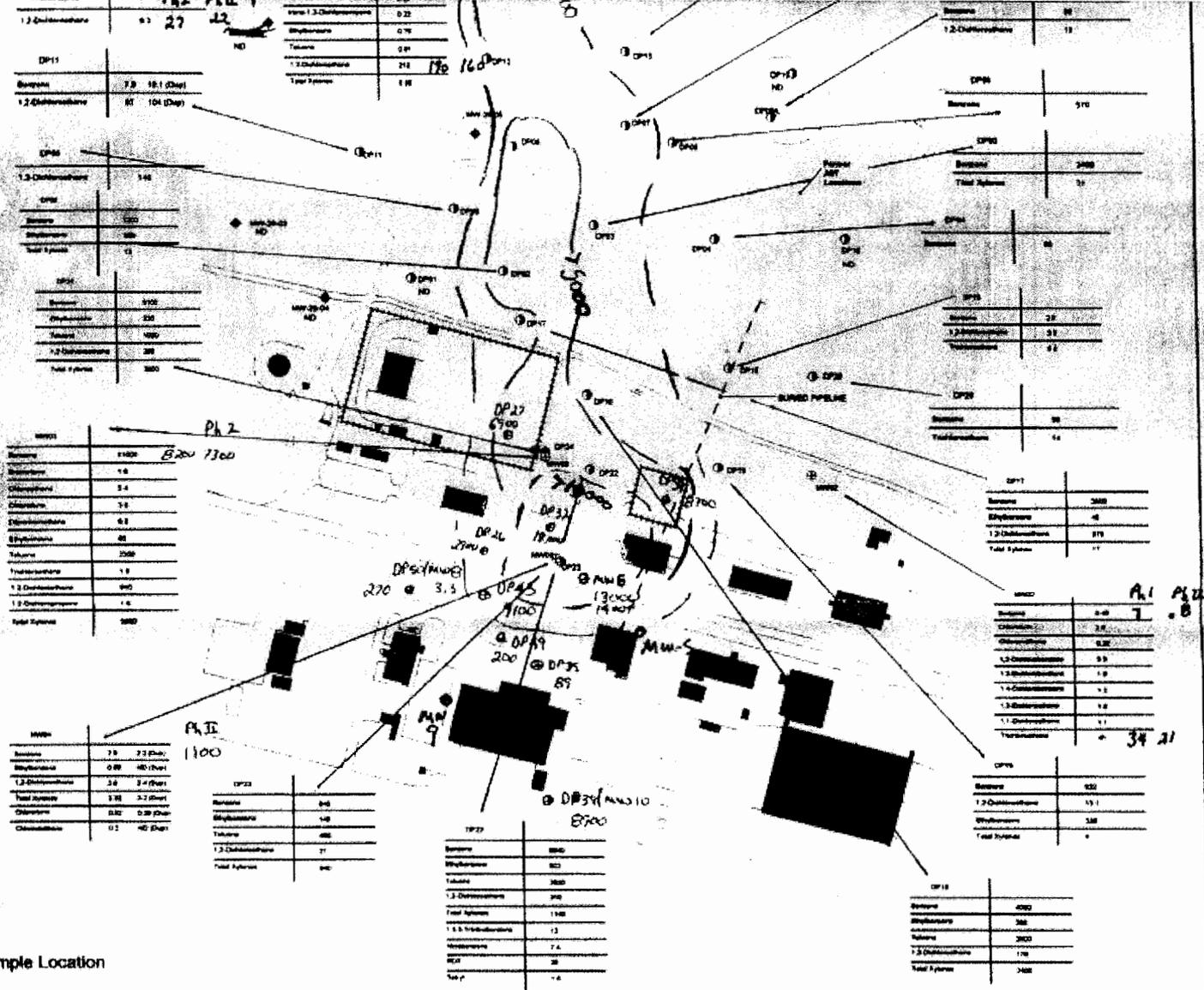
Sample Location

SS02
TRPH 23

250 0 250 500 Feet

Analyte Analyte concentration

1 inch = 250 ft



Sample Location

SS02
TRPH 23



1 inch = 250 ft

Analyte Analyte concentration

LEGEND

- ▲ Piezometers
- Fenceline
- ⊕ SS-81 Monitoring Wells
- LF-29 Monitoring Wells
- ⊙ Direct Push Samples
- Buildings
- Roads

Notes:
 Analyte concentrations are presented in micrograms per liter (ug/L).
 All groundwater samples were collected from the upper portion (less than 10 feet) of the shallow water-bearing zone.
 ND - Analyte not detected
 NS - Location not sampled



Benzene Plume

SS-81 REMEDIAL INVESTIGATION REPORT
 Holloman Air Force Base, New Mexico
 U.S. Army Corps of Engineers, Omaha District

Figure 5-3
 Distribution of Analytes Detected in Groundwater During the RFI

Foster Wheeler Environmental Corporation

APPENDIX B

Summary of Previous Investigations at SS-61

Foster Wheeler Environmental Corporation, *Final Phase II Remedial Investigation Report for SS-61, Holloman Air Force Base, New Mexico*, December 2000.

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southern portion of SS-61 is limited because this part of the site has been used by the U.S. Army for aircraft maintenance and storage for the White Sands Missile Range. Despite the lack of detailed information about the operations, the Phase II RI was designed to provide sufficient data to adequately characterize the source, nature, and extent of contamination in this area. The Phase II RI consisted of:

- Conducting personal interviews
- Searching records available on base
- Mapping site cultural features
- Surveying the area using geophysics to locate the underground piping and other potential sources

Soil and groundwater sampling was conducted throughout the southern area in the suspected source areas and at upgradient and downgradient locations. The Phase II data are combined in this report with the summary information from previous investigations for site characterization.

1.1 Purpose

The purpose of this report is to present the results of the Phase II RI and previous investigations of SS-61 and the surrounding area. These results were used to complete the following assessments:

- Soil and groundwater sampling results, along with information on site features, were used to assess the nature and extent of contamination in the northern part of the site and to confirm the existence of upgradient sources to the south.
- Fuel constituent concentrations in soil and groundwater were compared to action levels established by the NMED for petroleum-contaminated sites at Holloman AFB (NMED, 1995).
- Concentrations of other site contaminants were compared to human health medium-specific screening levels (HHSLs) developed by EPA Region VI (EPA, 1999).
- A site conceptual model and screening-level risk assessment were provided to document the potential exposure pathways and risks to human and ecological receptors at the site.

The conclusions of the assessments listed above were then used to support recommendations for the closure of this site.

1.2 SITE DESCRIPTION AND BACKGROUND

SS-61 is located in the central part of Holloman AFB at the edge of an industrial area (Figure 1-2). The northern part of the site, which was the focus of the Phase I RI, is approximately 300 feet (ft) north of two aircraft hangars. The primary focus of the Phase II RI is the southern part of SS-61,

which consists of potentially impacted soil and groundwater in the vicinity of the following two features:

- The two hangars where fuel and waste fluids may have been previously disposed
- The underground piping, which connected one or both of the former ASTs in the northern part of the site that traverses the site from north to south toward the aircraft tarmac

The Phase II RI investigation area is bounded on the north and south by DeZonia Drive and the aircraft tarmac, respectively. The east and west boundaries of the site extend just past the two hangars, Buildings 1079 and 1080. Samples were collected outside of the investigation area to delineate contaminated groundwater potentially migrating from the hangar areas.

Most of the investigated area is relatively flat and paved in asphalt, concrete, or coarse gravel. Sparse vegetation is present along with some brush in areas originally designated as landscaping. The eastern hangar, Building 1080, is the newer of the two structures. Infrequent activity was observed in the area of Building 1080, and there was no indication of external sumps or fuel spills that could have leached to groundwater in the past. The western hangar, Building 1079, is an older structure that dates back to the 1940s as observed in an aerial photograph from 1942 (Appendix C). In the vicinity of Building 1079, an underground concrete sump was observed outside of the northwest entrance of the hangar. Site personnel indicated that they did not dispose of anything in the sump as it currently appears dry and unused. A shallow surface depression, approximately 3 ft deep, is in the parking lot north of Building 1079 and measures approximately 100 x 70 ft. According to base Civil Engineering personnel (St. John, 2000), the area was used as a surface overflow basin used as a stormwater collection basin.

Contamination at SS-61 was first detected during Phase II of the Table 1 RFI of SWMU 104 in 1994 (Foster Wheeler and Radian Corporation [Radian], 1997). This landfill, located north of Building 1001 and northwest of SS-61, was used for disposal of waste munitions. During Phase II of the Table 1 RFI, monitoring well MW-29-05 was installed and sampled upgradient from the landfill. Groundwater contamination detected in MW-29-05 included benzene, 1,2-dichloroethane (1,2-DCA), 2,4,6-trinitrotoluene (TNT), and 1,3,5-trinitrobenzene. Water levels measured in the SWMU 104 wells indicated a hydraulic gradient for groundwater flow to the north-northwest. Therefore, the source of the contamination was believed to be to the south-southeast of the landfill. Based on these results, a recommendation for No Further Action status was requested for SWMU 104. The area southeast of the landfill was designated Area of

Concern (AOC)-1001. An investigation of AOC-1001 was conducted to assess the nature and extent of the groundwater contamination detected in MW-29-05 and to locate the source of this contamination.

Two investigations were conducted at AOC-1001 prior to the RI of SS-61, one in 1996 and one in 1997, to delineate the contamination and locate its source (Foster Wheeler and GTI, 1997b). These investigations detected soil contamination and the highest groundwater contaminant concentrations in the vicinity of the concrete pad. Groundwater samples were collected from 24 direct push technology (DPT) locations and 11 monitoring wells in the vicinity of AOC-1001 and SWMU 104. The resulting data outlined a groundwater contaminant plume extending to the north of the concrete pad area. Groundwater monitoring results suggest that this plume also extends to the east (crossgradient) and south-southeast (upgradient) from the concrete pad.

SS-61 was added as an IRP site upon completion of a CERCLA site investigation (SI) and RFI in 1996 and 1997 (Foster Wheeler and GTI, 1997b). At that time, it was concluded that an additional RI was required to determine the nature and extent of soil and groundwater contamination, develop a site conceptual model, and collect information in support of screening-level human health and ecological risk assessments. Field activities for the RI were conducted from March through April 1999.

The six other SWMUs are located within the vicinity of SS-61 and are listed below:

- ~~SWMU 36—Oil-water separator at Building 1001~~
- ~~SWMU 37—Oil-water separator at Building 1080~~
- ~~SWMU 38—Oil-water separator at Building 1080A~~
- ~~SWMU 126—Waste oil tank at Building 1001~~
- ~~SWMU 164—Pond at Building 1080~~
- ~~SWMU 212 (IRP Site SD-28)—Former North Area washrack~~

These Table 2 and 3 SWMUs are listed in the Base's RCRA Permit and were investigated under during the RFI or the IRP, and are not believed to be the sources of the contamination observed at SS-61. These six SWMUs have been proposed to the NMED for No Further Action status as part of the modification to the Base's RCRA Permit.

In December 1997, the area previously referred to as AOC-1001 was designated as IRP Site SS-61. At this time, an SI was conducted and it was determined that an RI would be needed to complete the site investigation.

Soil sampling conducted during the SI and the 1996 and 1997 investigations detected benzene, toluene, ethylbenzene, and xylenes (BTEX), as well as 1,2-DCA, tetryl, and TNT. Most detections of these compounds were in samples collected directly above the water table (depths greater than 15 ft below ground surface [bgs]) where groundwater contamination is interpreted to have entered the capillary fringe. Benzene, ethylbenzene, and xylenes were detected in only one sample collected from unsaturated vadose zone soil above the capillary fringe. These detections occurred in a soil sample collected north of the concrete pad at a depth of 11 to 12 ft bgs. Tetryl and TNT were detected in one sample collected west of the AST area at a depth of 15 to 18 ft bgs. Groundwater contaminants included BTEX, 1,2-DCA, and trichloroethene (TCE). The results of these previous investigations indicated possible soil contamination in the area of the concrete pad and a broad groundwater contaminant plume extending to the north from SS-61, as well as crossgradient to the east and possibly upgradient to the south-southeast.

1.3.2 Phase I RI

In March and April 1999, the Phase I RI was conducted to complete the characterization of the site and to refine the assessment of the source and extent of soil and groundwater contamination in this area to the southeast of SWMU 104. Contamination was detected in the upgradient well at SWMU 104 in 1994.

The results of the following field activities are summarized in this report (Foster Wheeler, 1999b):

- Collection of soil and groundwater samples at 12 locations using a DPT rig. The sampling locations were distributed:
 - Near the pipeline identified along the east edge of the site near the southern berm and north of Building 1072
 - In the vicinity of the concrete pad
 - Near Building 1001
 - South of the concrete pad
 - Upgradient of SS-61 near the hangars (Buildings 1079 and 1080)

- Collection of surface soil and sediment samples in the vicinity of the concrete pad and within the northern bermed area, as well as at a location where the buried pipeline extends above the ground surface at the former southern AST, to support the evaluation of human health and ecological risk at the site
- Installation and sampling of two monitoring wells southeast of the concrete pad to evaluate water quality upgradient of SS-61
- Sampling of eight existing wells in the area associated with SS-61 and SWMU 104 to help define the source of shallow groundwater contamination in the area
- Excavation of a test pit at the north side of the western concrete vault to determine if a subsurface release has occurred

In March and April 1999, the Phase I RI field sampling was conducted. The objective was conducted to locate the source and assess the extent of fuel contamination in soil and groundwater to the southeast of solid waste management unit (SWMU) 104 (LF-29). Contamination was detected in the upgradient monitoring well at SWMU 104 in 1994.

Detailed mapping of the site and geophysical data collection were conducted during the Phase I RI to identify potential sources of this groundwater contamination. These activities located the underground piping that connected the former ASTs to the concrete pad. Phase I RI samples were collected at the following locations to confirm the contaminant source:

- In the area of the two former ASTs to the northeast of the site
- Along the pipeline that once connected the former ASTs to a concrete pad in the southwest part of the site
- Under and around the concrete pad where AST-related underground piping emerges
- Near a debris pile that lies to the north of the concrete pad
- In the southeastern portion of the parking area outside Building 1001, where motor vehicle maintenance is conducted
- Upgradient of SS-61 in an area surrounding two hangars

Groundwater samples collected during the RI confirmed that past releases in the vicinity of the concrete pad account for the elevated concentrations of groundwater contaminants in a plume that extends to the north toward SWMU 104. However, soil sampling showed that there is no continuing source of groundwater contamination above the water table in this area. Groundwater sampling conducted to the south and southeast of the pad indicates that there is also crossgradient and upgradient groundwater contamination attributable to one or more other

sources that have not yet been characterized.

All total recoverable petroleum hydrocarbon (TRPH) soil sample concentrations in the northern part of the site were below the 1,000-milligrams per kilograms (mg/kg)-action level. No continuing source of groundwater contamination was indicated by soil sample results and no free product was observed at the water table at any of the groundwater sampling locations. Of the soil samples collected above the capillary fringe zone affected by groundwater contamination, only one contained a benzene concentration above the Holloman AFB screening level of 25 mg/kg. This benzene concentration and other individual soil and groundwater analytes were evaluated in a human-health risk assessment (HHRA) and screening-level ecological risk assessment. The risk assessments concluded that no unacceptable risk is posed to either human or ecological receptors. ~~There is no remediation required to protect human health and the environment in the northern part of SS-61.~~

As a result of the Phase I RI, an additional investigation was recommended to the south of the AST system and concrete pad area investigated to date. The Phase II RI was recommended to locate and characterize upgradient sources of the observed groundwater contamination. Groundwater sampling at three locations in the southern part of SS-61 indicated these sources may be located in the vicinity of the hangars, Buildings 1079 and 1080.

1.4 DOCUMENT ORGANIZATION

This report presents information gathered as a result of the 2000 Phase II RI field activities and the previous investigations to support recommendations for SS-61. The remainder of this report is organized into the following sections:

- Section 2.0 — Remedial Investigation Field Program
- Section 3.0 — Physical Setting
- Section 4.0 — Applicable or Relevant and Appropriate Requirements
- Section 5.0 — Nature and Extent of Contamination
- Section 6.0 — Contaminant Fate and Transport
- Section 7.0 — Screening-Level Risk Assessment
- Section 8.0 — Summary and Conclusions

5.0 NATURE AND EXTENT OF CONTAMINATION

The evaluation of the nature and extent of contamination is based on the analytical results for samples collected during the Phase I and Phase II RFIs in 1996 and 1997 (Foster Wheeler and GTI, 1997), the Phase I RI in 1999 (Foster Wheeler, 1999b), and the Phase II RI in 2000 (Foster Wheeler, 2000). A summary of the sample results is presented below for the following media:

- Soil vapor sampled during the Phase I RFI
- Soil sampled during both phases of the RFI and of the RI
- Groundwater samples collected at DPT locations and from monitoring wells during both phases of the RFI and of the RI

5.1 SOIL VAPOR SURVEY RESULTS

During the Phase I RFI, a passive soil vapor survey was performed to help locate the source of contamination. Forty-nine passive soil vapor points (Gore-SorbersSM) were installed 3 ft bgs in a grid with a 50-ft spacing. The survey was conducted upgradient of well MW-29-05 and within the area believed to be a former fuel storage area. The Gore-SorbersSM remained in the ground for approximately two weeks.

The soil vapor samples were analyzed for VOCs, semivolatile organic compounds (SVOCs), and explosives using thermal desorption gas chromatography, and mass selective detection laboratory analysis. A trace of BTEX was detected in only one sample collected on the northwest side of the northern bermed area at a concentration of 1.12 micrograms (μg). The 1.12 micrograms per kilograms ($\mu\text{g}/\text{kg}$) BTEX result consisted of 0.80 μg of toluene and 0.32 μg of total xylenes. Undecane was detected in 22 soil vapor samples at concentrations ranging from 0.02 to 0.26 μg . Diesel-range alkanes (C11, C13, and C15) were also detected in a sample located near DP01 north of the fenced area of Building 1001 at a concentration of 0.26 μg . Undecane and diesel-range alkanes were also detected at 0.10 μg in a laboratory blank, so the actual presence of undecane and diesel-range alkanes in the samples is suspect. No SVOCs or explosives were detected above method reporting limits in any of the soil vapor samples (Foster Wheeler and GTI, 1997).

5.2 SOIL

5.2.1 Phase I RFI Soil Sampling Results

Phase I RFI soil sampling analytical results are also presented in previous reports and summarized in Table 5-1 (Foster Wheeler and GTI, 1997; Foster Wheeler, 1999b). Figure 5-1 presents the distribution of analytes detected in soil during the RFI. Methylene chloride was detected in soil samples collected from borings DP09A and DP10 at concentrations ranging from 10,000 to 17,000 $\mu\text{g}/\text{kg}$. Methylene chloride was also detected in the method blank at a

concentration of 3.86 µg/kg. No other VOCs were detected in the soil samples collected during the Phase I RFI. The soil sample collected from DP08 from 15 to 18 ft bgs contained two explosives, tetryl at 1,000 µg/kg and TNT at 1,000 µg/kg.

5.2.2 Phase II RFI Soil Sampling Results

Phase II RFI soil sampling analytical results are also summarized in Table 5-1 and presented in previous reports (Foster Wheeler and GTI, 1997b; Foster Wheeler, 1999b). Figure 5-1 presents the distribution of analytes detected in soil during the RFI. Selected soil samples were analyzed onsite by the mobile laboratory for specific halogenated hydrocarbons and BTEX using modified EPA Methods 8010/8020. BTEX was identified in only two samples. One sample collected from DP22 at 11 to 12 ft bgs contained 37,970 µg/kg of total BTEX, and one sample from DP23 collected at 17 to 20 ft bgs contained 430 µg/kg of total BTEX. The benzene concentration of 29,400 µg/kg in the sample from DP22 slightly exceeds the 25 mg/kg Holloman AFB action level for benzene. No other VOCs were detected in the soil samples analyzed by the mobile laboratory during the Phase II RFI.

The offsite laboratory analyzed two of the DPT soil samples and the four soil samples collected during the installation of monitoring wells SS61-MW01 through SS61-MW04 for halogenated hydrocarbons and BTEX using EPA Methods 8010/8020. These results are provided in Table 5-1 and presented in Figure 5-1. Benzene (3.2 µg/kg) was detected in the 20 to 22 ft-bgs sample collected from the borehole MW02. The soil sample collected from the borehole MW03 at 18 to 20 ft bgs contained 446.4 µg/kg of total BTEX and 37 µg/kg of 1,2-DCA. No other VOCs were detected in any of the soil samples collected during the Phase II RFI.

5.2.3 Phase I RI Soil Sampling Results

During the RI field activities conducted in April 1999, 17 soil samples were collected to determine the source of contamination resulting from previous activities in the vicinity of SS-61. Soil samples in three separate categories were collected and analyzed as follows:

- Seven subsurface soil samples, including one field duplicate, were collected from three DPT locations; these samples were analyzed offsite for VOCs using EPA SW-846 Methods 5035/8260B and TRPH using EPA Method 418.1
- Eight surface soil samples (0 to 0.5 ft bgs) (including one duplicate) and one sediment sample were collected and analyzed for VOCs using SW-846 Methods 5035/8260B and TRPH using EPA Method 418.1
- A test pit bgs excavated on the north side of the western vault and one soil sample was collected at a depth of 13 ft; this sample was analyzed for VOCs using SW-846 Methods 5035/8260B and TRPH using EPA Method 418.1.

The analytical results for the soil samples are provided in Table 5-2 and the distribution of contaminants in soil in the northern part of SS-61 is presented in Figure 5-1.

TRPH was detected in 11 of the 17 soil samples collected during the Phase I RI (including 1 field duplicate sample). Of the 11 soil samples containing TRPH, 6 samples were collected from surface soil and sediment in the vicinity of the concrete pad (Figure 5-1). Surface soil and sediment concentrations of TRPH ranged from 23 to 270 mg/kg, and the highest concentration of TRPH was detected in the sediment sample collected from the eastern concrete vault. TRPH was also detected in four subsurface soil samples and one field duplicate sample near the concrete pad and the fenced area north of Building 1072 (Figure 5-1). TRPH was detected in unsaturated soil at concentrations ranging from 54 to 99 mg/kg in four samples collected from the test pit and DP30. TRPH was detected in one subsurface sample and field duplicate collected from DP31, north of Building 1072. TRPH concentrations in soil samples collected during the RI do not exceed the Holloman AFB action level of 1,000 mg/kg.

VOCs were detected in only one sample collected from 16 to 18 ft bgs at DP30, and, like TRPH, are associated with contaminated groundwater. The VOCs detected in this soil sample are associated with gasoline hydrocarbons, and the only BTEX compound detected in this sample was ethylbenzene (Figure 5-1). Benzene was not detected in any soil samples collected during the RI.

5.2.4 Phase II RI Soil Sampling Results

A total of 40 soil samples was collected during the Phase II RI conducted in April and May 2000. The purpose of the investigation was to determine the nature and extent of fuel contamination in the soil and groundwater at SS-61. Whereas Phase I of the RI concentrated on the northern portion of SS-61, Phase II concentrated on the upgradient and crossgradient sources of the southern portion of the site.

Soil samples were collected using DPT. The primary sample areas included Building 1079, Building 1080, and the parking lot on the north side of Building 1079. Twenty borings were drilled and one to three samples were collected from each boring. The samples were analyzed for VOCs and TRPH using SW-846 Methods 5030/8260B and 9071/418.1, respectively. Analytical results for the soil samples are provided in Table 5-3. Figure 5-2 presents the distribution of TRPHJP-4 and VOCs in soil samples collected during the Phase II RI.

TRPHJP-4 was detected at four of the 20 DPT locations. TRPHJP-4 was detected at DP39 and DP40 in the 1- to 2-ft interval at concentrations of 260- and 7,800 mg/kg, respectively. At DP41, TRPHJP-4 was detected in the 8- to 9-ft interval at a concentration of 210 mg/kg. TRPHJP-4 was also detected at DP44 in the 11- to 12-ft interval at a concentration of 46 mg/kg.

Several VOCs were detected in one sample collected at 21 to 22 ft bgs from DP43 and included the following (significant concentrations are noted): benzene (2,800 μ g/kg), ethylbenzene, isopropylbenzene, n-propylbenzene, toluene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, o-xylene, and m-xylene. The sample was collected from groundwater-saturated soil at the capillary fringe. Isopropylbenzene was also detected at DP49 in the 15- to 16-ft interval at a concentration 1,100 μ g/kg. Styrene occurred as an isolated detection at DP49 at 11.5 to 12.5 ft bgs and a concentration of 1,400 μ g/kg.

5.3 GROUNDWATER

5.3.1 Phase I and Phase II RFI Groundwater Sampling and Monitoring Results

Phase I RFI groundwater samples were analyzed for VOCs by EPA Method 8260A and explosives by EPA Method 8330. Phase II RFI groundwater samples were analyzed for VOCs by EPA Methods 8010/8020. The VOC analytical list was shortened for Phase II because only BTEX constituents and 1,2-DCA were identified in the groundwater samples collected during Phase I. Because the holding time was exceeded for some of the Phase I explosives samples, 6 of the Phase II DPT points were also sampled for explosives analyses. Analytical results for groundwater samples collected during the Phase I and Phase II RFIs are presented in Table 5-4. Figure 5-3 shows the distribution of groundwater contaminants during the Phase I and Phase II RFIs.

5.3.1.1 *Phase I RFI Groundwater Results*

Ten groundwater samples were collected during Phase I. The analytical results for these samples (DP01 through DP10) are summarized in Table 5-4. Benzene was detected in groundwater samples collected from 7 of the 10 Phase I DPT locations. Benzene concentrations in the seven samples ranged from 80 micrograms per liter ($\mu\text{g/L}$) to 7,200 $\mu\text{g/L}$ (Table 5-4). Ethylbenzene and total xylenes were detected in DP02 at concentrations of 890 and 13 $\mu\text{g/L}$, respectively. Total xylenes were also detected in groundwater at DP03 (31 $\mu\text{g/L}$) and DP06 (18 $\mu\text{g/L}$). 1,2-DCA was detected in groundwater samples collected from DP05 (140 $\mu\text{g/L}$) and DP09A (18 $\mu\text{g/L}$). No other VOCs were detected in groundwater samples collected during Phase I. Analytical results indicated that no explosives constituents occurred above method reporting limits in any of the groundwater samples collected during Phase I.

5.3.1.2 *Phase II RFI Groundwater Results*

A total of 17 groundwater samples (including 2 duplicates) were obtained from 14 DPT points (DP11 through DP20 and DP22 through DP25 [DP21 was not installed]). Eleven DPT samples (DP11 [duplicate], DP12 [duplicate], DP16 through DP20, DP18 [duplicate], and DP23 through DP25) were analyzed onsite by the mobile laboratory for specific halogenated hydrocarbons and BTEX using modified EPA Methods 8010/8020. Samples DP11 through DP15 and DP22 were analyzed offsite. One water sample (DP16) was also analyzed for gasoline, diesel, and oil using modified EPA Method 8015. These results are summarized in Table 5-4 and are also presented in previous reports (Foster Wheeler and GTI, 1997b; Foster Wheeler, 1999b).

BTEX constituents associated with gasoline hydrocarbons were detected in 14 of 17 DPT groundwater samples collected during Phase II including 2 duplicate samples. Benzene was detected in 14 groundwater samples, including 2 duplicate samples, and ranged in concentration from 2.8 to 8,640 $\mu\text{g/L}$. Ethylbenzene was detected at six DPT locations, ranging from 40 to 523 $\mu\text{g/L}$. Toluene was detected in four DPT groundwater samples, and ranged from 460 to 3,620 $\mu\text{g/L}$. Total xylenes concentrations were detected at eight locations, ranging from 4.9 to 3,800 $\mu\text{g/L}$.

VOCs not associated with gasoline hydrocarbons were detected in up to 12 DPT well point locations sampled during Phase II. 1,2-DCA was detected in 13 of the 17 Phase II groundwater DPT samples including 2 duplicate samples and ranged from 3.8 $\mu\text{g/L}$ to 315 $\mu\text{g/L}$. TCE was the

only other VOC detected in groundwater samples collected from DP15 (5.6 µg/L) and DP20 (14 µg/L).

The water sample from DP16 was also analyzed for gasoline, diesel, and oil by modified EPA Method 8015 to characterize the possible source of the contamination at SS-61. Only gasoline was detected in the sample from DP16, located north of the concrete pad and east of the fenced area at Building 1001 at a concentration of 41,000 µg/L (Foster Wheeler and GTI, 1997b).

The offsite laboratory analyzed groundwater samples from six of the DPT well points for explosives (Table 5-4). Explosives were detected only in the groundwater sample from DP22 where four compounds were detected at levels ranging from 1.6 to 35 µg/L.

Six groundwater samples (including one duplicate) were also obtained from five monitoring wells at the site (MW-29-05 and SS61-MW01 through SS61-MW04) and analyzed offsite for VOCs by EPA Methods 8010/8020. These results are summarized in Table 5-4. Benzene was detected in all wells except SS61-MW01 at concentrations ranging from 0.43 µg/L (SS61-MW02) to 11,000 µg/L (SS61-MW03). The maximum total BTEX concentration (19,165 µg/L) was detected in SS61-MW03 northeast of the concrete pad. 1,2-DCA was also detected in all wells except SS61-MW01 at concentrations ranging from 1.8 µg/L (SS61-MW02) to 940 µg/L (SS61-MW03). TCE was detected in two wells. Other low concentrations of VOCs were detected in groundwater samples as presented in Table 5-4.

5.3.2 Phase I Remedial Investigation Groundwater Sampling Results

During the RI in April 1999, 24 groundwater samples (including 2 duplicates) were collected at 12 DPT locations and from 10 monitoring wells and analyzed for VOCs using SW-846 Method 8260B. The analytical results are summarized in Table 5-5 and a map showing the distribution of VOCs detected in groundwater is presented in Figure 5-4.

During the RI, VOCs were detected in groundwater samples collected from all 12 DPT locations and 8 monitoring wells. Based on the constituents detected and the extent of VOCs in groundwater, one source of contamination is a past release of gasoline-related hydrocarbons in the vicinity of the concrete pad. BTEX compounds were detected in groundwater across the site as far south as DP29 and downgradient of the concrete pad in groundwater sampled at MW-29-05. Benzene was the contaminant most frequently detected and occurred at the highest concentration of all of the BTEX constituents at levels ranging from 7 µg/L at SS61-MW02 to 19,000 µg/L at DP33. Toluene, ethylbenzene, and xylenes were also detected in groundwater at SS-61. Besides BTEX, other gasoline-related VOCs were detected in groundwater and include 1,2-dibromoethane, 1,2-dichlorobenzene, isopropylbenzene, n-propylbenzene, sec-butylbenzene, tert-butylbenzene, and trimethylbenzene isomers (Table 5-5). At SS61-MW05, where the highest BTEX concentrations were detected, an electronic probe was used to check for the presence of floating product, but none was found.

VOCs not related to gasoline were also detected in groundwater during the RI and include 1,2-DCA, TCE, and chloroform (Table 5-5). These VOCs are common solvents that exhibit a different pattern of distribution at the site. The source of this low-level groundwater contamination may be upgradient in the area of the hangars.

5.3.3 Phase II RI Groundwater Sampling Results

During the Phase II RI in April and May 2000, a total of 36 groundwater samples were collected at 20 DPT locations and from 16 monitoring wells. The analytical results are summarized in Table 5-6. Figure 5-5 presents the distribution of VOCs and JP-4 detected in groundwater samples collected at SS-61 and the surrounding area during the Phase II RI.

VOCs were detected in 9 groundwater samples collected from DPT locations and 11 samples collected from monitoring wells. The most commonly detected VOC was benzene, which was detected in 10 groundwater samples ranging in concentration from 0.86 to 13,000 $\mu\text{g/L}$. Isopropylbenzene, which was detected in nine groundwater samples, ranging in concentration from 7.8 to 5,600 $\mu\text{g/L}$. Most of the DPT groundwater samples had sporadic detections of VOCs, with the exception of DP43 and DP49. Nine VOCs were detected in the groundwater at DP43, including benzene, ethylbenzene, isopropylbenzene, n-propylbenzene, toluene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, o-xylene, and m-xylene. The 10 VOCs detected at DP49 included benzene, sec-butylbenzene, tert-butylbenzene, ethylbenzene, isopropylbenzene, n-propylbenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, o-xylene, and m-xylene. In the southern portion of SS-61 benzene was detected in four samples collected from DP39 located south of building 1079, and DP43, DP49, and DP50, all located on the south side of DeZonia Drive, northwest of Building 1079.

The highest levels of VOCs in groundwater were detected in wells MW03, MW04, and MW06, which are all located north of DeZonia Drive in the vicinity of the concrete pad. Gasoline fuel-related VOCs detected in all three samples included benzene, ethylbenzene, isopropylbenzene, toluene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and m-xylene. 1,2-Dichlorobenzene and p-xylenes were also detected at MW03. Sec-butylbenzene, tert-butylbenzene, 1,2-dichlorobenzene, 2-hexanone, n-propylbenzene, styrene, and o-xylene were additional VOCs detected at MW04. Additional VOCs detected at MW06 included sec-butylbenzene, naphthalene, n-propylbenzene, and o-xylene.

VOCs consisting of chlorinated solvent, not related to gasoline, were detected at low levels at the site (chloroform, 1,1-dichloroethane, 1,2-DCA, and TCE). These chlorinated solvents were detected in samples collected from DPT locations on the east side of SS-61 in the vicinity of the eastern hangar, Building 1080. None of these samples show contamination related to petroleum fuels.

JP-4 was detected in the groundwater at nine DPT locations. Concentrations ranged from 530 to 60,000 $\mu\text{g/L}$. JP-4 contamination is concentrated around the area of Building 1079. JP-4 was detected in three samples collected from monitoring wells MW03, MW04, and MW06 in the

vicinity of the concrete pad north of DeZonia Drive. Concentrations of JP-4 in these three wells ranged from 650 to 2,500 $\mu\text{g/L}$.

5.4 SUMMARY OF THE NATURE AND EXTENT OF CONTAMINATION

Results from soil sampling conducted during the Phase I and Phase II RFI field activities in 1996 and 1997 indicated detections of BTEX and 1,2-DCA. Most of these analytes were detected in samples collected directly above the water table (depths greater than 15 ft bgs), where groundwater contamination is interpreted to have entered the capillary fringe. The results of these previous investigations indicated possible soil contamination in the area of the concrete pad and a broad groundwater contaminant plume extending downgradient from the concrete pad, crossgradient to the east and northeast and possibly upgradient (Foster Wheeler and GTI, 1997b).

According to the interpretation of the chemical analytical results from the Phase I and Phase II RFIs and the results of the Phase I and Phase II RIs, a contaminant release occurred in the vicinity of the concrete pad. The location of this past release is best shown by groundwater BTEX concentrations during the Phase I RI (Figure 5-6), since no significant remnant soil contamination was detected. The results also indicated additional upgradient releases of groundwater contamination in the area south of DeZonia Drive. These upgradient releases were suspected because partial delineation of the groundwater contaminant plume during the Phase I RI showed that the plume extends both crossgradient and upgradient from the concrete pad (Figure 5-6).

The geophysical survey conducted during the Phase I RI also indicated that the underground piping from the former ASTs led not only to the concrete pad, but also south toward an area where the two hangars are located (Buildings 1079 and 1080). Based on the findings during the Phase I RI, a Phase II RI was conducted in April and May 2000 and concentrated on investigating the southern portion of SS-61. Samples collected during the Phase II RI indicated that contamination exists in the southern portion of SS-61. Currently, groundwater contamination extends about 100 ft south of Building 1079 to the north toward LF-29 and encompasses the area occupied by the two hangars (Figure 5-7).

Groundwater samples collected upgradient directly south and southwest of the concrete pad contained gasoline-related constituents resulting from past spills or leaks from underground pipes in the vicinity of SS-61. MW10 is the southernmost location where gasoline-related constituents were detected; these detections are likely the result of a past release from an oil/water separator formerly located at the southeast corner of Building 1079. If these releases accumulated at the watertable as free product, they would be observed as light nonaqueous phase liquid (LNAPL). LNAPL was not observed during any of the sampling activities at SS-61 during the Phase II RI.

Soil action levels applicable to Holloman AFB include standards for petroleum hydrocarbons (1,000 mg/kg) and benzene (25 mg/kg). Benzene was detected in four samples during previous investigations. One of those samples, collected during the Phase II RFI from DP22 at 11 to 12 ft bgs, exceeded the standard with a concentration of 29,400 $\mu\text{g/kg}$, just above the action level. Benzene was detected in one soil sample collected during the Phase II RI at a concentration less than the action level. Petroleum hydrocarbons were detected in soil at SS-61 at levels less than 1,000 mg/kg. Only one soil sample collected during the Phase II RI exceeded the petroleum

hydrocarbon action level. ~~IP-4~~TRPH was detected at a concentration of 7,800 mg/kg at DP40 in the sample collected from 1 to 2 ft. This isolated occurrence of petroleum is likely the result of a previous surface spill in the area. Surface petroleum contamination was not visible in the area surrounding DP40.

Since groundwater at SS-61 contains TDS exceeding 10,000 mg/L, similar to TDS concentrations measured across the base, state groundwater quality standards do not apply. However, any continuing source of groundwater contamination, if present, must be removed. No significant vadose zone soil contamination was detected in any of the three previous investigations that could be a continuing source of groundwater contamination. All elevated concentrations of contaminants occurred in samples collected from the capillary fringe, immediately above the water table. Measurable LNAPL has not been observed at SS-61 during the RI or in monitoring wells sampled downgradient of the site. Groundwater contaminant concentrations in each monitoring well are generally similar between the RFI Phase II and RI Phase I sampling events.

The original Phase I RI field program included nine DPT groundwater locations and two upgradient monitoring wells to the southeast of the concrete pad to confirm the presence of an upgradient source. During the Phase I RI field program, three additional DPT groundwater locations were added in the area of the two hangars. Two of the samples were collected downgradient from the hangars, and the third was collected upgradient from the hangars at the edge of the aircraft taxiway. These additional groundwater samples contained low levels of VOCs.

During the Phase II RI field investigation, contamination in the southern portion of SS-61 was investigated. Of the 36 groundwater samples collected, 10 samples had detections of benzene ranging from 0.86 to 60,000 μ g/L. Only one soil sample contained benzene. VOCs were only detected in the soil at two sample locations. Nineteen groundwater samples contained low levels of various VOCs.

As described in Section 5.3, groundwater contaminants in the northern and southern portions of SS-61 differ to the extent of that BTEX-related fuel products predominant in groundwater to the north and jet fuel-related constituents detected in groundwater to the south. A comparison of DPT groundwater data collected at locations where monitoring wells were subsequently installed indicated that DPT groundwater samples contain higher concentrations of ~~IP-4~~IP-4 and BTEX. This difference likely occurs because DPT groundwater sampling procedures are not comparable to the presample purging required for development and sampling of monitoring wells. DPT groundwater samples represent a less-disturbed, or stagnant, aliquot that is probably more influenced by contaminants contained within the capillary fringe, which slowly leach to groundwater and remain localized. Chlorinated solvents in groundwater occur sporadically in the western and eastern edges of the site and are most likely the result of minor releases of cleaning fluids during past maintenance operations at both hangars.

Table 5-1. Analytical Results for Soil Detections, Phases I and II RFI Site Characterization (1996 and 1997)

Location	Depth Interval	VOC (µg/kg)					Explosives (µg/kg)		
		Benzene	1,2-Dichloroethane	Ethylbenzene	Toluene	Total Xylenes	Methylene Chloride	Tetryl	Trinitrotoluene
On-Site Mobile Laboratory Analyses									
<u>Phase I</u>									
SS61-DP01	9-12	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP01	15-18	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP01	18-21	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP02	9-12	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP02	15-18	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP02	18-21	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP03	9-12	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP03	15-18	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP03	18-21	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP04	9-12	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP04	15-18	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP04	24-27	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP05	9-12	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP05	15-18	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP05	18-21	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP06	6-9	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP06	12-15	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP06	18-21	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP07	9-12	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP07	15-18	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP07	18-21	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP08	9-12	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP08	15-18	ND	ND	ND	ND	ND	ND	1,000	1,000
SS61-DP08	21-24	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP09A	18-21	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP09A	21-24	ND	ND	ND	ND	ND	13,000	ND	ND
SS61-DP09A	24-27	ND	ND	ND	ND	ND	17,000	ND	ND
SS61-DP10	18-21	ND	ND	ND	ND	ND	10,000	ND	ND
SS61-DP10	21-24	ND	ND	ND	ND	ND	15,000	ND	ND
SS61-DP10	24-27	ND	ND	ND	ND	ND	17,000	ND	ND
<u>Phase II</u>									
SS61-DP11	16-19	ND	ND	ND	ND	ND	ND	NR	NR
SS61-DP11 (dup)	16-19	ND	ND	ND	ND	ND	ND	NR	NR
SS61-DP12	16-19	ND	ND	ND	ND	ND	ND	NR	NR
SS61-DP15	18-21	ND	ND	ND	ND	ND	ND	NR	NR
SS61-DP16	12-15	ND	ND	ND	ND	ND	ND	NR	NR
SS61-DP17	14-17	ND	ND	ND	ND	ND	ND	NR	NR
SS61-DP18	19-22	ND	ND	ND	ND	ND	ND	NR	NR
SS61-DP18 (dup)	19-22	ND	ND	ND	ND	ND	ND	NR	NR
SS61-DP22	11-12	29,400	ND	6,540	ND	2,030	ND	NR	NR
SS61-DP23	17-20	360	ND	ND	ND	70	ND	NR	NR
SS61-DP24	17-20	ND	ND	ND	ND	ND	ND	NR	NR

Table 5-1. Analytical Results for Soil Detections, Phases I and II RFI Site Characterization (1996 and 1997)

Location	Depth Interval	VOC (µg/kg)					Explosives (µg/kg)		
		Benzene	1,2-Dichloroethane	Ethylbenzene	Toluene	Total Xylenes	Methylene Chloride	Tetryl	Trinitrotoluene
Off-Site Fixed Laboratory Analyses									
SS61-DP11	16-19	ND	ND	ND	ND	ND	ND	NR	NR
SS61-DP18	19-22	ND	ND	ND	ND	ND	ND	NR	NR
SS61-MW01	30-32	ND	ND	ND	ND	ND	ND	NR	NR
SS61-MW02	20-22	3.2	ND	ND	ND	ND	ND	NR	NR
SS61-MW03	18-20	330	37	7.4	24	85	ND	NR	NR
SS61-MW04	15-17	ND	ND	ND	ND	ND	ND	NR	NR

Notes:

ft - feet

mg/kg - Milligrams per kilogram

NR - Analysis not requested

ND - Analyte detected or reported at less than the detection limit

VOC - Volatile organic compound

Table 5-2. Analytical Results for Soil Detections, Phase I Remedial Investigation

Location	Depth Interval (ft)	TRPH (mg/kg)	VOCs (µg/kg)															
			Benzene	sec-Butylbenzene	tert-Butylbenzene	Chloroform	1,2-Dibromoethane	1,2-Dichlorobenzene	1,2-Dichloroethane	Ethylbenzene	Isopropylbenzene	n-Propylbenzene	Toluene	Trichloroethene	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	o-Xylene	m,p-Xylenes
SS61-DP30	0-0.5	61	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP30	8-10	54	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP30	16-18	99	ND	ND	ND	ND	ND	ND	ND	630	1,700	760	ND	ND	12,000	10,000	ND	ND
SS61-DP31	4-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP31	14-16	250	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP32	3-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP32	12-14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-SS01	0-0.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-SS02	0-0.5	23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-SS03	0-0.5	93	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-SS04	0-0.5	33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-SS05	0-0.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-SS06	0-0.5	51	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-SD01	0-0.5	270	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-TP01	13-13.5	91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-SS01(dup)	0-0.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP31(dup)	4-6	31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:
 ft - feet
 mg/kg - milligrams per kilogram
 ND - Analyte detected or reported at less than the detection limit
 TRPH - total recoverable petroleum hydrocarbons
 VOC - volatile organic compound
 µg/kg - micrograms per kilogram

Table 5-3. Summary of Analytical Results for Soil Samples Collected During the Phase II RI

Location	Depth Interval (ft)	TRPH (mg/kg)	VOCs (µg/kg)									
			Benzene	Ethyl-benzene	Isopropyl-benzene	n-Propyl-benzene	Styrene	Toluene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	o-Xylene	m-Xylenes
DPT Soil Samples												
SS61-DP38	5 - 6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP38	10 - 11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP39	1 - 2	260	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP39	10 - 11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP39	16 - 17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP40	1 - 2	7,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP40	5 - 6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP40	8.5 - 9.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP41	3 - 4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP41	8 - 9	210	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP42	6 - 7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP42	9 - 10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP43	1 - 2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP43	17 - 18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP43	21 - 22	ND	2,800	7,400	17,000	1,400	ND	21,000	13,000	6,200	14,000	34,000
SS61-DP44	1 - 2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP44	7 - 8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP44	11 - 12	46	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP45	1 - 2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP45	9 - 10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP45	12 - 13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP46	1 - 2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP46	5 - 6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP46	9 - 10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP47	8 - 9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP47	11 - 12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP48	11 - 12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP49	1 - 2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP49	11.5 - 12.5	ND	ND	ND	ND	ND	1,400	ND	ND	ND	ND	ND
SS61-DP49	15 - 16	ND	ND	ND	1,100	ND	ND	ND	ND	ND	ND	ND
SS61-DP50	1 - 2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP50	10 - 11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP50	15 - 16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP51	14 - 15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP52	15 - 16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP53	15 - 16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP54	14 - 15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP55	12 - 13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP56	15 - 16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP57	11 - 12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

DPT - Direct push technology

mg/kg - Milligrams per kilogram

TRPH - Total recoverable petroleum hydrocarbons

µg/kg - Micrograms per kilogram

ft - Feet

ND - Not detected

VOCs - Volatile organic compounds

Table 5-4. Analytical Results for Groundwater Detections, Phases I and II RFI Site Characterization (1996 and 1997)

Location	VOCs (µg/L)							
	Benzene	Bromoform	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	Dibromomethane	1,2-Dichlorobenzene
On-Site Mobile Laboratory Analyses								
Phase I								
SS61-DP01	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP02	7,200	ND	ND	ND	ND	ND	ND	ND
SS61-DP03	3,400	ND	ND	ND	ND	ND	ND	ND
SS61-DP04	96	ND	ND	ND	ND	ND	ND	ND
SS61-DP05	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP06	6,000	ND	ND	ND	ND	ND	ND	ND
SS61-DP07	1,900	ND	ND	ND	ND	ND	ND	ND
SS61-DP08	570	ND	ND	ND	ND	ND	ND	ND
SS61-DP09	80	ND	ND	ND	ND	ND	ND	ND
SS61-DP10	ND	ND	ND	ND	ND	ND	ND	ND
Phase II								
SS61-DP11 (dup)	10.1	ND	ND	ND	ND	ND	ND	ND
SS61-DP12 (dup)	2,200	ND	ND	ND	ND	ND	ND	ND
SS61-DP16	4,080	ND	ND	ND	ND	ND	ND	ND
SS61-DP17	3,900	ND	ND	ND	ND	ND	ND	ND
SS61-DP18	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP18 (dup)	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP19	922	ND	ND	ND	ND	ND	ND	ND
SS61-DP20	59	ND	ND	ND	ND	ND	ND	ND
SS61-DP23	640	ND	ND	ND	ND	ND	ND	ND
SS61-DP24	5,100	ND	ND	ND	ND	ND	ND	ND
SS61-DP25	ND	ND	ND	ND	ND	ND	ND	ND
MW-29-05	46	ND	0.65	ND	0.26	ND	0.3	ND
SS61-MW01	ND	ND	ND	ND	ND	ND	ND	ND
SS61-MW02	0.43	ND	ND	ND	2.5	0.22	ND	5.3
SS61-MW03	11,000	1.6	ND	5.4	3.6	ND	6.8	ND
SS61-MW04	2.9	ND	ND	ND	0.52	0.2	ND	ND
SS61-MW04 (Dup)	2.2	ND	ND	ND	0.29	ND	ND	ND
Off-Site Fixed Laboratory Analyses								
SS61-DP11	7.9	ND	ND	ND	ND	ND	ND	ND
SS61-DP12	1,900	ND	ND	ND	ND	ND	ND	ND
SS61-DP13	704	ND	ND	ND	ND	ND	ND	ND
SS61-DP14	1,420	ND	ND	ND	ND	ND	ND	ND
SS61-DP15	2.8	ND	ND	ND	ND	ND	ND	ND
SS61-DP22	8,640	ND	ND	ND	ND	ND	ND	ND

Note: The sample collected at SS61-DP16 was also analyzed for gasoline, diesel, and oil

ND - Analyte detected or reported at less than the detection limit

VOC - Volatile organic compound

µg/L - Micrograms per liter

Table 5-4. Analytical Results for Groundwater Detections, Phases I and II RFI Site Characterization (1996 and 1997)

Location	VOCs (µg/L)							
	1,3-Dichlorobenzene	1,4-Dichlorobenzene	1,1-Dichloroethane	1,2-Dichloroethane	1,2-Dichloropropane	cis-1,3-Dichloropropene	trans-1,3-Dichloropropene	Ethylbenzene
On-Site Mobile Laboratory Analyses								
Phase I								
SS61-DP01	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP02	ND	ND	ND	ND	ND	ND	ND	890
SS61-DP03	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP04	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP05	ND	ND	ND	140	ND	ND	ND	ND
SS61-DP06	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP07	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP08	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP09	ND	ND	ND	18	ND	ND	ND	ND
SS61-DP10	ND	ND	ND	ND	ND	ND	ND	ND
Phase II								
SS61-DP11 (dup)	ND	ND	ND	104	ND	ND	ND	ND
SS61-DP12 (dup)	ND	ND	ND	102	ND	ND	ND	ND
SS61-DP16	ND	ND	ND	178	ND	ND	ND	308
SS61-DP17	ND	ND	ND	315	ND	ND	ND	40
SS61-DP18	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP18 (dup)	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP19	ND	ND	ND	13.1	ND	ND	ND	336
SS61-DP20	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP23	ND	ND	ND	21	ND	ND	ND	140
SS61-DP24	ND	ND	ND	288	ND	ND	ND	230
SS61-DP25	ND	ND	ND	ND	ND	ND	ND	ND
MW-29-05	ND	ND	ND	210	0.4	0.27	0.22	0.76
SS61-MW01	ND	ND	ND	ND	ND	ND	ND	ND
SS61-MW02	1.9	1.2	1.1	1.8	ND	ND	ND	ND
SS61-MW03	ND	ND	ND	940	1.6	ND	ND	65
SS61-MW04	ND	ND	ND	3.8	ND	ND	ND	0.53
SS61-MW04 (Dup)	ND	ND	ND	3.4	ND	ND	ND	ND
Off-Site Fixed Laboratory Analyses								
SS61-DP11	ND	ND	ND	87	ND	ND	ND	ND
SS61-DP12	ND	ND	ND	118	ND	ND	ND	ND
SS61-DP13	ND	ND	ND	47	ND	ND	ND	ND
SS61-DP14	ND	ND	ND	60	ND	ND	ND	ND
SS61-DP15	ND	ND	ND	3.8	ND	ND	ND	ND
SS61-DP22	ND	ND	ND	310	ND	ND	ND	523

Note: The sample collected at SS61-DP10

ND - Analyte detected or reported at less t

VOC - Volatile organic compound

µg/L - Micrograms per liter

Table 5-4. Analytical Results for Groundwater Detections, Phases I and II RFI Site Characterization (1996 and 1997)

Location	VOCs (ug/L)			Explosives (ug/L)			
	Toluene	Total Xylenes	Trichloroethene	Nitrobenzene	RDX	Tetryl	1,3,5-Trinitrobenzene
On-Site Mobile Laboratory Analyses							
Phase I							
SS61-DP01	ND	ND	ND	ND	ND	ND	ND
SS61-DP02	ND	13	ND	ND	ND	ND	ND
SS61-DP03	ND	31	ND	ND	ND	ND	ND
SS61-DP04	ND	ND	ND	ND	ND	ND	ND
SS61-DP05	ND	ND	ND	ND	ND	ND	ND
SS61-DP06	ND	18	ND	ND	ND	ND	ND
SS61-DP07	ND	ND	ND	ND	ND	ND	ND
SS61-DP08	ND	ND	ND	ND	ND	ND	ND
SS61-DP09	ND	ND	ND	ND	ND	ND	ND
SS61-DP10	ND	ND	ND	ND	ND	ND	ND
Phase II							
SS61-DP11 (dup)	ND	ND	ND	ND	ND	ND	ND
SS61-DP12 (dup)	ND	ND	ND	ND	ND	ND	ND
SS61-DP16	2,600	2,400	ND	ND	ND	ND	ND
SS61-DP17	ND	17	ND	ND	ND	ND	ND
SS61-DP18	ND	ND	ND	ND	ND	ND	ND
SS61-DP18 (dup)	ND	ND	ND	ND	ND	ND	ND
SS61-DP19	ND	6	ND	ND	ND	ND	ND
SS61-DP20	ND	ND	14	ND	ND	ND	ND
SS61-DP23	460	940	ND	ND	ND	ND	ND
SS61-DP24	1,030	3,800	ND	ND	ND	ND	ND
SS61-DP25	ND	ND	ND	ND	ND	ND	ND
MW-29-05	0.81	0.89	ND	ND	ND	ND	ND
SS61-MW01	ND	ND	ND	ND	ND	ND	ND
SS61-MW02	ND	ND	45	ND	ND	ND	ND
SS61-MW03	2,300	5,800	1.8	ND	ND	ND	ND
SS61-MW04	ND	2.32	ND	ND	ND	ND	ND
SS61-MW04 (Dup)	ND	3.2	ND	ND	ND	ND	ND
Off-Site Fixed Laboratory Analyses							
SS61-DP11	ND	ND	ND	ND	ND	ND	ND
SS61-DP12	ND	ND	ND	ND	ND	ND	ND
SS61-DP13	ND	4.9	ND	ND	ND	ND	ND
SS61-DP14	ND	30	ND	ND	ND	ND	ND
SS61-DP15	ND	ND	5.6	ND	ND	ND	ND
SS61-DP22	3,620	1,140	ND	7.4	35	1.6	13

Note: The sample collected at SS61-DP16
 ND - Analyte detected or reported at less than
 VOC - Volatile organic compound
 ug/L - Micrograms per liter

Table 5-5. Analytical Results for Groundwater Detections in the Phase I Remedial Investigation

Location	Detected VOC Concentrations (µg/L)															
	Benzene	sec-Butylbenzene	tert-Butylbenzene	Chloroform	1,2-Dibromoethane	1,2-Dichlorobenzene	1,2-Dichloroethane	Ethylbenzene	Isopropylbenzene	n-Propylbenzene	Toluene	Trichloroethene	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	o-Xylene	m,p-Xylenes
SS61-DP26	2,900	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP27	6,900	ND	ND	ND	ND	ND	ND	ND	1,700	ND	2,000	ND	ND	ND	1,500	2,400
SS61-DP28	440	ND	ND	ND	ND	ND	ND	ND	ND	ND	6	ND	ND	ND	3	5
SS61-DP29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3	ND	ND	ND	ND	ND
SS61-DP30	15,000	ND	ND	ND	1,400	ND	ND	1,700	5,400	ND	20,000	ND	1,100	ND	3,100	7,400
SS61-DP31	8,700	ND	ND	ND	ND	ND	ND	670	1,400	ND	960	ND	ND	ND	640	1,100
SS61-DP32	18,000	28	ND	ND	49	ND	ND	1,100	3,300	53	1,200	ND	ND	ND	530	1,400
SS61-DP33	19,000	ND	ND	ND	110	ND	ND	750	650	27	14,000	ND	ND	ND	1,600	3,300
SS61-DP34	8,100	ND	ND	ND	ND	ND	ND	1,400	2,700	ND	600	ND	1,600	940	2,200	5,100
SS61-DP35	89	11	6	ND	ND	ND	ND	290	1,900	94	3	ND	ND	ND	9	ND
SS61-DP36	ND	ND	ND	ND	ND	ND	ND	ND	8	ND	ND	16	ND	ND	ND	ND
SS61-DP37	ND	ND	ND	8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-MW01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-MW02	7	ND	ND	ND	ND	9	ND	3	ND	ND	ND	34	ND	ND	ND	ND
SS61-MW03	8,200	ND	ND	ND	ND	ND	ND	ND	ND	ND	900	ND	ND	ND	770	1,200
SS61-MW04	ND	ND	ND	ND	ND	ND	ND	ND	94	ND	ND	ND	24	12	5	13
SS61-MW05	ND	ND	ND	ND	ND	ND	ND	3	66	ND	ND	ND	ND	ND	ND	ND
SS61-MW06	14,000	ND	ND	ND	ND	ND	ND	1,300	2,600	ND	6,800	ND	1,400	ND	3,300	7,800
MW-29-02	ND	ND	ND	ND	ND	ND	27	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-29-03	ND	ND	ND	9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-29-05	440	ND	ND	ND	ND	ND	190	ND	640	ND	ND	ND	ND	ND	ND	ND
MW-29-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-MW04D	ND	ND	ND	ND	ND	ND	ND	ND	160	ND	ND	ND	41	21	8	23
SS61DP31WD	14,000	ND	ND	ND	ND	ND	ND	1,900	3,400	ND	1,900	ND	1,100	ND	1,800	3,300

Notes:

µg/L - micrograms per liter

ND - Analyte detected or reported at less than the detection limit

VOC - Volatile organic compound

Table 5-6. Analytical Results for Groundwater Detections, Phase II Remedial Investigation

Location	TPH	VOCs (µg/L)									
	JP-4 (µg/L)	Benzene	Chloroform	sec-Butylbenzene	tert-Butylbenzene	1,2-Dibromoethane	1,2-Dichlorobenzene	1,2-Dichloroethane	1,1-Dichloroethane	Ethylbenzene	2-Hexanone
DPT Groundwater Samples											
SS61-DP38	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP39	5,600 J	8,900	ND	ND	85	ND	ND	ND	ND	ND	ND
SS61-DP40	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP41	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP42	1,100 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP43	60,000	9,100	ND	ND	ND	ND	ND	ND	ND	940	ND
SS61-DP44	3,400 J	ND	ND	ND	7.3	ND	ND	ND	ND	ND	ND
SS61-DP45	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP46	530 J	ND	ND	ND	ND	ND	6.2	ND	ND	ND	ND
SS61-DP47	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP48	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP49	3,600	200 J	ND	15 J	8 J	ND	ND	ND	ND	3,700 J	ND
SS61-DP50	860 J	270 J	ND	ND	6.9 J	ND	ND	ND	ND	ND	ND
SS61-DP51	760 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP52	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP53	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP54	840	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP55	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-DP56	ND	ND	ND	ND	ND	ND	ND	ND	15	ND	ND
SS61-DP57	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Monitoring Well Samples											
SS61-MW01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-MW02	ND	0.86	0.63	ND	ND	ND	5.6	ND	ND	ND	ND
SS61-MW03	1,400 J	7,300 J	ND	ND	ND	18 J	160 J	ND	ND	22 J	ND
SS61-MW04	650	1,100 J	ND	10 J	5.7 J	ND	49 J	ND	ND	5.5 J	16 J
SS61-MW05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-MW06	2,500 J	13,000 J	ND	14 J	ND	ND	ND	ND	ND	720 J	ND
SS61-MW07	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-MW08	ND	3.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-MW09	ND	ND	0.54	ND	ND	ND	ND	ND	ND	ND	ND
SS61-MW10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS61-MW11	ND	ND	2.6 J	ND	ND	ND	ND	ND	ND	ND	ND
SS61-MW12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-29-02	ND	ND	1.3	ND	ND	ND	ND	22	ND	ND	ND
MW-29-03	ND	ND	6	ND	ND	ND	ND	ND	ND	ND	ND
MW-29-05	ND	79	ND	3.5	2.2	ND	ND	160	ND	ND	ND
MW-29-06	ND	ND	ND	ND	ND	ND	ND	3.1	ND	ND	ND

Notes:

DPT - Direct push technology

ND - Not detected above the reporting limit

TPH - Total petroleum hydrocarbons

VOCs - Volatile organic compounds

µg/L - Micrograms per liter

APPENDIX C

Lithologic Logs and Well Construction Diagrams

Foster Wheeler Environmental Corporation, Final Remedial Investigation Report for Spill Site 61, Holloman Air Force Base, New Mexico, August 1999.

Foster Wheeler Environmental Corporation, Final Phase II Remedial Investigation Report for SS-61, Holloman Air Force Base, New Mexico, December 2000.

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Lithologic Logs and Well Construction Diagrams

Foster Wheeler Environmental Corporation, *Final Remedial Investigation Report for Spill Site 61, Holloman Air Force Base, New Mexico, August 1999.*

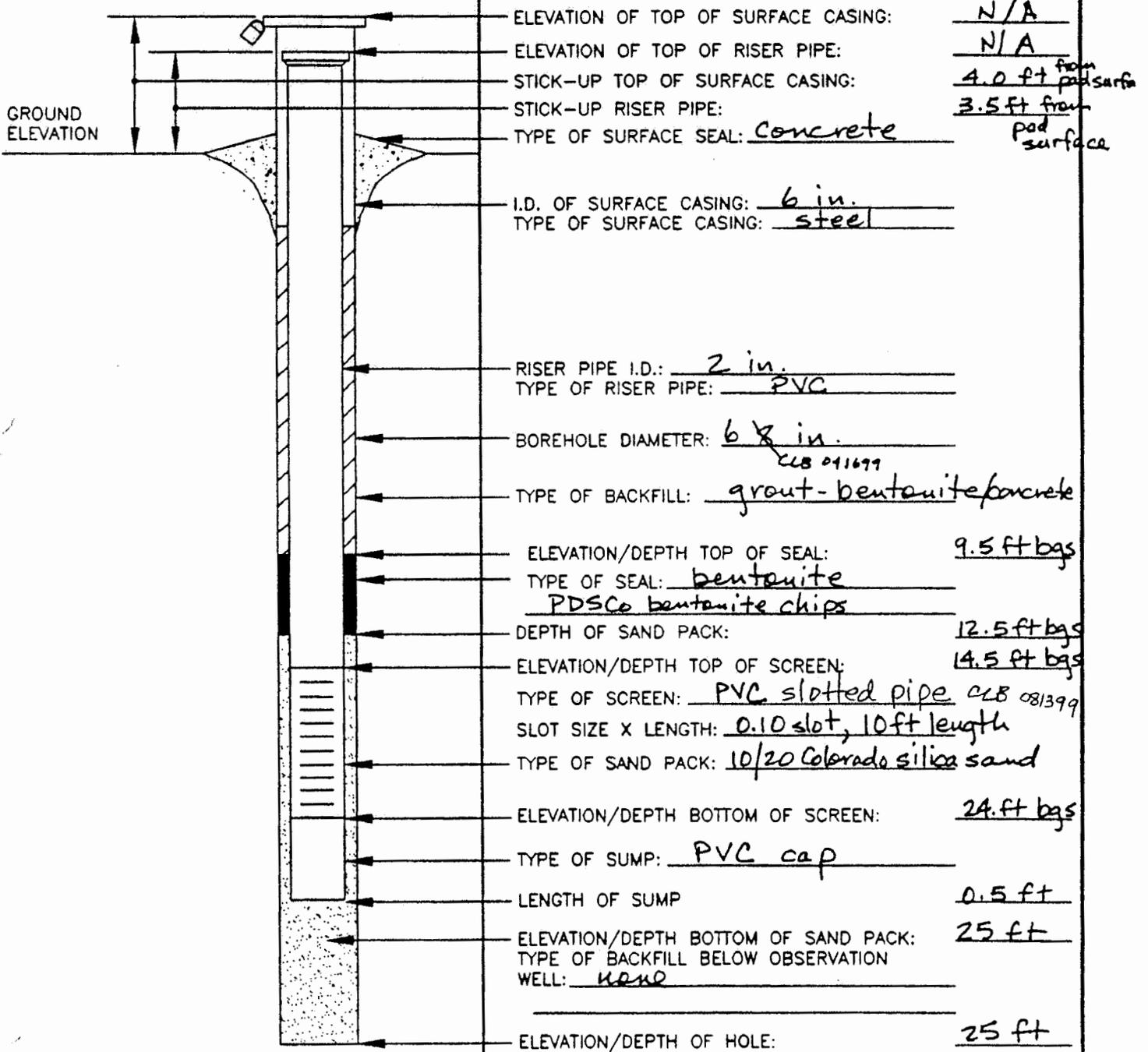
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OVERBURDEN
MONITORING WELL SHEET

WELL NO. SS61-MW05

PROJECT: SS-61 RI
 PROJECT NO.: 5155.0022.0003 BORING NO.: SS61-MW05
 ELEVATION: N/A DATE: 4/9/99
 FIELD GEOLOGIST: Carol Bieniulis

DRILLER: D. Hogan-Alliance
 DRILLING METHOD: HSA
 DEVELOPMENT METHOD: Teflon bailer/pump



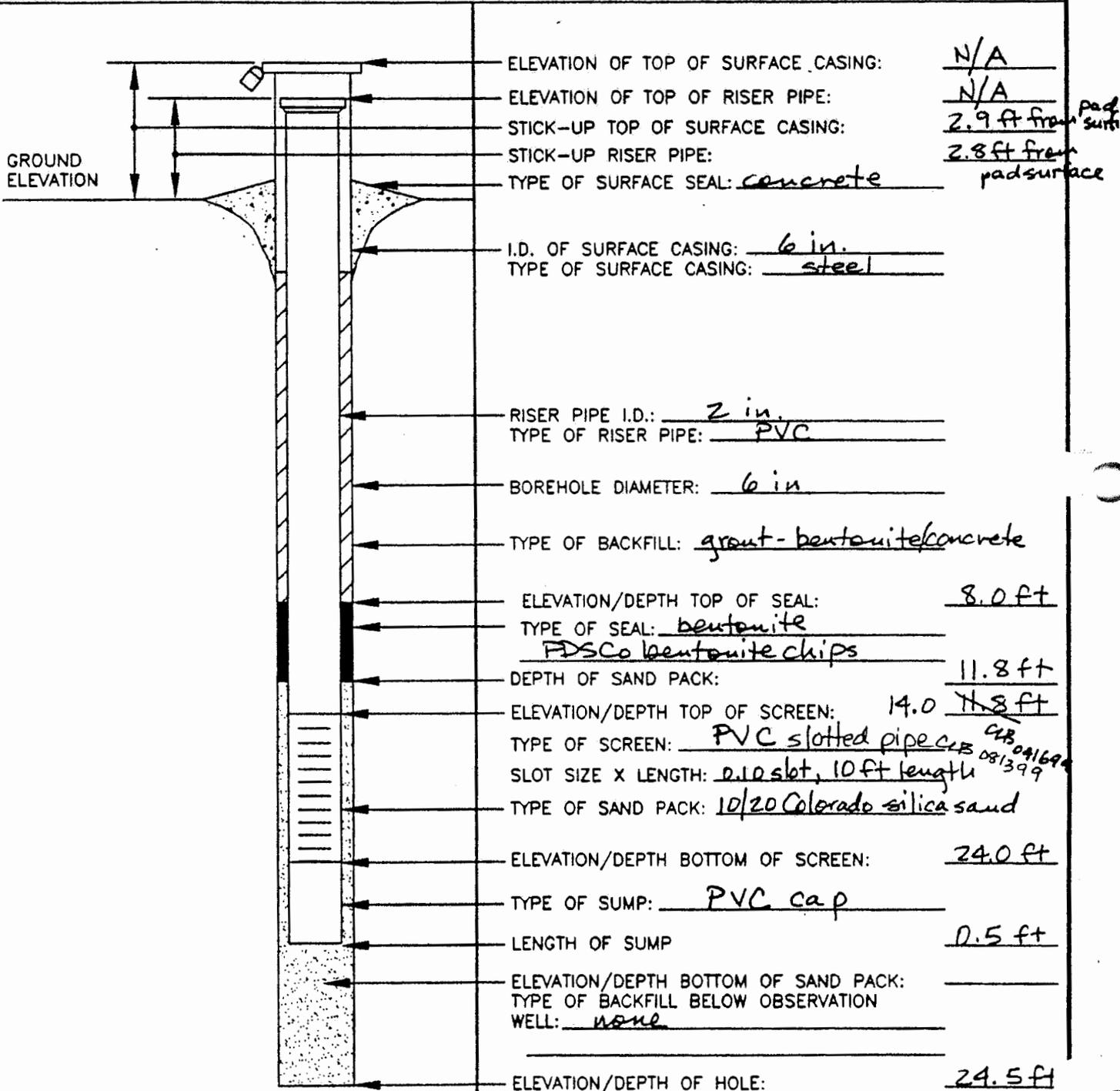
NOT TO SCALE

OVERBURDEN
MONITORING WELL SHEET

WELL NO. SS61-MW06

PROJECT: SS61 RI
 PROJECT NO.: 5155.0022.0003 BORING NO.: SS61-MW06
 ELEVATION: N/A DATE: 4/8/99
 FIELD GEOLOGIST: Carol Bieniulis

DRILLER: D. Hagan - Alliance
 DRILLING METHOD: HSA
 DEVELOPMENT METHOD: Teflon bailer / pump



ELEVATION OF TOP OF SURFACE CASING: N/A
 ELEVATION OF TOP OF RISER PIPE: N/A
 STICK-UP TOP OF SURFACE CASING: 2.9 ft from pad surface
 STICK-UP RISER PIPE: 2.8 ft from pad surface
 TYPE OF SURFACE SEAL: concrete
 I.D. OF SURFACE CASING: 6 in.
 TYPE OF SURFACE CASING: steel
 RISER PIPE I.D.: 2 in.
 TYPE OF RISER PIPE: PVC
 BOREHOLE DIAMETER: 6 in
 TYPE OF BACKFILL: grout-bentoniteconcrete
 ELEVATION/DEPTH TOP OF SEAL: 8.0 ft
 TYPE OF SEAL: bentonite
FDSCO bentonite chips
 DEPTH OF SAND PACK: 11.8 ft
 ELEVATION/DEPTH TOP OF SCREEN: 14.0 ft
 TYPE OF SCREEN: PVC slotted pipe
 SLOT SIZE X LENGTH: 0.10 slot, 10 ft length
 TYPE OF SAND PACK: 10/20 Colorado silica sand
 ELEVATION/DEPTH BOTTOM OF SCREEN: 24.0 ft
 TYPE OF SUMP: PVC cap
 LENGTH OF SUMP: 0.5 ft
 ELEVATION/DEPTH BOTTOM OF SAND PACK: 24.5 ft
 TYPE OF BACKFILL BELOW OBSERVATION WELL: none
 ELEVATION/DEPTH OF HOLE: 24.5 ft

NOT TO SCALE

HTRW DRILLING LOG		DISTRICT OMAHA		HOLE NO. SS61-MW05	
1. COMPANY NAME FOSTER WHEELER ENVIRONMENTAL CORPORATION		2. DRILLING SUBCONTRACTOR Alliance Environmental, Inc.		SHEET 1 OF 3	
3. SITE SS-61, Holloman AFB, NM		4. LOCATION SS61-MW05			
5. NAME OF DRILLER		6. MANUFACTURERS DESIGNATION OF DRILL Mobile Drill, model B-61			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	8. HOLE LOCATION with yard north of Bldg. 1087				
	9. SURFACE ELEVATION N/A				
10. DATE STARTED 4-9-99		11. DATE COMPLETED 4-9-99			
12. OVERBURDEN THICKNESS N/A		15. DEPTH GROUNDWATER ENCOUNTERED ~19 ft			
13. DEPTH DRILLED INTO ROCK N/A		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 18.5 ft			
14. TOTAL DEPTH OF HOLE 24.5 ft		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)			
18. GEOTECHNICAL SAMPLES none	DISTURBED N/A		UNDISTURBED N/A		19. TOTAL NUMBER OF CORE BOXES: N/A
20. SAMPLES FOR CHEMICAL ANALYSIS None	VOC NA	METALS NA	OTHERS (SPECIFY) NA	OTHERS (SPECIFY) NA	OTHERS (SPECIFY) NA
					21. TOTAL CORE REC. % 100
22. DISPOSITION OF HOLE Install monitoring well	BACKFILLED —	MONITORING WELL X	OTHERS (SPECIFY) —	23. SIGNATURE OF INSPECTOR Carol Biennio	
LOCATION SKETCH/COMMENTS:					
<p>The sketch shows a plan view of the site. At the top is a rectangular box labeled 'Bldg 1087'. Below it, a horizontal line represents a 'Road'. To the left of the road is another rectangular box labeled 'Bldg 1072'. To the right of the road is a rectangular box labeled 'concrete Pad'. Two monitoring wells are marked with circles and crosses: 'SS61-MW05' is located between Bldg 1087 and the road, and 'SS61-MW06' is located between the road and the concrete pad. A north arrow is shown in the bottom left corner, pointing downwards.</p>					

PROJECT #:		SITE:		LOCATION:	
5155.0022.0003.H0000		SS-61, Holloman AFB, NM		SS61-MW05	
HTRW DRILLING LOG			DISTRICT		LOCATION:
			OMAHA		SS61-MW05
1. PROJECT #			2. INSPECTOR		SHEET
5155.0022.0003.H0000			Carol Bieniulis		2 OF 3
ELEV.	DEPTH (feet)	FIELD SCREEN RESULTS	USCS CLASS.	MATERIAL DESCRIPTION	COMMENTS
	1.0	BKGD		Fill material, poorly sorted	
	2	BKGD	CL	Clayey sand w/ some gravel, slightly moist, low plasticity, 10YR 6/2, poorly sorted	
	3				
	4	BKGD	CL	Clay with some sand and silt, med plasticity, slight. moist; 10YR 7/4	
	5				
	6			same as above	
	7	BKGD			
	8				
	9		SC	Clayey sand w/ some gravel, slightly moist, poorly sorted, 7.5 YR 7/2	
	10				
	11	BKGD			
	12				
	13				
	14	BKGD	CL	sandy clay, slightly moist, low plasticity, well sorted/graded, 7.5 YR 7/2	
	15			CL 091099	
	16				
	17			Silty clay, no sand or gravel, well graded, low plasticity, slightly moist, 7.5 YR 8/4	
	18				
	19	BKG	ML	Clay w/ silt, well graded, slightly moist, high plasticity, 7.5 YR 7/4	▽ Water
	20				

PROJECT #: 5155.0022.0003.H0000		SITE: SS-61, Holloman AFB, NM		LOCATION: SS61-MW05	
HTRW DRILLING LOG			DISTRICT OMAHA		LOCATION: SS61-MW05
1. PROJECT # 5155.0022.0003.H0000			2. INSPECTOR Carol Bieniulis		SHEET 3 OF 3
ELEV.	DEPTH (feet)	FIELD SCREEN RESULTS	USCS CLASS.	MATERIAL DESCRIPTION	COMMENTS
	21			Same as above	
	22	BKGD			
	23				
	24	BKGD	ML	Clay w/ silt, well graded, saturated, very plastic, 5 YR 6/4.	Strong petroleum odor
			CL	Silty clay w/ some sand, saturated, med plasticity, well graded, 10 YR 5/1 TD = 24.5 ft Water at 18.5 ft (0820) Measured at 14.3 ft (0945)	Very Strong Petroleum odor Need to take water level again

HTRW DRILLING LOG		DISTRICT OMAHA		HOLE NO. SS61-MW06	
1. COMPANY NAME FOSTER WHEELER ENVIRONMENTAL CORPORATION		2. DRILLING SUBCONTRACTOR Alliance Environmental, Inc.		SHEET 1 OF 3	
3. SITE SS-61, Holloman AFB, NM		4. LOCATION SS61-MW06			
5. NAME OF DRILLER Dave Hogan - Alliance		6. MANUFACTURERS DESIGNATION OF DRILL Mobile Drill, model B-61			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	Hollow-stem auger		8. HOLE LOCATION South of east end of concrete pad		
	4.25 in ID		9. SURFACE ELEVATION N/A		
8.5 in OD		10. DATE STARTED 4-8-99		11. DATE COMPLETED 4-8-99	
12. OVERBURDEN THICKNESS N/A		15. DEPTH GROUNDWATER ENCOUNTERED ~ 19 ft			
13. DEPTH DRILLED INTO ROCK N/A		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 19.5 ft			
14. TOTAL DEPTH OF HOLE 24.5		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)			
18. GEOTECHNICAL SAMPLES none	DISTURBED N/A		UNDISTURBED N/A		19. TOTAL NUMBER OF CORE BOXES: N/A
20. SAMPLES FOR CHEMICAL ANALYSIS none	VOC	METALS	OTHERS (SPECIFY)	OTHERS (SPECIFY)	21. TOTAL CORE REC. 100 NA
	NA	NA	NA	NA	
22. DISPOSITION OF HOLE Monitoring well installation	BACKFILLED	MONITORING WELL	OTHERS (SPECIFY)	23. SIGNATURE OF INSPECTOR Carl Bienialis	
		X			
LOCATION SKETCH/COMMENTS: <p> <input type="checkbox"/> — concrete vaults — <input type="checkbox"/> <input type="checkbox"/> Concrete pad <input type="checkbox"/> SS61-MW04 SS61-MW06 </p>					

4/30/99

PROJECT #: 5155.0022.0003.H0000		SITE: SS-61, Holloman AFB, NM		LOCATION: SS61-MW26	
HTRW DRILLING LOG			DISTRICT OMAHA		LOCATION: SS61-MW26
1. PROJECT # 5155.0022.0003.H0000			2. INSPECTOR Carol Bieniulis		SHEET 2 OF 3
ELEV.	DEPTH (feet)	FIELD SCREEN RESULTS	USCS CLASS.	MATERIAL DESCRIPTION	COMMENTS
	1	BKGD		See HTRW Drilling Log for SS61-DP34 for lithologic descriptions to 22.0 ft in depth	
	2				
	3				
	4				
	5	BKGD			
	6				
	7				
	8				
	9				
	10	BKGD			
	11				
	12				
	13				
	14				
	15	BKGD			
	16				
	17				
	18				
	19	12 ppm			▽ water
	20				

Lithologic Logs and Well Construction Diagrams

Foster Wheeler Environmental Corporation, *Final Phase II Remedial Investigation Report for SS-61, Holloman Air Force Base, New Mexico*, December 2000.

HTRW DRILLING LOG		DISTRICT OMAHA			HOLE NUMBER SS61-DP43	
1.COMPANY NAME Foster Wheeler Environmental Corp.		2.DRILL SUBCONTRACTOR Indian Fire and Safety			SHEET SHEETS 1 of 3	
3.PROJECT 515.0027.0007 H2000			4.LOCATION SS-61, Holloman AFB			
5.NAME OF DRILLER Rafe Jones			6.MANUFACTURER'S DESIGNATION OF DRILL			
7.SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT DPT Rig		8.HOLE LOCATION SS61-DP43				
		9.SURFACE ELEVATION N/A				
		10.DATE STARTED 5/2/00		11.DATE COMPLETED 5/2/00		
12.OVERBURDEN THICKNESS N/A		15.DEPTH GROUNDWATER ENCOUNTERED 23 ft				
13.DEPTH DRILLED INTO ROCK N/A		16.DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 12.45 ft bgs at 1200 on 5/3/00				
14.TOTAL DEPTH OF HOLE 25.5 ft		17.OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A				
18.GEOTECHNICAL SAMPLES None		DISTURBED N/A	UNDISTURBED N/A	19.TOTAL NUMBER OF CORE BOXES		
20.SAMPLES FOR CHEMICAL ANALYSIS		VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)
		soil and water		soil -TRPH	water - TPH-JP4	
22.DISPOSITION OF HOLE		BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23.SIGNATURE OF INSPECTOR Luke Darragh	
		w/ bentonite	N/A			
LOCATION SKETCH/COMMENTS					SCALE 1 inch = 300 feet	
PROJECT 5155.0027.0007				HOLE NO. SS61-DP43		

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP43

PROJECT 5155.0027.0007 H2000

INSPECTOR Luke Darragh

SHEET 2 of 3 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
		Tan Silty SAND, dry, loose, fine to medium Sand, trace coarse Sand	1.0 ppm				SM
	2	Brown Silty CLAY, dry, soft, low plasticity, trace fine Sand					CL
	4	Brown/Tan Clayey SAND, moist, medium density, fine to medium Sand, trace coarse Sand	0.30 ppm				SC
	6	Grey/Tan Silty CLAY, moist, soft, low plasticity, trace fine Sand					CL
	8	same as above - color change to brown					
	10	Brown Clayey SILT, moist, soft, fine Sand, trace medium and coarse Sand	1.0 ppm				ML
	12	Brown Silty CLAY, moist, medium stiffness, medium plasticity, some fine Sand	7.95 ppm				CL
	14	same as above, Silty CLAY	53.25 ppm				CL
	16	Grey/Green Silty CLAY, moist, stiff, slight plasticity, some fine Sand					CL
	18	same as above - strong odor	45.22 ppm				CL
		Brown Silty CLAY, moist, stiff, fine Sand and small crystals	33.5 ppm				CL

PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-DP43

HTRW DRILLING LOG (CONTINUATION SHEET)				HOLE NUMBER SS61-DP43	
PROJECT 5155.0027.0007 H2000		INSPECTOR Luke Darragh			SHEET 3 OF SHEETS 3

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
		Brown Silty CLAY, moist, stiff, medium plasticity, some fine Sand and crystals, strong odors	2000 ppm				CL
	22	Same as above, (Silty CLAY) Wet at about 23 ft	2022 ppm				CL
	24	Same as above but saturated	1795 ppm				CL
	26	TD = 25.5 ft					

PROJECT 5155.0027.0007 H2000	HOLE NO. SS61-DP43
ENG FORM 5056A-R, AUG 94	(Proponent: CECW-EG)

HTRW DRILLING LOG		DISTRICT OMAHA			HOLE NUMBER SS61-DP45	
1.COMPANY NAME Foster Wheeler Environmental Corp.		2.DRILL SUBCONTRACTOR Indian Fire and Safety			SHEET SHEETS 1 OF 2	
3.PROJECT 5155.0027.0007			4.LOCATION SS-61, Holloman AFB			
5.NAME OF DRILLER Rafe Jones			6.MANUFACTURER'S DESIGNATION OF DRILL			
7.SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT DPT Rig		8.HOLE LOCATION SS61-DP45				
9.SURFACE ELEVATION N/A						
			10.DATE STARTED 5/2/00		11.DATE COMPLETED 5/2/00	
12.OVERBURDEN THICKNESS N/A			15.DEPTH GROUNDWATER ENCOUNTERED 13 ft			
13.DEPTH DRILLED INTO ROCK N/A			16.DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 11.60 ft bgs on 5/3/00			
14.TOTAL DEPTH OF HOLE 19.5 ft			17.OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A			
18.GEOTECHNICAL SAMPLES None		DISTURBED		UNDISTURBED		19.TOTAL NUMBER OF CORE BOXES
20.SAMPLES FOR CHEMICAL ANALYSIS		VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)
		soil and water	N/A	soil - TRPH	water - TPH-JP4	21.TOTAL CORE RECOVERY %
22.DISPOSITION OF HOLE		BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23.SIGNATURE OF INSPECTOR Luke Darragh	
		w/ bentonite	N/A			
LOCATION SKETCH/COMMENTS					SCALE 1 Inch = 300 feet	
PROJECT 5155.0027.0007				HOLE NO. SS61-DP45		

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP45

PROJECT **5155.0027.0007 H2000**

INSPECTOR **Luke Darragh**

SHEET **2** OF **2** SHEETS

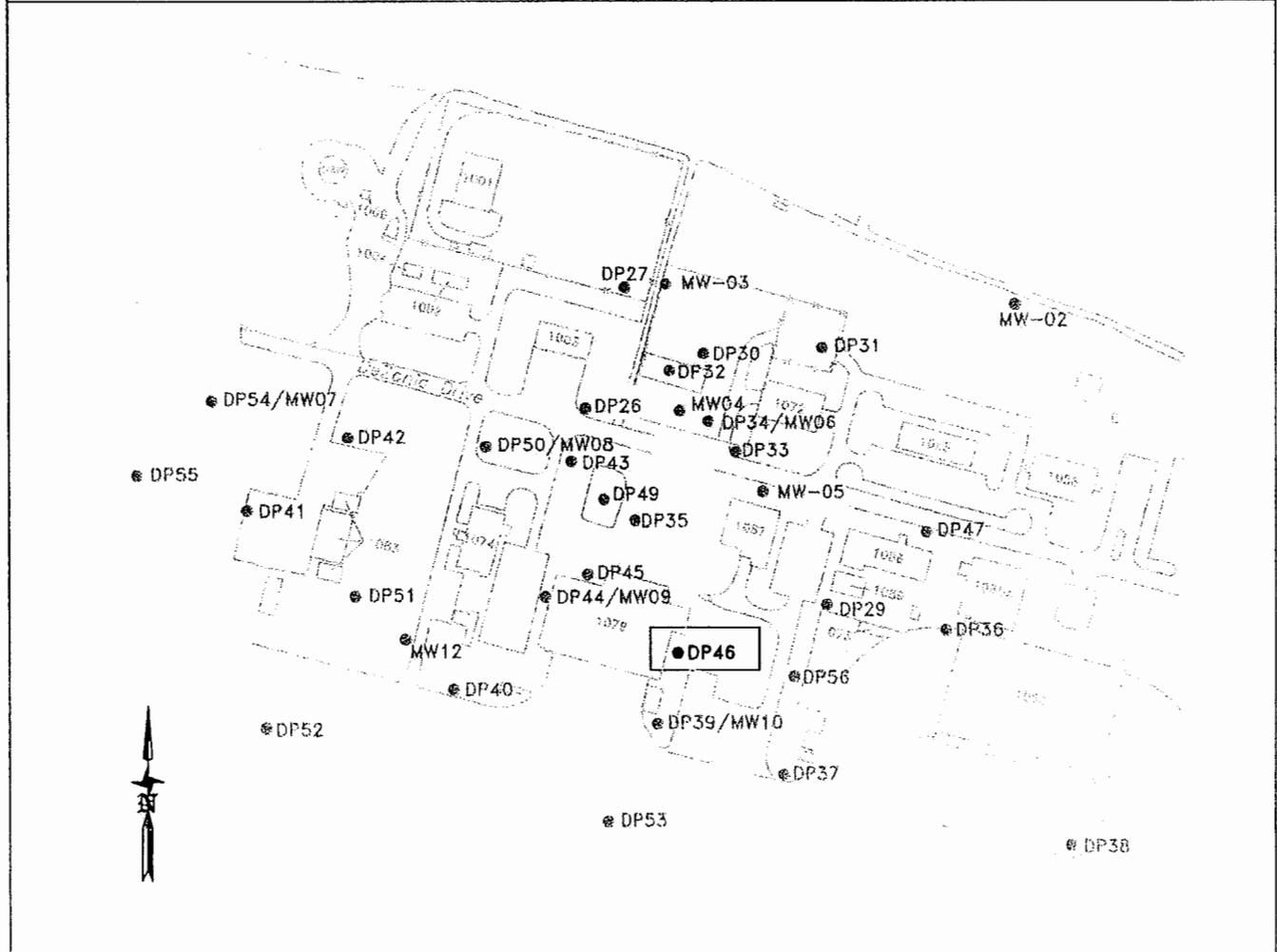
ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	2	Brown Clayey SILT with fine Sand, dry, soft	1.30 ppm				ML
	4	tip of sampler wet at 4 ft					
	6	Grey/Tan Clayey SILT with fine Sand, very moist, soft, trace medium Sand	1.25 ppm				ML
	8	Grey, well graded SAND with Gravel, dry, loose, trace Silt, gravel rounded to 10 mm in size					SW
	10	Tan Silty CLAY, very moist, soft, fine to medium Sand	0.79 ppm		SS61DP45S901 SS61DP45S902		CL
	12	Same as above with a trace of rounded gravel to 10 mm in size	1.5 ppm		SS61DP45S1201		CL
	14	Same as above except wet at about 13 ft	0.47 ppm				CL
	16	Brown Silty CLAY, wet soft, low plasticity, some fine to medium Sand, trace coarse Sand	240 ppm				CL
	18	Same as above (Silty CLAY) but stained grey/green from 18.5 to 19.5 ft, odor	1329 ppm				CL
		TD = 19.5 ft					

PROJECT **5155.0027.0007 H2000**

HOLE NO. **SS61-DP45**

HTRW DRILLING LOG		DISTRICT OMAHA		HOLE NUMBER SS61-DP46		
1.COMPANY NAME Foster Wheeler Environmental Corp.		2.DRILL SUBCONTRACTOR Indian Fire and Safety		SHEET SHEETS 1 of 1		
3.PROJECT 5155.0027.0007		4.LOCATION SS-61, Holloman AFB				
5.NAME OF DRILLER Rafe Jones		6.MANUFACTURER'S DESIGNATION OF DRILL				
7.SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT DPT Rig		8.HOLE LOCATION SS61-DP46				
		9.SURFACE ELEVATION N/A				
		10.DATE STARTED 5/3/00		11.DATE COMPLETED 5/3/00		
12.OVERBURDEN THICKNESS N/A		15.DEPTH GROUNDWATER ENCOUNTERED 12 ft				
13.DEPTH DRILLED INTO ROCK N/A		16.DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 11.04 ft 15 minutes after drilling				
14.TOTAL DEPTH OF HOLE 20 ft		17.OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A				
18.GEOTECHNICAL SAMPLES None		DISTURBED N/A	UNDISTURBED N/A	19.TOTAL NUMBER OF CORE BOXES		
20.SAMPLES FOR CHEMICAL ANALYSIS		VOC soil and water	METALS N/A	OTHER (SPECIFY) soil - TRPH	OTHER (SPECIFY) water - TPH-JP4	21.TOTAL CORE RECOVERY %
22.DISPOSITION OF HOLE w/ bentonite		BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23.SIGNATURE OF INSPECTOR Luke Darragh	

LOCATION SKETCH/COMMENTS SCALE 1 Inch = 300 feet



PROJECT 5155.0027.0007	HOLE NO. SS61-DP46
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HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP46

PROJECT 5155.0027.0007 H2000

INSPECTOR Luke Darragh

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
		gravel and stone (road cover)					
	2	Grey Silty SAND, dry, loose, fine to medium Sand, trace coarse Sand	0.31 ppm				SM
	4						
	6	Grey Sandy SILT, dry, soft, fine Sand	0.40 ppm		SS61DP46S501		ML
	8						
	10	Grey/Brown poorly graded SAND, dry, dense, medium to coarse Sand, very little fines			SS61DP46S901		SP
	12	Grey/Tan Silty CLAY, very moist, soft, trace medium Sand, low plasticity Same as above- color change to brown	0.43 ppm				CL
	14	Tan/Grey Clayey SILT, wet, soft, some medium Sand	0.57 ppm				ML
	16	Black/Grey well graded SAND, moist, loose, some angular gravel up to 20 mm in size					SW
	18	Brown Silty CLAY, wet, stiff, medium Plasticity, some medium Sand, white crystals	0.91 ppm				CL
		Same as Above, slight odor, color change to tan at 19 ft	2.53 ppm				CL
		TD = 20 ft					

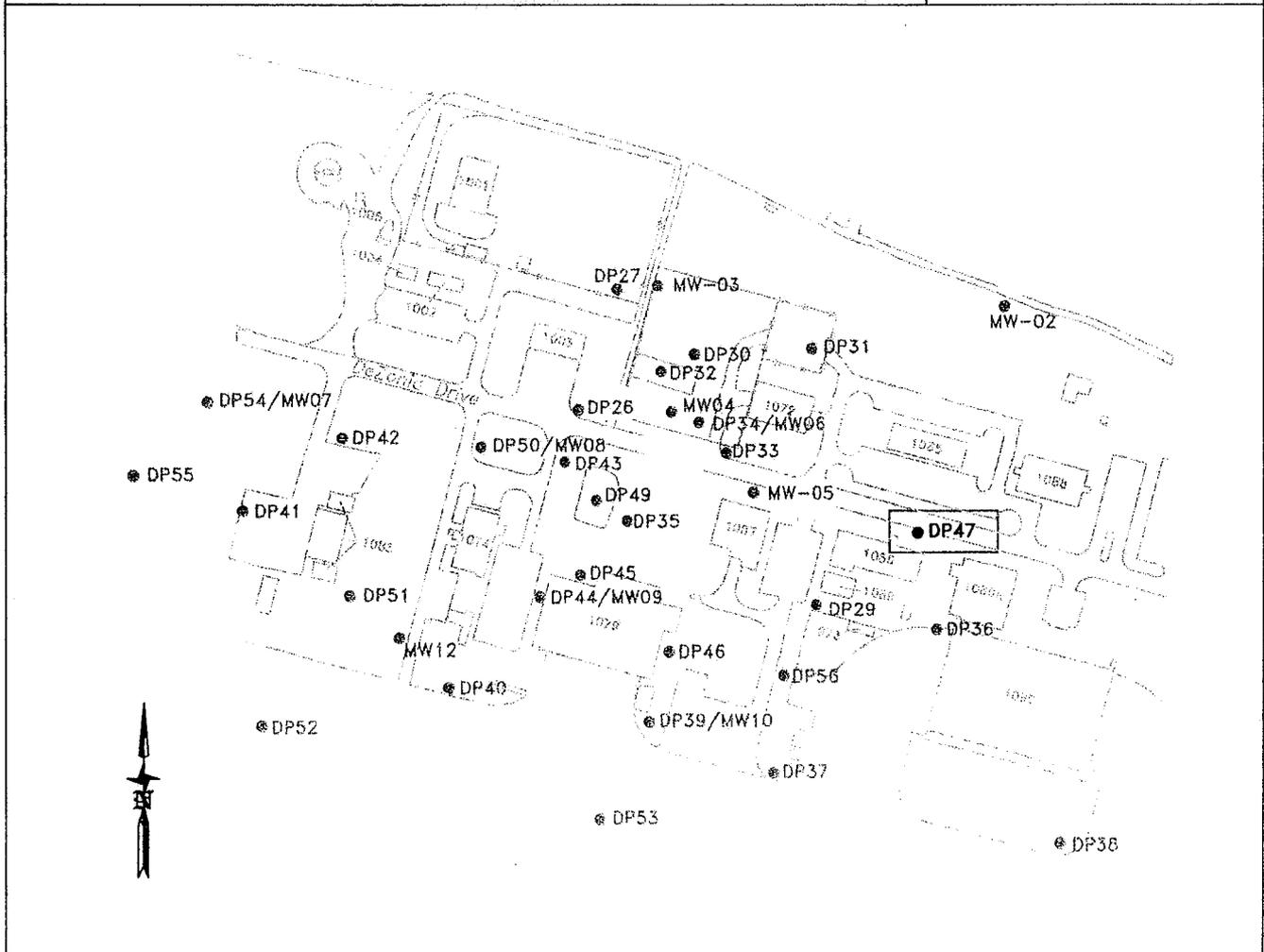
PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-DP46

HTRW DRILLING LOG		DISTRICT OMAHA		HOLE NUMBER SS61-DP47	
1.COMPANY NAME Foster Wheeler Environmental Corp.		2.DRILL SUBCONTRACTOR Indian Fire and Safety		SHEET SHEETS 1 of 2	
3.PROJECT 5155.0027.0007 H2000		4.LOCATION SS-61, Holloman AFB			
5.NAME OF DRILLER Rafe Jones		6.MANUFACTURER'S DESIGNATION OF DRILL			
7.SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT DPT Rig		8.HOLE LOCATION SS61-DP47			
		9.SURFACE ELEVATION N/A			
		10.DATE STARTED 5/4/00		11.DATE COMPLETED 5/4/00	
12.OVERBURDEN THICKNESS N/A		15.DEPTH GROUNDWATER ENCOUNTERED 14.8 ft			
13.DEPTH DRILLED INTO ROCK N/A		16.DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 13.75 ft at 1145 hours on 5/3/00			
14.TOTAL DEPTH OF HOLE 19.5 ft		17.OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A			
18.GEOTECHNICAL SAMPLES None		DISTURBED N/A	UNDISTURBED N/A	19.TOTAL NUMBER OF CORE BOXES	
20.SAMPLES FOR CHEMICAL ANALYSIS		VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)
		soil and water	N/A	soil - TRPH	water - TPH-JP4
22.DISPOSITION OF HOLE		BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	21.TOTAL CORE RECOVERY %
		w/ bentonite	N/A		
				23.SIGNATURE OF INSPECTOR Luke Darragh	

LOCATION SKETCH/COMMENTS

SCALE 1 Inch = 300 feet



PROJECT 5155.0027.0007

HOLE NO. SS61-DP47

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP47

PROJECT 5155.0027.0007 H2000

INSPECTOR Luke Darragh

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	2	Grey/Tan Silty SAND, dry, loose, medium Sand some coarse Sand					SM
	4	Same as above, color change to Brown					SM
	6	Light brown SILT, damp, soft, trace fine Sand					ML
	8	Same as above but dry	1.21 ppm		SS61DP47S801		ML
	10	Light brown Sandy SILT, damp, soft, fine Sand			SS61DP47S1101		ML
	12						
	14	Light brown Silty CLAY, very moist, soft, low plasticity, some fine Sand					CL
	16	Light brown Silty CLAY, damp, stiff, fine white Sand lenses (caliche)					CL
	18	same as above, very moist					CL
		Grey Silty SAND, very moist, fine Sand lenses, some coarse Sand, some Clay					SM
		Total Depth=19.5 ft					

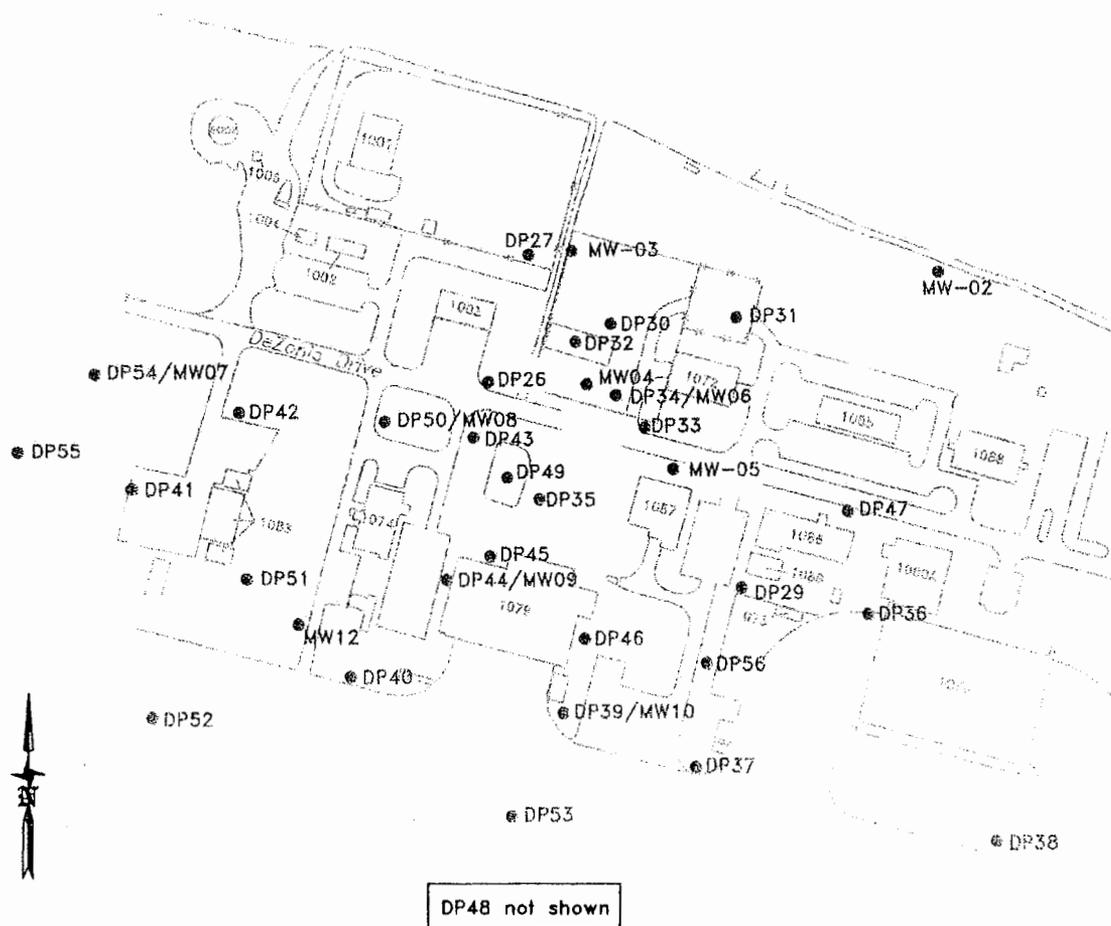
PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-DP47

HTRW DRILLING LOG		DISTRICT OMAHA		HOLE NUMBER SS61-DP48	
1.COMPANY NAME Foster Wheeler Environmental Corp.		2.DRILL SUBCONTRACTOR Indian Fire and Safety		SHEET SHEETS 1 of 2	
3.PROJECT 5155.0027.0007		4.LOCATION SS-61, Holloman AFB			
5.NAME OF DRILLER Rafe Jones		6.MANUFACTURER'S DESIGNATION OF DRILL			
7.SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT DPT Rig		8.HOLE LOCATION SS61-DP48			
		9.SURFACE ELEVATION N/A			
		10.DATE STARTED 5/10/00		11.DATE COMPLETED 5/10/00	
12.OVERBURDEN THICKNESS N/A		15.DEPTH GROUNDWATER ENCOUNTERED 15.0 ft			
13.DEPTH DRILLED INTO ROCK N/A		18.DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 10.51 ft, 2 hours after drilling			
14.TOTAL DEPTH OF HOLE 19.5 ft		17.OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A			
18.GEOTECHNICAL SAMPLES None		DISTURBED N/A	UNDISTURBED N/A	19.TOTAL NUMBER OF CORE BOXES	
20.SAMPLES FOR CHEMICAL ANALYSIS		VOC	METALS	OTHER (SPECIFY)	21.TOTAL CORE RECOVERY %
		soil and water	N/A	soil - TRPH	water - TPH-JP4
22.DISPOSITION OF HOLE		BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23.SIGNATURE OF INSPECTOR Luke Darragh
		V/ Bentonite	N/A		

LOCATION SKETCH/COMMENTS

SCALE 1 inch = 300 feet



PROJECT **5155.0027.0007**

HOLE NO. **SS61-DP48**

HTRW DRILLING LOG			DISTRICT OMAHA			HOLE NUMBER SS61-DP48	
1.COMPANY NAME Foster Wheeler Environmental Corp.			2.DRILL SUBCONTRACTOR Indian Fire and Safety			SHEET 1 OF 2 SHEETS	
3.PROJECT 5155.0027.0007 H2000			4.LOCATION SS-61, Holloman AFB				
5.NAME OF DRILLER Rafe Jones			6.MANUFACTURER'S DESIGNATION OF DRILL				
7.SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT			8.HOLE LOCATION SS61-DP48				
			9.SURFACE ELEVATION N/A				
			10.DATE STARTED 5/10/00		11.DATE COMPLETED 5/10/00		
12.OVERBURDEN THICKNESS N/A			15.DEPTH GROUNDWATER ENCOUNTERED 15.0 ft				
13.DEPTH DRILLED INTO ROCK N/A			16.DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 10.51 ft, 2 hours after drilling				
14.TOTAL DEPTH OF HOLE 19.5 ft			17.OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A				
18.GEOTECHNICAL SAMPLES None		DISTURBED N/A	UNDISTURBED N/A		19.TOTAL NUMBER OF CORE BOXES		
20.SAMPLES FOR CHEMICAL ANALYSIS		VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21.TOTAL CORE RECOVERY %
		soil and water	N/A	soil - TRPH	water - TPH-JP4		
22.DISPOSITION OF HOLE		BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23.SIGNATURE OF INSPECTOR		
		V/ Bentonite	N/A				
LOCATION SKETCH/COMMENTS						SCALE	
PROJECT 5155.0027.0007 H2000					HOLE NO. SS61-DP48		

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP48

PROJECT 5155.0027.0007 H2000

INSPECTOR Luke Darragh

SHEET 2 of 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	2	Light Brown SILT, dry, soft, trace fine to medium Sand					ML
	4						
	6	Light brown Silty CLAY, dry, medium stiffness, low plasticity, trace fine Sand					CL
	8	Grey Silty CLAY, dry, stiff, low plasticity, fine white Sand lenses throughout					CL
	10						
	12	Reddish brown Silty CLAY, damp, soft, low plasticity, trace fine to medium Sand, white sand lenses, moist at 13 ft.					CL
	14	Grey Clayey SAND, damp, medium density, medium to coarse Sand					SC
	16	Light brown Silty SAND, wet, loose, fine Sand					SM
	18	Grey Sandy CLAY, wet, stiff, low plasticity, fine Sand					CL
		Total Depth = 19.5 ft					

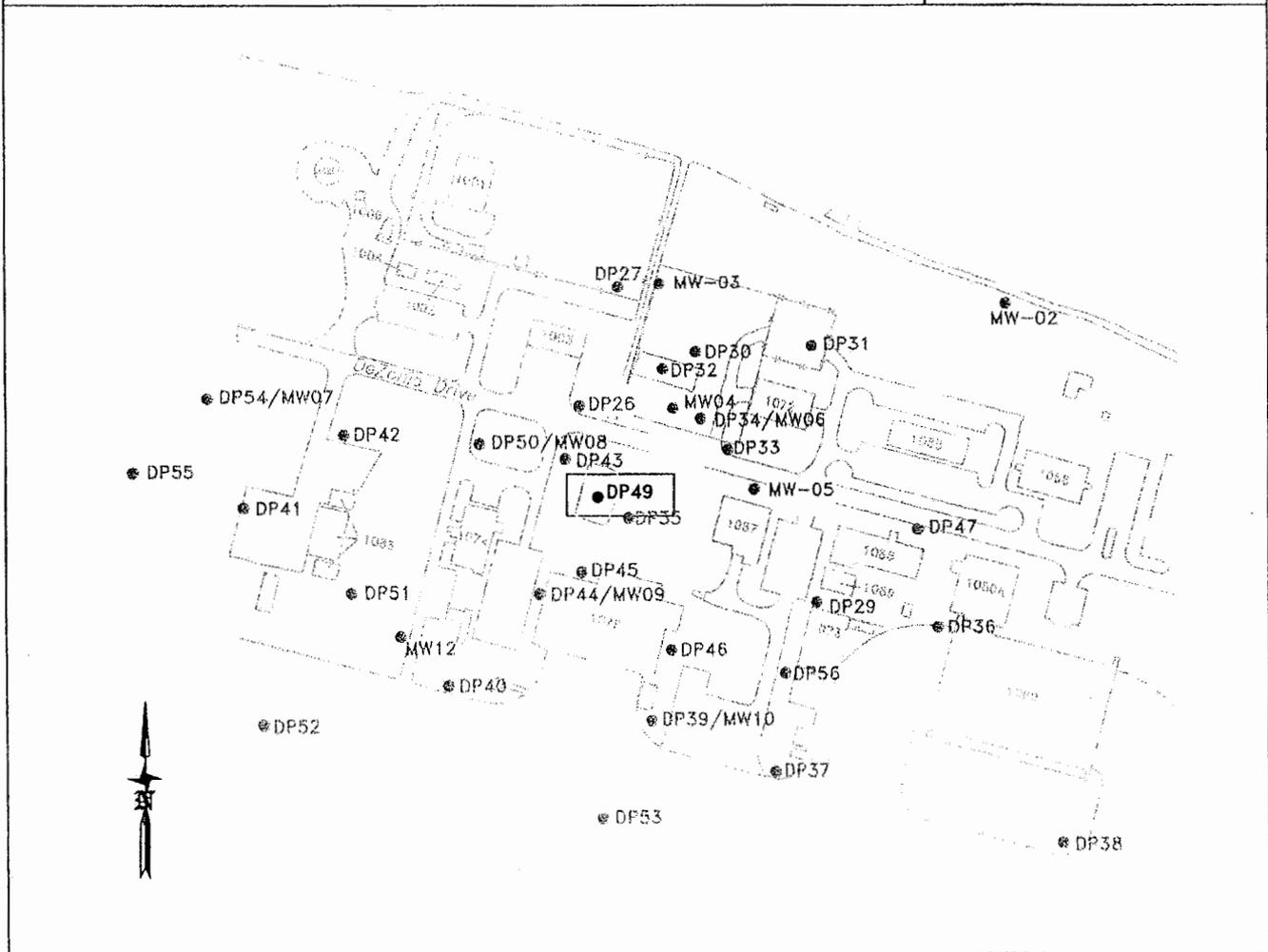
PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-DP48

HTRW DRILLING LOG		DISTRICT OMAHA		HOLE NUMBER SS61-DP49	
1.COMPANY NAME Foster Wheeler Environmental Corp.		2.DRILL SUBCONTRACTOR Indian Fire and Safety		SHEET SHEETS 1 OF 3	
3.PROJECT 5155.0027.0007			4.LOCATION SS-61, Holloman AFB		
5.NAME OF DRILLER Rafe Jones			6.MANUFACTURER'S DESIGNATION OF DRILL		
7.SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT DPT Rig		8.HOLE LOCATION SS61-DP49			
9.SURFACE ELEVATION N/A					
			10.DATE STARTED 5/10/00		11.DATE COMPLETED 5/10/00
12.OVERBURDEN THICKNESS N/A			15.DEPTH GROUNDWATER ENCOUNTERED 16.5 ft		
13.DEPTH DRILLED INTO ROCK N/A			16.DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 8.75 ft prior to sampling about 30 minutes after drilling		
14.TOTAL DEPTH OF HOLE 21.5 ft			17.OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A		
18.GEOTECHNICAL SAMPLES None		DISTURBED N/A	UNDISTURBED N/A	19.TOTAL NUMBER OF CORE BOXES	
20.SAMPLES FOR CHEMICAL ANALYSIS		VOC soil and water	METALS N/A	OTHER (SPECIFY) soil - TRPH	OTHER (SPECIFY) water - TPH-JP4
22.DISPOSITION OF HOLE w/ bentonite		BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	21.TOTAL CORE RECOVERY %
				23.SIGNATURE OF INSPECTOR Luke Darragh	

LOCATION SKETCH/COMMENTS

SCALE 1 Inch = 300 feet



PROJECT 5155.0027.0007

HOLE NO. SS61-DP49

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP49

PROJECT 5155.0027.0007 H2000

INSPECTOR Luke Darragh

SHEET 2 OF 3 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	2	Light Brown Clayey SILT with Sand, damp/moist, soft, fine Sand, some medium Sand					ML
	4						
	6	Grey/Tan Silty SAND, moist, loose, medium Sand, trace coarse Sand					SM
	8	Brown Silty CLAY, damp, stiff, low plasticity, fine white Sand lenses	0.56 ppm				CL
	10						
	12	Brown Silty CLAY, damp, medium stiffness, low plasticity, trace medium Sand	69 ppm		SS61DP49S110L		CL
	14						
	16	Light brown Silty CLAY, damp, stiff, low plasticity, fine Sand lenses, trace crystals Discoloration and odor from 16-16.5 ft, very moist			SS61DP49160L		CL
	18	Grey Silty CLAY, wet, stiff, low plasticity, large crystals and white Sand lenses					CL

PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-DP49

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP49

PROJECT 5155.0027.0007 H2000

INSPECTOR Luke Darragh

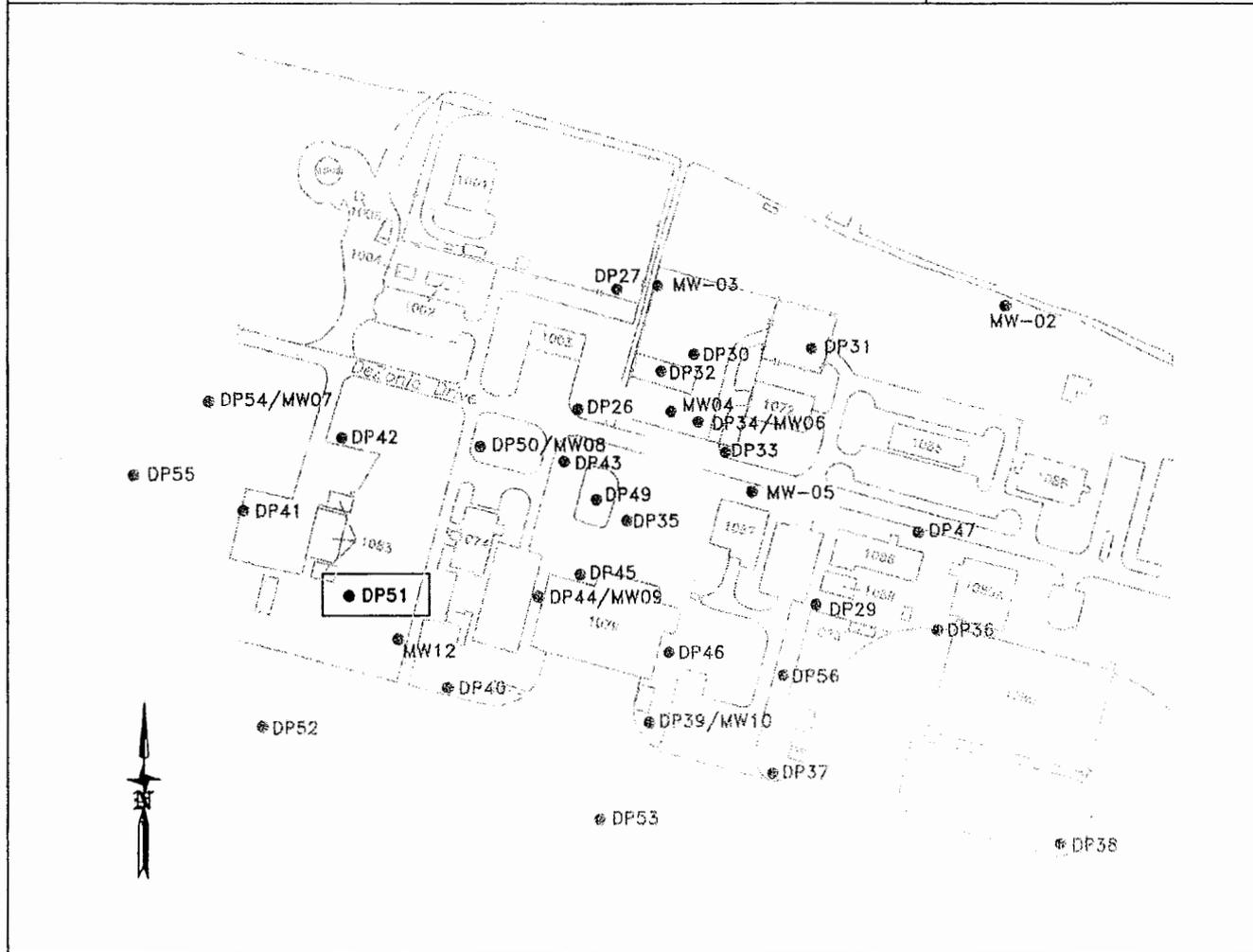
SHEET 3 of SHEETS 3

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
		Grey Silty SAND, wet, loose, fine Sand, trace mudun Sand, discoloration, odor					SM
	22	TD = 21.5 ft					

PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-DP49

HTRW DRILLING LOG		DISTRICT OMAHA		HOLE NUMBER SS61-DP51	
1.COMPANY NAME Foster Wheeler Environmental Corp.		2.DRILL SUBCONTRACTOR Indian Fire and Safety		SHEET SHEETS 1 of 2	
3.PROJECT 5155.0027.0007		4.LOCATION SS-61, Holloman AFB			
5.NAME OF DRILLER Rafe Jones		6.MANUFACTURER'S DESIGNATION OF DRILL			
7.SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT DPT Rig		8.HOLE LOCATION SS61-DP51			
		9.SURFACE ELEVATION N/A			
		10.DATE STARTED 5/11/00		11.DATE COMPLETED 5/11/00	
12.OVERBURDEN THICKNESS N/A		15.DEPTH GROUNDWATER ENCOUNTERED 15.5 ft			
13.DEPTH DRILLED INTO ROCK N/A		16.DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED			
14.TOTAL DEPTH OF HOLE 20.5 ft		17.OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A			
18.GEOTECHNICAL SAMPLES None		DISTURBED N/A	UNDISTURBED N/A	19.TOTAL NUMBER OF CORE BOXES	
20.SAMPLES FOR CHEMICAL ANALYSIS		VOC soil and water	METALS N/A	OTHER (SPECIFY) Soil - TRPH	OTHER (SPECIFY) water - TPH-JP4
22.DISPOSITION OF HOLE BACKFILLED w/ bentonite		MONITORING WELL N/A	OTHER (SPECIFY)	23.SIGNATURE OF INSPECTOR Luke Darragh	
LOCATION SKETCH/COMMENTS				SCALE 1 Inch = 300 feet	



PROJECT	5155.0027.0007	HOLE NO.	SS61-DP51
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HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP51
SHEET **2** of **2** SHEETS

PROJECT **5155.0027.0007 H2000**

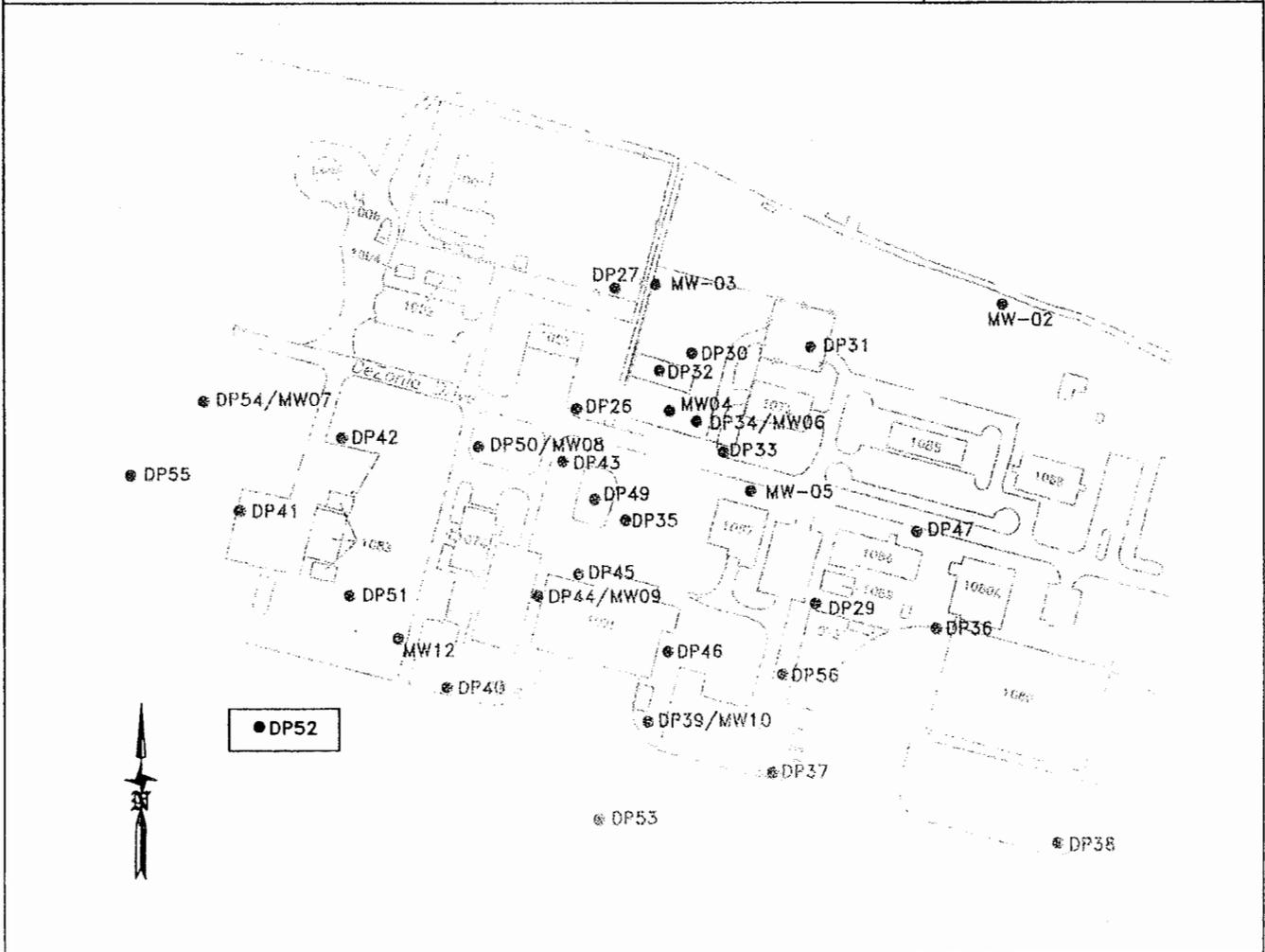
INSPECTOR **Luke Darragh**

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	2	Brown Silty CLAY, dry, soft, fine white Sand lenses throughout, low plasticity					CL
	4						
	6	Light brown Sandy SILT with fine sand, damp, soft, trace medium Sand					ML
	8						
	10	Grey/Tan Clayey SILT, some medium Sand, moist, soft, trace coarse Sand					ML
	12	Same as above with more medium Sand and coarse Sand (rounded)					ML
	14	Brown Silty CLAY, moist, soft, low plasticity, medium to coarse rounded Sand			SS61DP51S1401 SS61DP51S1402		CL
	16	Grey Silty CLAY, wet, soft, some medium to coarse Sand					CL
	18	Reddish brown Silty CLAY, very moist, fine to medium white Sand lenses, some small crystals, low plasticity					CL
		Grey/Green Silty CLAY, wet, soft, low plasticity, some medium to coarse Sand, discoloration and odor					CL
		TD = 20.5 ft					

PROJECT **5155.0027.0007 H2000**

HOLE NO. **SS61-DP51**

HTRW DRILLING LOG		DISTRICT OMAHA		HOLE NUMBER SS61-DP52	
1.COMPANY NAME Foster Wheeler Environmental Corp.		2.DRILL SUBCONTRACTOR Indian Fire and Safety		SHEET 1 SHEETS 3	
3.PROJECT 5155.0027.0007		4.LOCATION SS-61, Holloman AFB			
5.NAME OF DRILLER Rafe Jones		6.MANUFACTURER'S DESIGNATION OF DRILL			
7.SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT DPT Rig		8.HOLE LOCATION SS61-DP52			
		9.SURFACE ELEVATION N/A			
		10.DATE STARTED 5/11/00		11.DATE COMPLETED 5/11/00	
12.OVERBURDEN THICKNESS N/A		15.DEPTH GROUNDWATER ENCOUNTERED 18 ft			
13.DEPTH DRILLED INTO ROCK N/A		16.DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 16.25 ft, 5 minutes after drilling			
14.TOTAL DEPTH OF HOLE 24.5 ft		17.OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A			
18.GEOTECHNICAL SAMPLES None		DISTURBED N/A	UNDISTURBED N/A	19.TOTAL NUMBER OF CORE BOXES	
20.SAMPLES FOR CHEMICAL ANALYSIS		VOC soil and water	METALS N/A	OTHER (SPECIFY) soil - TRPH	OTHER (SPECIFY) water - TPH-JP4
22.DISPOSITION OF HOLE BACKFILLED		MONITORING WELL N/A	OTHER (SPECIFY)	23.SIGNATURE OF INSPECTOR Luke Darragh	
		w/ bentonite	N/A		
LOCATION SKETCH/COMMENTS				SCALE 1 Inch = 300 feet	



PROJECT 5155.0027.0007	HOLE NO. SS61-DP52
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HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP52

PROJECT 5155.0027.0007 H2000

INSPECTOR Luke Darragh

SHEET 2 of 3 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
		0-13 inches- black top and cement					
	2	Tan Silty SAND, dry, loose, medium to coarse Sand, trace subrounded gravel 7 mm in size					SM
	4	Tan Sandy SILT, damp, soft, medium Sand, trace fine Sand					ML
	6	Tan Silty SAND, damp, loose, medium Sand, some subangular gravel 10 mm in size					SM
	8	Reddish brown SILT, dry, soft, trace fine to medium Sand					ML
	10	Brown Silty SAND, damp, loose, medium Sand, trace coarse Sand					SM
	12	Reddish brown Silty CLAY, damp, soft, small crystals throughout, trace large crystals 20 mm in size, medium plasticity, fine white Sand lenses (calcite)					CL
	14						
	16				SS61DP52S1501		
	18	Reddish brown Silty CLAY, wet, medium plasticity, soft, white and brown Sand lenses throughout, small crystals					CL

PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-DP52

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP52
 SHEET **3** of **3** SHEETS

PROJECT **5155.0027.0007 H2000**

INSPECTOR **Luke Darragh**

ELEV. (c)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
		Same as above					CL
	22 24	Brown/Tan Clayey SILT with Sand, wet, soft, medium Sand, trace coarse Sand					ML
		TD = 24.5 ft					

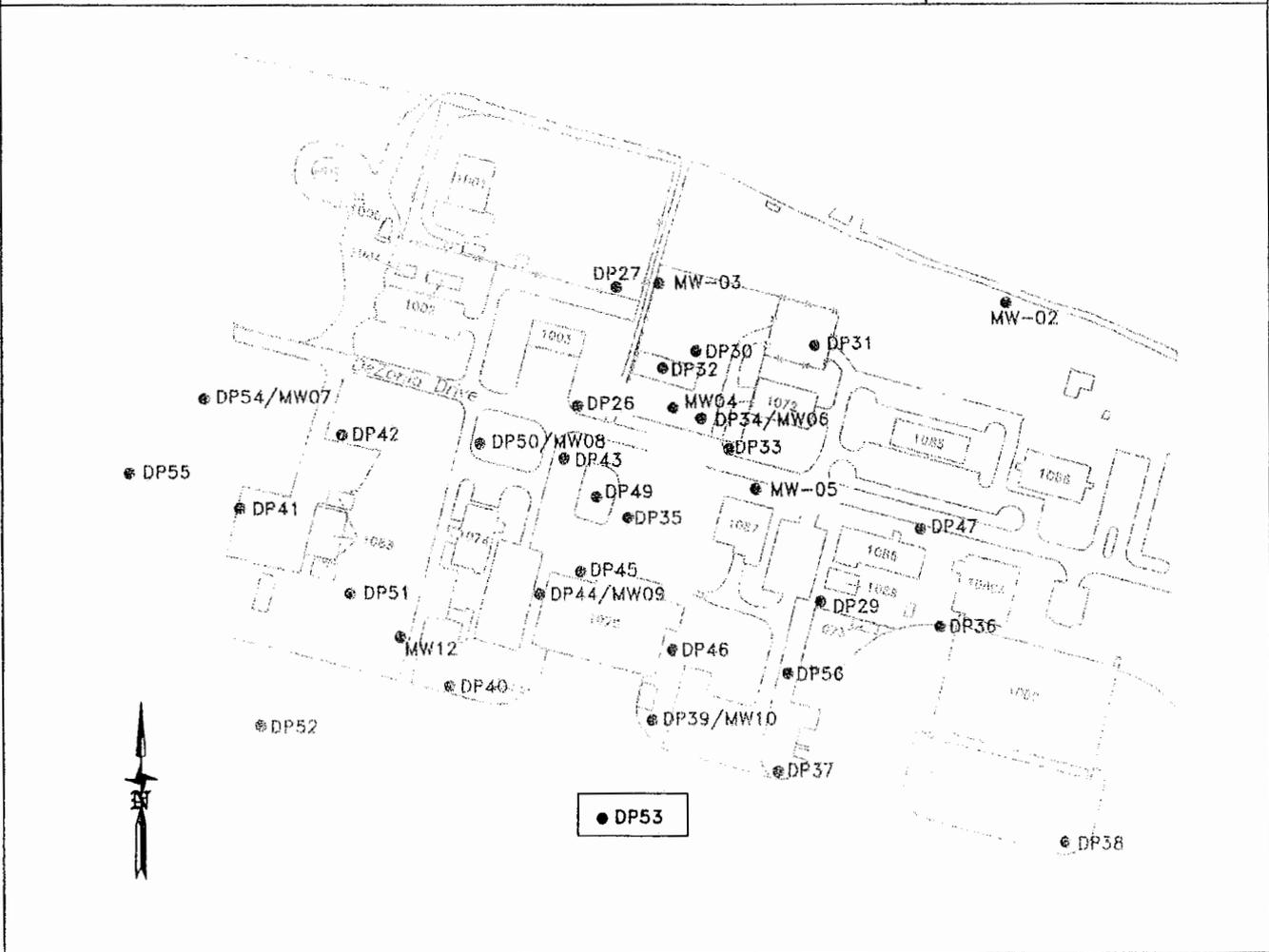
PROJECT **5155.0027.0007 H2000**

HOLE NO. **SS61-DP52**

HTRW DRILLING LOG		DISTRICT OMAHA		HOLE NUMBER SS61-DP53	
1.COMPANY NAME Foster Wheeler Environmental Corp.		2.DRILL SUBCONTRACTOR Indian Fire and Safety		SHEET SHEETS 1 OF 3	
3.PROJECT 5155.0027.0007			4.LOCATION SS-61, Holloman AFB		
5.NAME OF DRILLER Rafe Jones			6.MANUFACTURER'S DESIGNATION OF DRILL		
7.SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT DPT Rig		8.HOLE LOCATION SS61-DP53			
9.SURFACE ELEVATION N/A					
10.DATE STARTED 5/11/00			11.DATE COMPLETED 5/11/00		
12.OVERBURDEN THICKNESS N/A		15.DEPTH GROUNDWATER ENCOUNTERED 22.5 ft			
13.DEPTH DRILLED INTO ROCK N/A		16.DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 11.59 ft, 5 minutes after drilling			
14.TOTAL DEPTH OF HOLE 24.5 ft		17.OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A			
18.GEOTECHNICAL SAMPLES None		DISTURBED N/A	UNDISTURBED N/A	19.TOTAL NUMBER OF CORE BOXES	
20.SAMPLES FOR CHEMICAL ANALYSIS		VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)
		soil and water	N/A	soil - TRPH	water - TPH-JP4
22.DISPOSITION OF HOLE		BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23.SIGNATURE OF INSPECTOR
		w/bentonite	N/A		Luke Darragh

LOCATION SKETCH/COMMENTS

SCALE 1 Inch = 300 feet



PROJECT 5155.0027.0007

HOLE NO. SS61-DP53

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP53

PROJECT 5155.0027.0007 H2000

INSPECTOR Luke Darragh

SHEET 2 of SHEETS 3

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
		asphalt/ concrete					
	2	Tan Silty CLAY, moist, soft, Trace fine and medium Sand					CL
	4	Tan Sandy SILT, moist, soft, Fine to medium Sand					ML
	6						
	8	Brown Silty CLAY with Sand, damp/ moist, soft, fine to medium Sand very wet from 8.5 to 9.0 ft					CL
	10						
	12	Light brown Silty CLAY, damp, soft, some fine white Sand lenses throughout, medium plasticity					CL
	14						
	16	Brown Silty CLAY with Sand, damp, soft, medium to coarse Sand					CL
	16	Reddish Brown Clayey SILT, damp, medium stiffness, trace fine Sand					ML
	18	Reddish Brown Silty CLAY, damp, medium stiffness, medium plasticity, fine Sand lenses and small crystals					CL
	18	Same as above but very moist at 19 ft					CL

PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-DP53

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP53

PROJECT 5155.0027.0007 H2000

INSPECTOR Luke Darragh

SHEET 3 OF 3 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	22	Reddish Brown Silty CLAY, very moist, soft, sand lenses and crystals					CL
		Silty SAND, moist, loose, fine Sand, some medium Sand					SM
		Same as above but wet					SM
	24	Reddish Brown Silty CLAY, wet, stiff, some medium Sand					CL
	26	TD = 24.5 ft					

PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-DP53

HTRW DRILLING LOG		DISTRICT OMAHA			HOLE NUMBER SS61-DP55	
1.COMPANY NAME Foster Wheeler Environmental Corp.		2.DRILL SUBCONTRACTOR Indian Fire and Safety			SHEET 1 of 2 SHEETS	
3.PROJECT 5155.0027.0007		4.LOCATION SS-61, Holloman AFB				
5.NAME OF DRILLER Rafe Jones		6.MANUFACTURER'S DESIGNATION OF DRILL				
7.SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT DPT Rig		8.HOLE LOCATION SS61-DP55				
		9.SURFACE ELEVATION N/A				
		10.DATE STARTED 5/12/00		11.DATE COMPLETED 5/12/00		
12.OVERBURDEN THICKNESS N/A		15.DEPTH GROUNDWATER ENCOUNTERED 16.0 ft				
13.DEPTH DRILLED INTO ROCK N/A		16.DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 14.95 ft, 5 minutes after drilling				
14.TOTAL DEPTH OF HOLE 19.0 ft		17.OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A				
18.GEOTECHNICAL SAMPLES None		DISTURBED N/A	UNDISTURBED N/A	19.TOTAL NUMBER OF CORE BOXES		
20.SAMPLES FOR CHEMICAL ANALYSIS		VOC soil and water	METALS N/A	OTHER (SPECIFY) soil - TRPH	OTHER (SPECIFY) water - TPH-JP4	OTHER (SPECIFY)
22.DISPOSITION OF HOLE BACKFILLED w/ bentonite		MONITORING WELL N/A	OTHER (SPECIFY)	23.SIGNATURE OF INSPECTOR Luke Darragh		
LOCATION SKETCH/COMMENTS					SCALE 1 inch = 300 feet	
PROJECT 5155.0027.0007				HOLE NO. SS61-DP55		

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP55

PROJECT 5155.0027.0007 H2000

INSPECTOR Luke Darragh

SHEET 2 OF SHEETS 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	2	Some asphalt near surface Light brown Clayey SILT with Sand, damp, soft, fine to medium Sand					ML
	4	Light brown Silty CLAY with fine Sand, damp, soft, low plasticity					CL
	6	Reddish brown SILT, dry, soft, trace fine Sand					ML
	8	Grey/Tan SAND with SILT, well graded, dry, loose, some Clay					SW
	10	Brown Silty CLAY, damp, stiff, fine white Sand lenses, small crystals					CL
	12	Reddish brown Silty CLAY, damp, soft, moderate plasticity, some fine Sand			SS61DP55S1201		CL
	14	Grey Silty CLAY, wet, soft, some fine to medium Sand, trace coarse Sand					CL
	16	Reddish brown Silty CLAY with Sand, wet, soft, low plasticity, medium to coarse Sand					CL
	18						
		Total Depth = 19 ft					

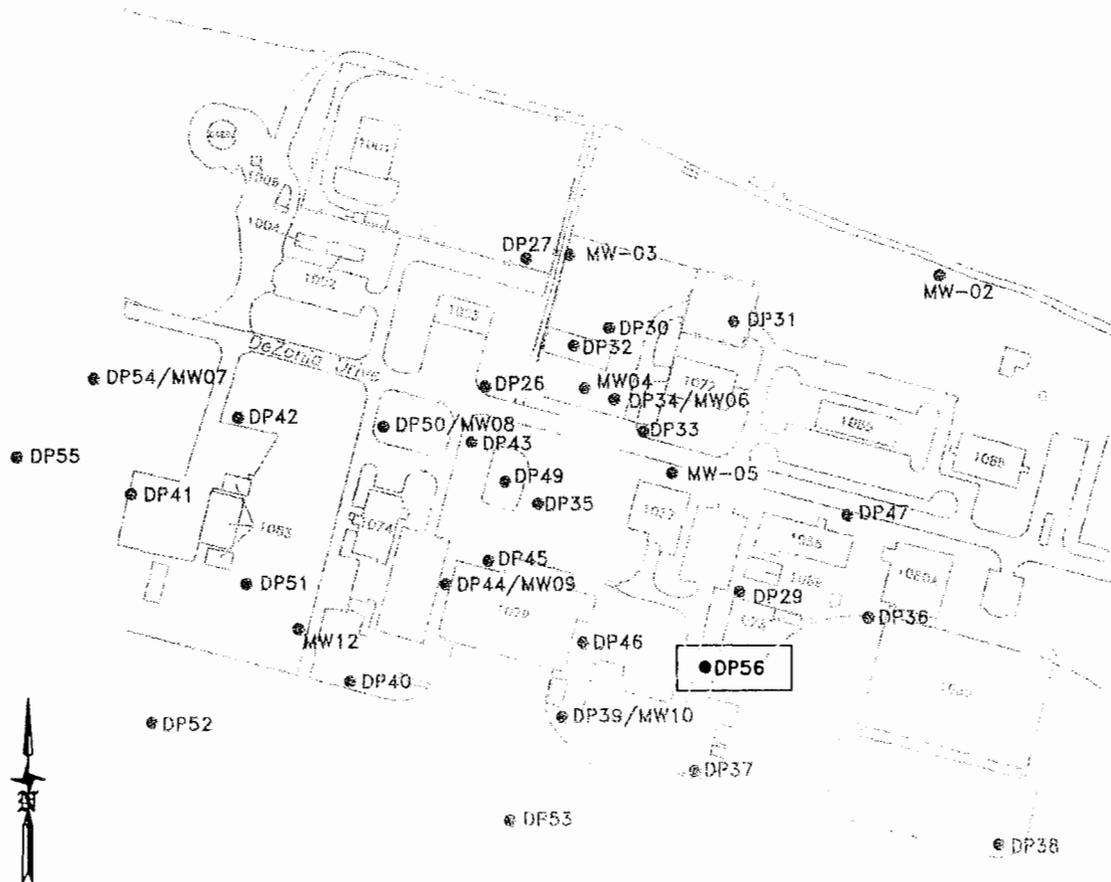
PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-DP55

HTRW DRILLING LOG		DISTRICT OMAHA		HOLE NUMBER SS61-DP56			
1.COMPANY NAME Foster Wheeler Environmental Corp.		2.DRILL SUBCONTRACTOR Indian Fire and Safety		SHEET SHEETS 1 of 3			
3.PROJECT 5155.0027.0007		4.LOCATION SS-61, Holloman AFB					
5.NAME OF DRILLER Rafe Jones		6.MANUFACTURER'S DESIGNATION OF DRILL					
7.SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT DPT Rig		8.HOLE LOCATION SS61-DP56					
		9.SURFACE ELEVATION N/A					
		10.DATE STARTED 5/12/00		11.DATE COMPLETED 5/12/00			
12.OVERBURDEN THICKNESS N/A		15.DEPTH GROUNDWATER ENCOUNTERED 18 ft					
13.DEPTH DRILLED INTO ROCK N/A		16.DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 18.03 ft, 5 minutes after drilling					
14.TOTAL DEPTH OF HOLE 23.0 ft		17.OTHER WATER LEVEL MEASUREMENTS (SPECIFY) 12.76 ft after sampling					
18.GEOTECHNICAL SAMPLES None		DISTURBED N/A	UNDISTURBED N/A	19.TOTAL NUMBER OF CORE BOXES			
20.SAMPLES FOR CHEMICAL ANALYSIS		VOC soil and water	METALS N/A	OTHER (SPECIFY) soil - TRPH	OTHER (SPECIFY) water - TPH-JP4	OTHER (SPECIFY)	21.TOTAL CORE RECOVERY %
22.DISPOSITION OF HOLE BACKFILLED		MONITORING WELL N/A	OTHER (SPECIFY)	23.SIGNATURE OF INSPECTOR Luke Darragh			
		w/ bentonite	N/A				

LOCATION SKETCH/COMMENTS

SCALE 1 inch = 300 feet



PROJECT **5155.0027.0007**

HOLE NO. **SS61-DP56**

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP56

PROJECT 5155.0027.0007 H2000

INSPECTOR Luke Darragh

SHEET 2 of SHEETS 3

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	2	Reddish brown Silty SAND, dry, fine to medium Sand, trace coarse Sand					SM
	4						
	6	Reddish brown SILT, damp, soft, trace fine Sand					ML
	8	Reddish brown Sandy SILT, very moist/wet, soft, fine Sand					ML
	10	Grey Silty CLAY, damp, soft, some fine to medium Sand					CL
	12	Reddish brown Silty CLAY, damp/moist, stiff, fine grey Sand lenses, moderate plasticity					CL
	14	Light brown Clayey SILT, damp/moist, soft, trace fine Sand					ML
	16	Reddish brown Silty CLAY, moist, stiff, fine white Sand lenses (caliche), moderate plasticity					CL
	18	Same as above but very moist					CL
		Same as above but wet					CL
		Same as above but not as wet-moist					CL

PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-DP56

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP56

PROJECT 5155.0027.0007 H2000

INSPECTOR Luke Darragh

SHEET 3 of SHEETS 3

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	22	Reddish brown Silty CLAY, wet, stiff, fine white Sand lenses, moderate plasticity Slight discoloration from 22 to 23 ft					CL
	24	Total Depth = 23 ft					

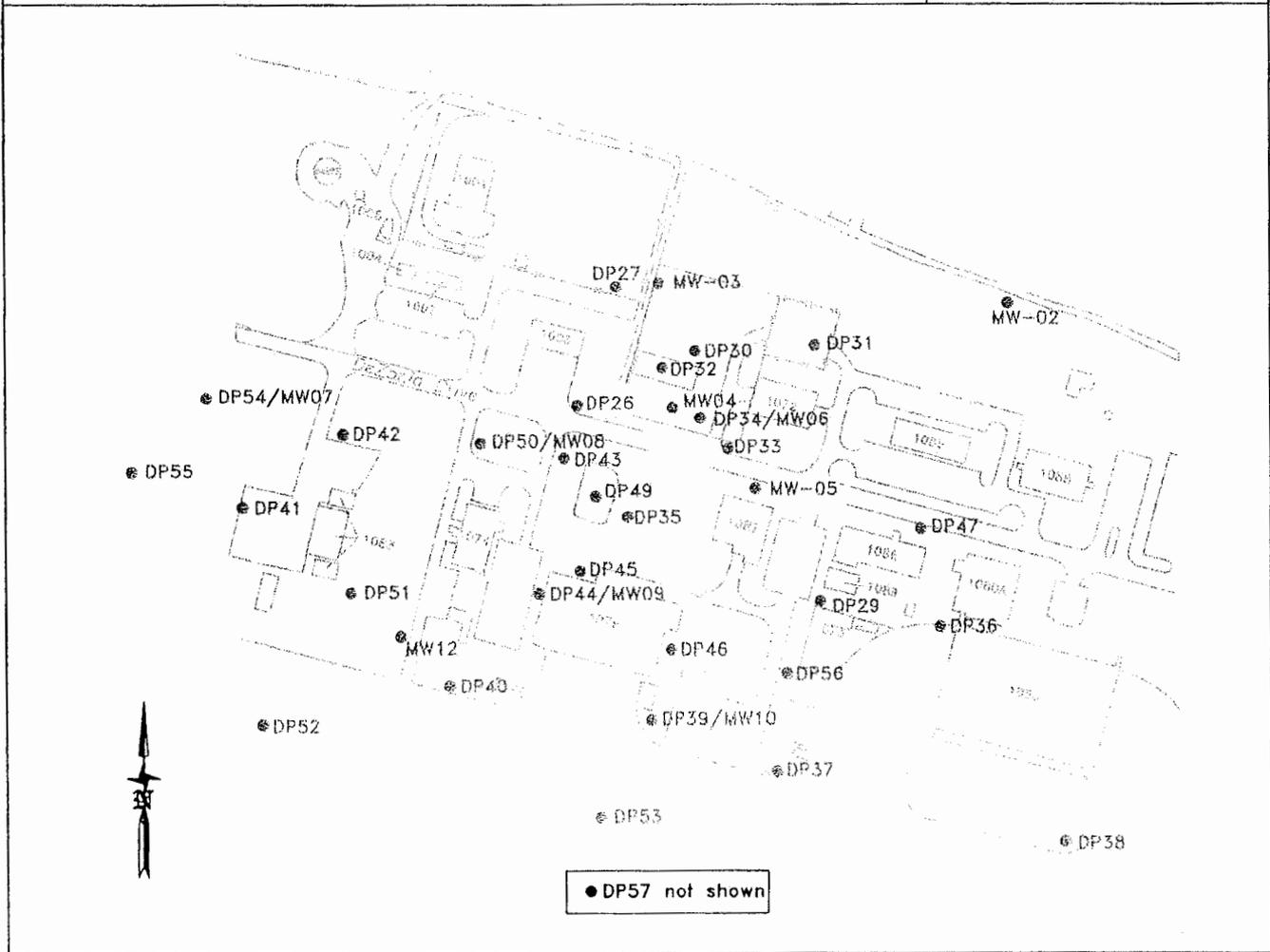
PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-DP56

HTRW DRILLING LOG		DISTRICT OMAHA		HOLE NUMBER SS61-DP57	
1.COMPANY NAME Foster Wheeler Environmental Corp.		2.DRILL SUBCONTRACTOR Indian Fire and Safety		SHEET SHEETS 1 of 2	
3.PROJECT 5155.0027.0007		4.LOCATION SS-61, Holloman AFB			
5.NAME OF DRILLER Rafe Jones		6.MANUFACTURER'S DESIGNATION OF DRILL			
7.SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT DPT Rig		8.HOLE LOCATION SS61-DP57			
		9.SURFACE ELEVATION N/A			
		10.DATE STARTED 5/12/00		11.DATE COMPLETED 5/12/00	
12.OVERBURDEN THICKNESS N/A		15.DEPTH GROUNDWATER ENCOUNTERED 13 ft			
13.DEPTH DRILLED INTO ROCK N/A		16.DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 7.11 ft, 5 minutes after drilling			
14.TOTAL DEPTH OF HOLE 15.0 ft		17.OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A			
18.GEOTECHNICAL SAMPLES None		DISTURBED		UNDISTURBED	
19.TOTAL NUMBER OF CORE BOXES					
20.SAMPLES FOR CHEMICAL ANALYSIS		VOC		METALS	
		sol and water		N/A	
		BACKFILLED		MONITORING WELL	
		w/ bentonite		N/A	
		OTHER (SPECIFY)		OTHER (SPECIFY)	
		sol - TRPH		water - TPH-JP4	
22.DISPOSITION OF HOLE		OTHER (SPECIFY)		23.SIGNATURE OF INSPECTOR Luke Darragh	

LOCATION SKETCH/COMMENTS

SCALE 1 Inch = 300 feet



PROJECT 5155.0027.0007

HOLE NO. SS61-DP57

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP57

PROJECT 5155.0027.0007 H2000

INSPECTOR Luke Darragh

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	2	Light brown Silty CLAY, very moist, soft, low plasticity, trace fine Sand					CL
	4	Reddish brown Silty CLAY with Sand, very moist, fine white Sand lenses, trace crystals					CL
	6						
	8	Brown Silty SAND, very moist, loose, fine and medium Sand, trace coarse Sand					SM
	10	Reddish brown Silty CLAY, moist, stiff, slight plasticity, fine white Sand lenses					CL
	12	Reddish brown Silty CLAY with Sand, moist, soft, fine Sand, trace medium Sand					CL
	14	Brown Clayey SAND, well graded, loose, trace subrounded gravel					SW
	16	Brown Silty CLAY, very moist, medium stiffness, low plasticity					CL
	18	Total Depth = 15.0 ft					

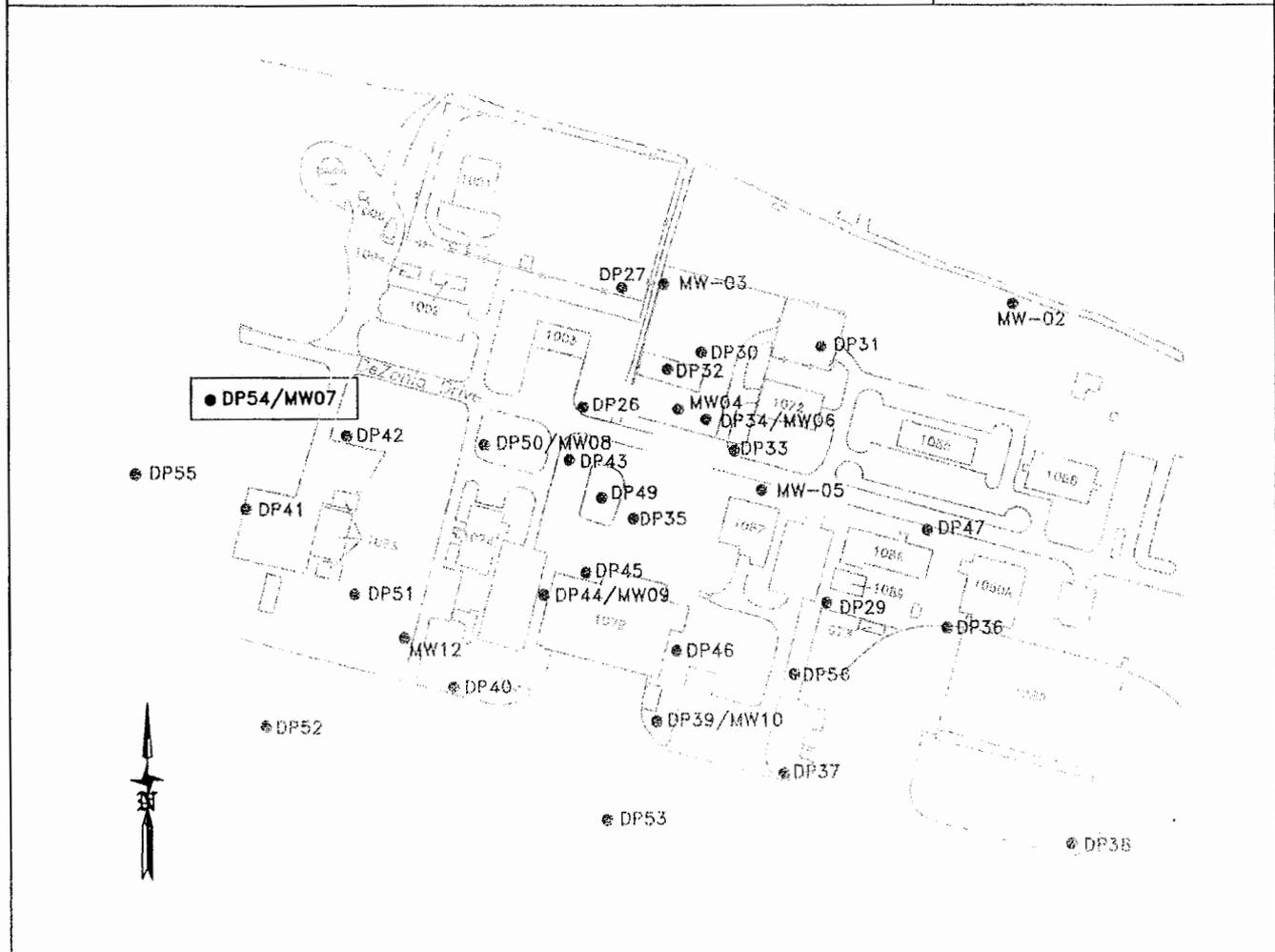
PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-DP57

HTRW DRILLING LOG		DISTRICT OMAHA		HOLE NUMBER SS61-DP54/MW07	
1.COMPANY NAME Foster Wheeler Environmental Corp.		2.DRILL SUBCONTRACTOR Indian Fire and Safety		SHEET 1 of 3 SHEETS	
3.PROJECT 5155.0027.0007		4.LOCATION SS-61, Holloman AFB			
5.NAME OF DRILLER Rafe Jones		6.MANUFACTURER'S DESIGNATION OF DRILL			
7.SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT DPT Rig		8.HOLE LOCATION SS61-DP54/MW07			
		9.SURFACE ELEVATION N/A			
		10.DATE STARTED 5/12/00		11.DATE COMPLETED 5/12/00	
12.OVERBURDEN THICKNESS N/A		15.DEPTH GROUNDWATER ENCOUNTERED 19.0 ft			
13.DEPTH DRILLED INTO ROCK N/A		16.DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 15.25 ft, 10 minutes after drilling			
14.TOTAL DEPTH OF HOLE 22 ft		17.OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A			
18.GEOTECHNICAL SAMPLES None		DISTURBED N/A	UNDISTURBED N/A	19.TOTAL NUMBER OF CORE BOXES	
20.SAMPLES FOR CHEMICAL ANALYSIS		VOC sol and water	METALS N/A	OTHER (SPECIFY) sol - TRPH	OTHER (SPECIFY) water - TPH-JP4
22.DISPOSITION OF HOLE w/ bentonite		BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	21.TOTAL CORE RECOVERY %
				23.SIGNATURE OF INSPECTOR Luke Darragh	

LOCATION SKETCH/COMMENTS

SCALE 1 inch = 300 feet



PROJECT **5155.0027.0007**

HOLE NO. **SS61-DP54/MW07**

HTRW DRILLING LOG (CONTINUATION SHEET)							HOLE NUMBER SS61-DP54/MW07
PROJECT 5155.0027.0007 H2000			INSPECTOR Luke Darragh			SHEET 2	SHEETS OF 3
ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	2	Tan Silty SAND, dry, loose, medun to coarse Sand, trace subrounded gravel 15 mm in size					SM
	4	Light brown Silty CLAY with Sand, damp, soft, low plasticity, medun Sand					CL
	6	Light brown Sandy SILT, soft, fine to medun Sand					ML
	8	Tan Silty SAND, dry, loose, medun Sand					SM
	10	Tan Silty SAND, dry, loose, medun to coarse Sand					SM
	12	Reddish brown Silty CLAY, damp, soft, medun plasticity, trace medun white Sand lenses					CL
	14	Same as above with a medun stiffness					CL
	14	Same as above with medun to coarse Sand					CL
	14	Same as above with a color change to grey			SS61DP54S1401		CL
	16	Grey Silty CLAY, damp/moist, soft, some medun to coarse Sand					CL
	18						CL

PROJECT 5155.0027.0007 H2000

HOLE NO.
SS61-DP54/MW07

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP54/MW07

PROJECT 5155.0027.0007 H2000

INSPECTOR Luke Darragh

SHEET 3 OF SHEETS 3

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	22	Reddish brown Silty CLAY, wet, medium stiffness, medium to high plasticity, trace medium Sand and 5 mm crystals					CL
		TD = 22 ft					

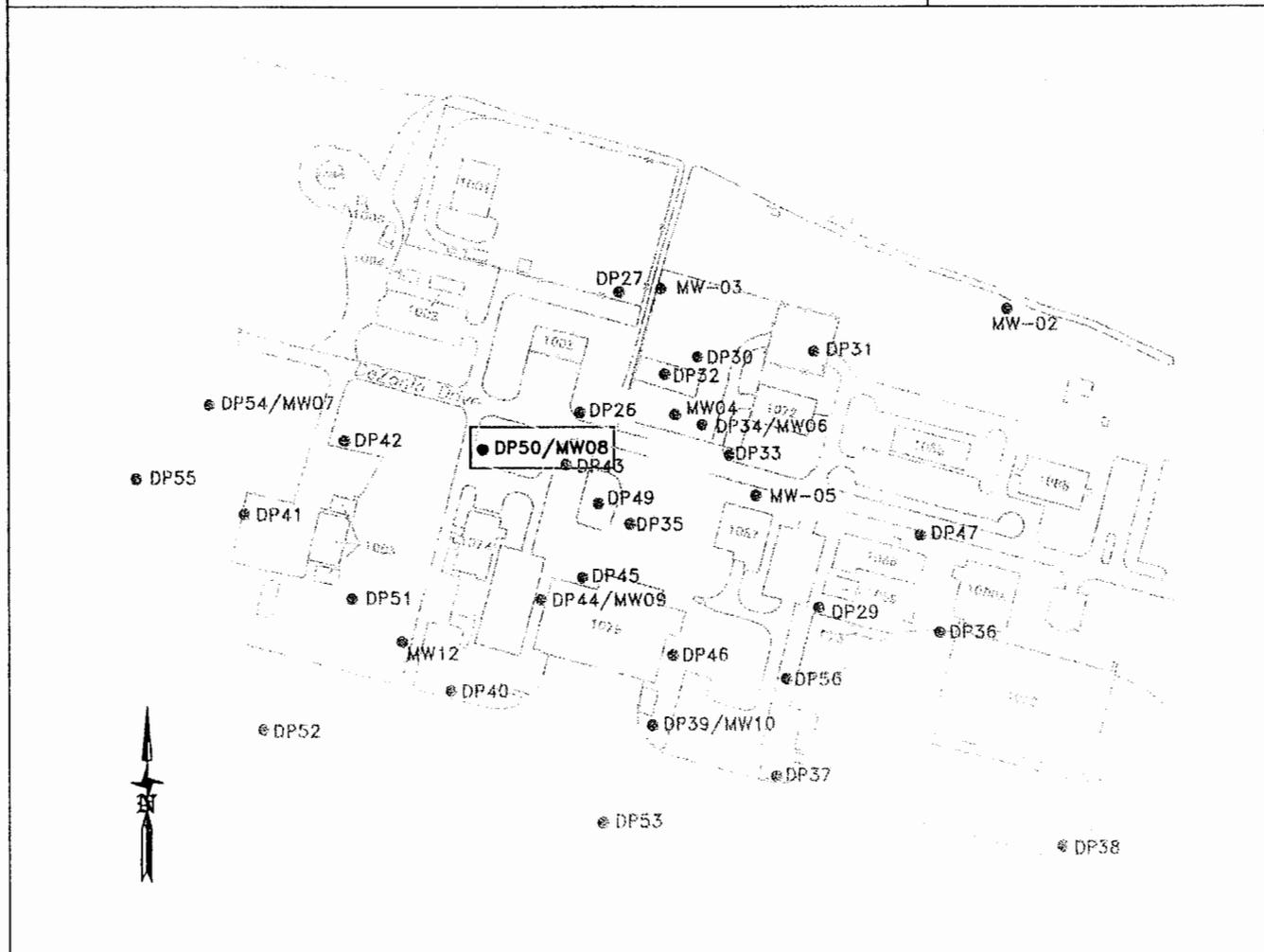
PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-DP54/MW07

HTRW DRILLING LOG		DISTRICT OMAHA		HOLE NUMBER SS61-DP50/MW08	
1.COMPANY NAME Foster Wheeler Environmental		2.DRILL SUBCONTRACTOR Indian Fire and Safety		SHEET SHEETS 1 OF 3	
3.PROJECT 5155.0027.0007		4.LOCATION SS61, Holloman AFB			
5.NAME OF DRILLER Rafe Jones		6.MANUFACTURER'S DESIGNATION OF DRILL			
7.SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT DPT Rig		8.HOLE LOCATION SS61-DP50/MW08			
		9.SURFACE ELEVATION N/A			
		10.DATE STARTED 5/11/00		11.DATE COMPLETED 5/11/00	
12.OVERBURDEN THICKNESS N/A		15.DEPTH GROUNDWATER ENCOUNTERED 20.5 ft			
13.DEPTH DRILLED INTO ROCK N/A		16.DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 12.72 ft 4 hours after drilling			
14.TOTAL DEPTH OF HOLE 22.5 ft		17.OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A			
18.GEOTECHNICAL SAMPLES None		DISTURBED		UNDISTURBED	
19.TOTAL NUMBER OF CORE BOXES					
20.SAMPLES FOR CHEMICAL ANALYSIS		VOC		METALS	
		OTHER (SPECIFY)		OTHER (SPECIFY)	
		OTHER (SPECIFY)		OTHER (SPECIFY)	
		OTHER (SPECIFY)		OTHER (SPECIFY)	
21.TOTAL CORE RECOVERY %					
22.DISPOSITION OF HOLE		BACKFILLED		MONITORING WELL	
		w/ bentonite		Yes, MW-08	
				23.SIGNATURE OF INSPECTOR Luke Darragh	

LOCATION SKETCH/COMMENTS

SCALE 1 Inch = 300 feet



PROJECT 5155.0027.0007

HOLE NO. SS61-DP50/MW08

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP50/MV08

PROJECT 5155.0027.0007 H2000

INSPECTOR Luke Darragh

SHEET 2 OF 3 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
		0-6 inches is gravel					
	2	Light brown Clayey SILT, dry, soft, some fine Sand					ML
	4	Light brown Sandy SILT with fine Sand, damp, soft, trace coarse Sand					ML
	6						
	8	Grey Silty CLAY, stiff, low plasticity, some medium Sand					CL
	10	Same as above but damp			SS61DP50S1001		CL
	12	Light Brown Silty CLAY with medium Sand, moist, soft Very moist from 12.5 to 13 ft					CL
	14	Light brown Silty CLAY, moist, low plasticity, medium stiffness, some fine Sand, trace medium Sand					CL
	16				SS61DP50S1501		
	18	Same as above but has moderate plasticity, slight odor	75.23 ppm				CL
		Grey Silty CLAY, moist, medium stiffness, fine white Sand lenses, some small crystals and some discoloration, odor	36.0 ppm				CL

PROJECT 5155.0027.0007 H2000

HOLE NO.
SS61-DP50/MV08

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP50/MV08

PROJECT 5155.0027.0007 H2000

INSPECTOR Luke Darragh

SHEET 3 OF 3 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	22	Grey Silty CLAY with fine to medium Sand, wet, soft, low plasticity, discoloration and an odor					CL
	24	TD = 22.5 ft					

PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-DP50/MV08

HTRW DRILLING LOG		DISTRICT OMAHA			HOLE NUMBER SS61-DP44/MW09	
1.COMPANY NAME Foster Wheeler Environmental Corp.		2.DRILL SUBCONTRACTOR Indian Fire and Safety			SHEET SHEETS 1 OF 2	
3.PROJECT 5155.0027.0007 H2000			4.LOCATION SS-61, Holloman AFB			
5.NAME OF DRILLER Rafe Jones			6.MANUFACTURER'S DESIGNATION OF DRILL			
7.SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT DPT Rig		8.HOLE LOCATION SS61-DP44/MW09				
		9.SURFACE ELEVATION N/A				
		10.DATE STARTED 5/2/00		11.DATE COMPLETED 5/2/00		
12.OVERBURDEN THICKNESS N/A		15.DEPTH GROUNDWATER ENCOUNTERED 14 ft				
13.DEPTH DRILLED INTO ROCK N/A		16.DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 12.65 ft at 1200 hrs, 5/3/00				
14.TOTAL DEPTH OF HOLE 21 ft		17.OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A				
18.GEOTECHNICAL SAMPLES None		DISTURBED N/A	UNDISTURBED N/A	19.TOTAL NUMBER OF CORE BOXES		
20.SAMPLES FOR CHEMICAL ANALYSIS		VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)
		soil and water	BACKFILLED	soil - TRPH	water - TPH-JP4	21.TOTAL CORE RECOVERY %
22.DISPOSITION OF HOLE		w/ bentonite	yes, MV-09	OTHER (SPECIFY)	23.SIGNATURE OF INSPECTOR Luke Darragh	
LOCATION SKETCH/COMMENTS					SCALE 1 Inch = 300 feet	
PROJECT 5155.0027.0007				HOLE NO. SS61-DP44/MW09		

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-DP44/MW09

PROJECT 5155.0027.0007 H2000

INSPECTOR Luke Darragh

SHEET 2 OF SHEETS 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
		Fill and gravel					
	2	Brown Silty CLAY with fine Sand, damp, soft, low plasticity	0.70 ppm				CL
	4	Brown Sandy SILT with fine Sand, very moist, soft	0.54 ppm				ML
	6	wet from 5-6 ft					
	8						
	10	Light grey Silty CLAY with fine Sand, moist, soft	0.35 ppm				CL
	12	Same Silty Clay as above but wet at 14 ft and stained from 13-14 ft, odor	0.75 ppm				CL
	14						
	16	Grey/Tan Silty CLAY with some fine Sand, wet, low plasticity, odor	26.26 ppm				CL
	18	Brown Silty CLAY, fine Sand, wet, soft, low plasticity, trace odor	0.93 ppm				CL
		Same Silty Clay as above, odor					CL
		Grey Silty CLAY with gravel, wet, soft, odor (same down to TD of 21 ft) TD = 21 ft	119 ppm				CL

PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-DP44/MW09

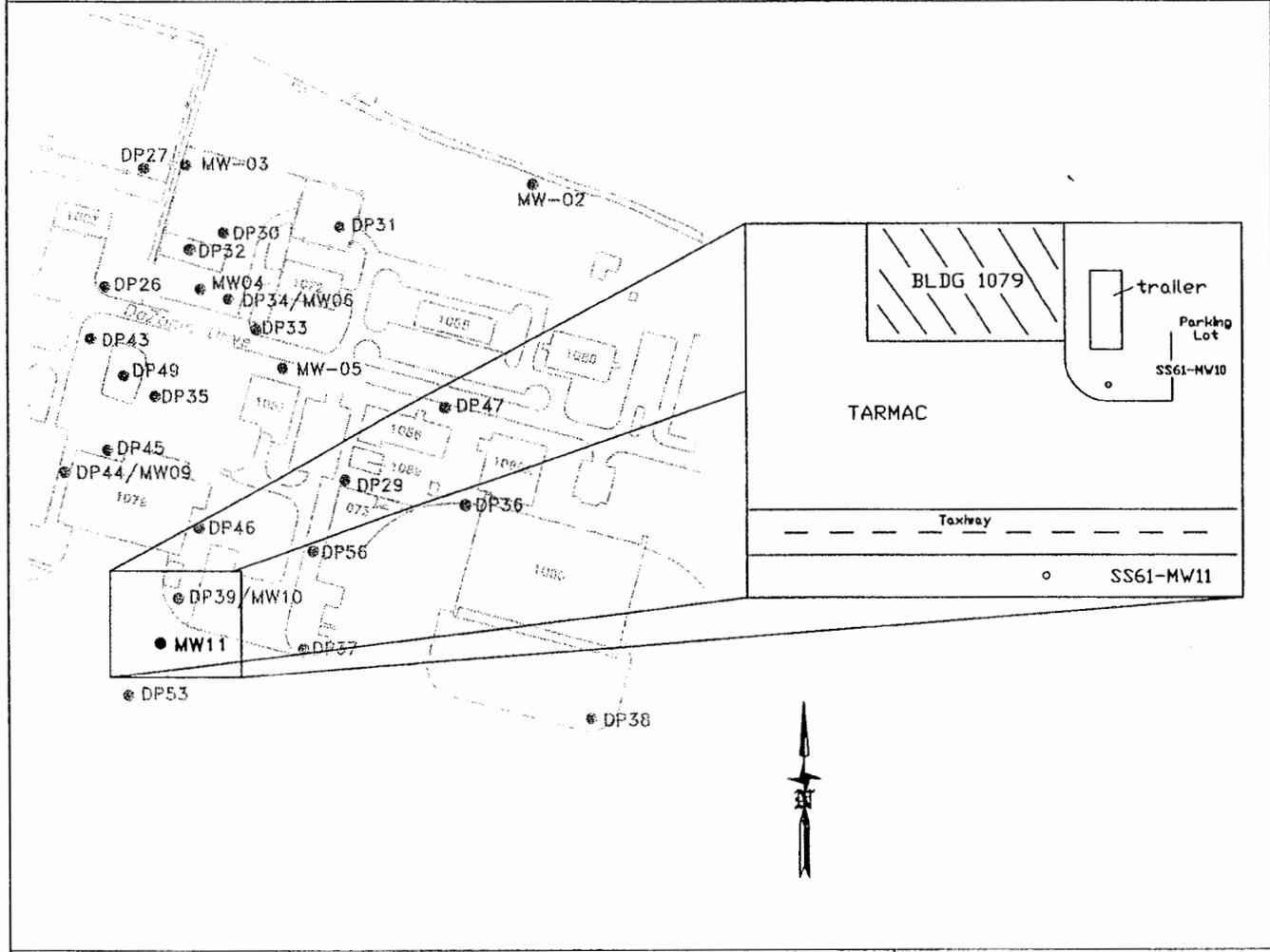
HTRW DRILLING LOG (CONTINUATION SHEET)							HOLE NUMBER SS61-DP39/MV10
PROJECT 5155.0027.0007 H2000				INSPECTOR Luke Darragh		SHEET 2	SHEETS OF 2
ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	2	Grey Clayey SILT with medium Sand and some fine Sand, damp and soft	ND				ML
	4						
	6	Grey Sandy SILT, fine Sand, moist, soft	0.12 ppm				ML
	8	same as above but very moist					ML
	10	Grey Silty CLAY, moist, slight plasticity, some fine Sand, stiff	0.22 ppm		SS61DP39S1001		CL
	12	Brown Silty CLAY, slightly plastic, trace fine to medium Sand, moist, stiff	0.87 ppm				CL
	14						
	16	Brown Silty CLAY, slight plasticity, damp, stiff, trace fine to medium Sand 16-17' color change to grey, odor, stained	494 ppm		SS61DP39S1401		CL
	18	Same as above but wet at 18 ft	454 ppm				CL
		TD = 19.0 ft					

PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-DP39/MV10

HTRW DRILLING LOG		DISTRICT OMAHA		HOLE NUMBER SS61-MW11	
1. COMPANY NAME Foster Wheeler Environmental Corp.		2. DRILL SUBCONTRACTOR Enviro-Drill		SHEET 1 OF 3	
3. PROJECT 5155.0027.0007		4. LOCATION SS-61, Holloman AFB			
5. NAME OF DRILLER D. Starnes		6. MANUFACTURER'S DESIGNATION OF DRILL CME 75 hollow stem auger			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT DPT Rig		8. HOLE LOCATION SS61-MW11			
		9. SURFACE ELEVATION N/A			
		10. DATE STARTED 5/24/00		11. DATE COMPLETED 5/24/00	
12. OVERBURDEN THICKNESS N/A		15. DEPTH GROUNDWATER ENCOUNTERED 17.5 ft			
13. DEPTH DRILLED INTO ROCK N/A		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED N/A			
14. TOTAL DEPTH OF HOLE 23.0 ft		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A			
18. GEOTECHNICAL SAMPLES None		DISTURBED		UNDISTURBED	
20. SAMPLES FOR CHEMICAL ANALYSIS		VOC N/A		METALS N/A	
22. DISPOSITION OF HOLE		BACKFILLED		MONITORING WELL YES, MW-11	
				OTHER (SPECIFY) N/A	
				OTHER (SPECIFY) N/A	
				OTHER (SPECIFY) N/A	
				21. TOTAL CORE RECOVERY %	
				23. SIGNATURE OF INSPECTOR Luke Darragh	

LOCATION SKETCH/COMMENTS SCALE 1 inch = 300 feet



PROJECT **5155.0027.0007** HOLE NO. **SS61-MW11**

HTRW DRILLING LOG			DISTRICT OMAHA			HOLE NUMBER SS61-MW11		
1.COMPANY NAME Foster Wheeler Environmental Corp.			2.DRILL SUBCONTRACTOR Enviro-Drill			SHEET SHEETS 1 OF 3		
3.PROJECT 5155.0027.0007 H2000			4.LOCATION SS-61, Holloman AFB					
5.NAME OF DRILLER D. Starnes			6.MANUFACTURER'S DESIGNATION OF DRILL CME 75 hollow stem auger					
7.SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT HSA 8 Inch I.D. augers			8.HOLE LOCATION SS61-MW11					
			9.SURFACE ELEVATION N/A					
			10.DATE STARTED 5/24/00			11.DATE COMPLETED 5/24/00		
12.OVERBURDEN THICKNESS N/A			15.DEPTH GROUNDWATER ENCOUNTERED 17.5 ft					
13.DEPTH DRILLED INTO ROCK N/A			16.DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED N/A					
14.TOTAL DEPTH OF HOLE 23.0 ft			17.OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A					
18.GEOTECHNICAL SAMPLES None		DISTURBED N/A	UNDISTURBED N/A		19.TOTAL NUMBER OF CORE BOXES			
20.SAMPLES FOR CHEMICAL ANALYSIS		VOC N/A	METALS N/A	OTHER (SPECIFY) N/A	OTHER (SPECIFY)	OTHER (SPECIFY)	21.TOTAL CORE RECOVERY %	
22.DISPOSITION OF HOLE		BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23.SIGNATURE OF INSPECTOR			
		YES, MV-11						
LOCATION SKETCH/COMMENTS						SCALE		
<p>The sketch shows a large hatched area labeled 'BLDG 1079'. To its right is a rectangular area labeled 'trailer'. Below the trailer is a 'Parking Lot'. A 'TARMAC' area is indicated at the bottom. A dashed line represents a 'Taxiway'. Two wells are marked: 'SS61-MW10' near the parking lot and 'SS61-MW11' near the taxiway.</p>								
PROJECT 5155.0027.0007 H2000						HOLE NO. SS61-MW11		

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-MW11

PROJECT 5155.0027.0007 H2000

INSPECTOR Jill Jefferson

SHEET 2 OF SHEETS 3

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	2	Brown SILT with some Sand, trace moisture, well graded					SM
	4	Light reddish brown CLAY with some silt, moist, moderately plastic, well graded					CL
	6						
	8	Light reddish brown CLAY with silt and fine grained Sand, slightly moist					CL
	10	Light brown SILT with some fine grained Sand, slightly moist					SM
	12						
	14	Light reddish brown CLAY with some silt, not plastic, slightly moist					CL
	16	Medium reddish brown CLAY with some SILT, not plastic, slightly moist					CL
	18	Same as above but more dense Water encountered at 17.5 ft					CL

PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-MW11

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-MW11

PROJECT 5155.0027.0007 H2000

INSPECTOR Jill Jefferson

SHEET 3 of 3 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	22	Same as above but more moist and moderately plastic					CL No visible contamination or odors
	24	Total Depth = 23.0 ft					

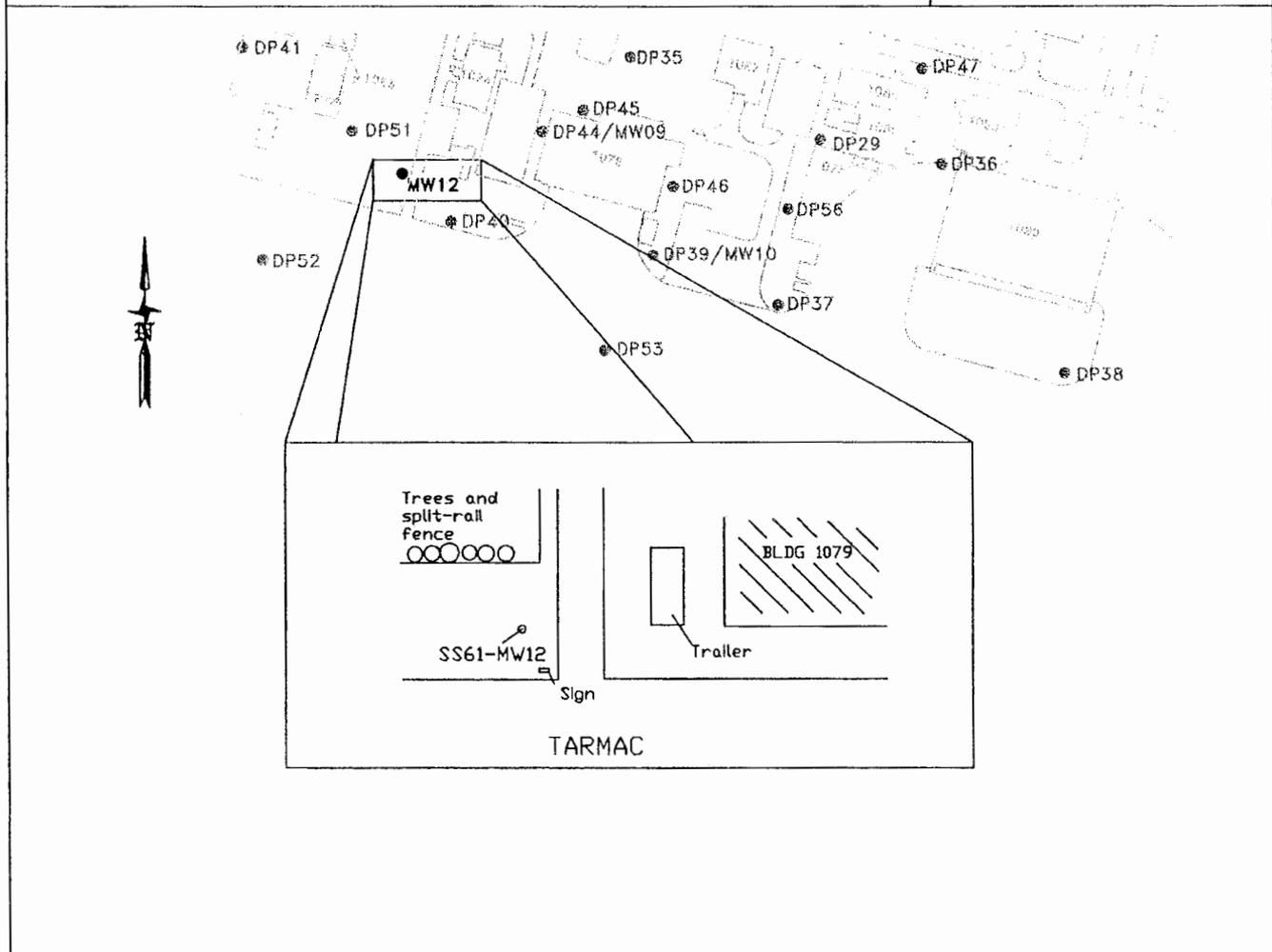
PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-MW11

HTRW DRILLING LOG		DISTRICT OMAHA		HOLE NUMBER SS61-MW12	
1. COMPANY NAME Foster Wheeler Environmental		2. DRILL SUBCONTRACTOR Enviro-Drill		SHEET 1 OF 3 SHEETS	
3. PROJECT 5155.0027.0007		4. LOCATION SS-61, Holloman AFB			
5. NAME OF DRILLER D. Starnes		6. MANUFACTURER'S DESIGNATION OF DRILL CME 75 hollow stem auger			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT DPT Rig		8. HOLE LOCATION SS61-MW12			
		9. SURFACE ELEVATION N/A			
		10. DATE STARTED 5/23/00		11. DATE COMPLETED 5/23/00	
12. OVERBURDEN THICKNESS N/A		15. DEPTH GROUNDWATER ENCOUNTERED 17.5 ft			
13. DEPTH DRILLED INTO ROCK N/A		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED N/A			
14. TOTAL DEPTH OF HOLE 23.0 ft		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A			
18. GEOTECHNICAL SAMPLES None		DISTURBED N/A	UNDISTURBED N/A	19. TOTAL NUMBER OF CORE BOXES	
20. SAMPLES FOR CHEMICAL ANALYSIS		VOC N/A	METALS N/A	OTHER (SPECIFY) N/A	OTHER (SPECIFY) N/A
21. TOTAL CORE RECOVERY %		BACKFILLED	MONITORING WELL YES, MW-12	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR Luke Darragh
22. DISPOSITION OF HOLE					

LOCATION SKETCH/COMMENTS

SCALE 1 Inch = 300 feet



PROJECT 5155.0027.0007	HOLE NO. SS61-MW12
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HTRW DRILLING LOG			DISTRICT OMAHA			HOLE NUMBER SS61-MW12		
1.COMPANY NAME Foster Wheeler Environmental			2.DRILL SUBCONTRACTOR Enviro-Drill			SHEET SHEETS 1 of 3		
3.PROJECT 5155.0027.0007 H2000				4.LOCATION SS-61, Holloman AFB				
5.NAME OF DRILLER D. Starnes				6.MANUFACTURER'S DESIGNATION OF DRILL CME 75 hollow stem auger				
7.SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT HSA 8 inch I.D. augers			8.HOLE LOCATION SS61-MW12					
			9.SURFACE ELEVATION N/A					
			10.DATE STARTED 5/23/00			11.DATE COMPLETED 5/23/00		
12.OVERBURDEN THICKNESS N/A			15.DEPTH GROUNDWATER ENCOUNTERED 17.5 ft					
13.DEPTH DRILLED INTO ROCK N/A			16.DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED N/A					
14.TOTAL DEPTH OF HOLE 23.0 ft			17.OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A					
18.GEOTECHNICAL SAMPLES None		DISTURBED N/A	UNDISTURBED N/A		19.TOTAL NUMBER OF CORE BOXES			
20.SAMPLES FOR CHEMICAL ANALYSIS		VOC N/A	METALS N/A	OTHER (SPECIFY) N/A	OTHER (SPECIFY)	OTHER (SPECIFY)	21.TOTAL CORE RECOVERY %	
22.DISPOSITION OF HOLE		BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23.SIGNATURE OF INSPECTOR			
			YES, MW-12					
LOCATION SKETCH/COMMENTS						SCALE		
<p>The sketch shows a north arrow pointing up. To the left, there are five circles representing trees and a split-rail fence. Below the trees is a sign labeled 'SS61-MW12'. To the right of the sign is a rectangular area labeled 'Trailer'. Further right is a large rectangular area with diagonal hatching labeled 'BLDG 1079'. The entire area is labeled 'TARMAC' at the bottom.</p>								
PROJECT 5155.0027.0007 H2000						HOLE NO. SS61-MW12		

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-MW12

PROJECT 5155.0027.0007 H2000

INSPECTOR Jill Jefferson

SHEET 2 OF 3 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	2	Dark brown fill material with some Clay, moderately plastic, trace moisture					
	4	Light brown SILT with some Clay, no plasticity or cementation, trace moisture					ML
	6	Same as above but color change to light reddish brown					ML
	8	Light reddish brown fine grained SAND with some SILT, trace moisture, no cementation, well graded					SM
	10	Light reddish brown SILT with some Clay and calcite, trace moisture, no plasticity, well graded					ML
	12	Light reddish brown CLAY with trace of SILT, moderately plastic, slightly moist					CL
	14	Medium reddish brown CLAY with trace of SILT, moist, moderately plastic					CL
	16	Same as above but more moist and contains calcite nodules					CL
	18	Groundwater encountered at 17.5 ft					CL

PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-MW12

HTRW DRILLING LOG		DISTRICT OMAHA			HOLE NUMBER SS61-MW12	
1. COMPANY NAME Foster Wheeler Environmental		2. DRILL SUBCONTRACTOR Enviro-Drill			SHEET 1 OF 3 SHEETS	
3. PROJECT 5155.0027.0007 H2000			4. LOCATION SS-61, Holloman AFB			
5. NAME OF DRILLER D. Starnes			6. MANUFACTURER'S DESIGNATION OF DRILL CME 75 hollow stem auger			
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT HSA 8 Inch O.D. augers		8. HOLE LOCATION SS61-MW12				
		9. SURFACE ELEVATION N/A				
		10. DATE STARTED 5/23/00		11. DATE COMPLETED 5/23/00		
12. OVERBURDEN THICKNESS N/A		15. DEPTH GROUNDWATER ENCOUNTERED 17.5 ft				
13. DEPTH DRILLED INTO ROCK N/A		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED				
14. TOTAL DEPTH OF HOLE 23.0 ft		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) N/A				
18. GEOTECHNICAL SAMPLES		DISTURBED N/A	UNDISTURBED N/A	19. TOTAL NUMBER OF CORE BOXES		
20. SAMPLES FOR CHEMICAL ANALYSIS		VOC N/A	METALS N/A	OTHER (SPECIFY) N/A	OTHER (SPECIFY)	OTHER (SPECIFY)
22. DISPOSITION OF HOLE		BACKFILLED	MONITORING WELL YES, MV-12	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %	
23. SIGNATURE OF INSPECTOR						
LOCATION SKETCH/COMMENTS					SCALE	
<p style="text-align: center; font-size: 24pt; font-weight: bold;">TARMAC</p>						
PROJECT 5155.0027.0007 H2000				HOLE NO. SS61-MW12		

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER
SS61-MW12

PROJECT 5155.0027.0007 H2000

INSPECTOR Jill Jefferson

SHEET 3 of SHEETS 3

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	22	Same as above					CL No visible contamination or odors
	24	Total Depth = 23.0 ft					

PROJECT 5155.0027.0007 H2000

HOLE NO. SS61-MW12

APPENDIX D

Quality Assurance Project Plan Addendum for SS-61

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QUALITY ASSURANCE PROJECT PLAN ADDENDUM

FOR SS-61 (AOC 1001)

ADDITIONAL GROUNDWATER MONITORING

HOLLOMAN AFB, NEW MEXICO

Prepared for:

U.S. Army Corps of Engineers
Omaha, Nebraska

CONTRACT NO. DACA45-02-D-0012
TASK ORDER NO. 5

Prepared by:

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

Bhate Project No. 9030024.05.05.01

May 2005

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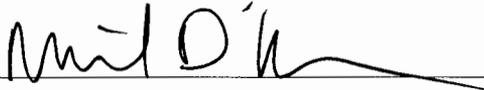
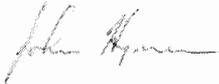
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QUALITY ASSURANCE PROJECT PLAN ADDENDUM

SS-61 (AOC 1001)

**ADDITIONAL GROUNDWATER MONITORING
HOLLOMAN AIR FORCE BASE
NEW MEXICO**

REVIEW SHEET

COMMITMENT TO IMPLEMENT THIS QUALITY ASSURANCE PROJECT PLAN ADDENDUM		
Michael D'Auben		
Project Chemist	Signature	Date
Frank Gardner		
Program Manager	Signature	Date
John Hymer		
Field Team Leader	Signature	Date

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QUALITY ASSURANCE PROJECT PLAN ADDENDUM
SS-61 (AOC 1001)
ADDITIONAL GROUNDWATER MONITORING
HOLLOMAN AIR FORCE BASE
NEW MEXICO

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4-1 Summary of Field QC Samples

4-2 Summary of Laboratory QC Limits

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LIST OF ACRONYMS

Bhate	Bhate Environmental Associates, Inc.
DO	Dissolved Oxygen
DQOs	Data Quality Objectives
EDD	Electronic data deliverable
ERPIMS	Environmental Resources Program Information Management System
HAFB	Holloman Air Force Base
LCL	Lower Control Limit
LCS	Laboratory Control Sample
MDL	Method Detection Limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NELAC	National Environmental Laboratory Accreditation Conference
NMED	New Mexico Environment Department
ORP	Oxidation Reduction Potential
QA	Quality Assurance
QAM	Quality Assurance Manual
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SOPs	Standard Operating Procedures
SS	Spill Site
SVOC	Semivolatile Organic Compounds
TOC	Total Organic Carbon
UCL	Upper Control Limit
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WP	Work Plan

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QUALITY ASSURANCE PROJECT PLAN ADDENDUM

This Quality Assurance Project Plan Addendum (QAPP Addendum) has been developed to assure that sample collection, analyses, and evaluations are legally and scientifically defensible for Spill Site 61 (SS-61) at Holloman Air Force Base (HAFB), New Mexico. This document is an addendum to the *Basewide Quality Assurance Project Plan, Holloman Air Force Base, New Mexico* (Bhate, November 2003) (Basewide QAPP) and must be used in conjunction with that document. This document contains the site specific information for the work at SS-61 outlined in the *Additional Groundwater Monitoring Work Plan for SS-61 (AOC 1001), Holloman Air Force Base, New Mexico* (Bhate, May 2005) (SS-61 Work Plan).

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1 INTRODUCTION

The U.S. Army Corps of Engineers, Omaha District (USACE) has retained Bhate Environmental Associates, Inc., (Bhate) to perform additional groundwater monitoring on behalf of HAFB for the New Mexico Environment Department (NMED). This additional monitoring addresses site SS-61 at HAFB, New Mexico. Bhate is performing this work on behalf of HAFB under the Service Contract with the USACE (Contract No. DACA45-02-D-0012, Task Order No. 5).

See the Basewide QAPP and SS-61 Work Plan for additional information on HAFB and SS-61.

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2 PROJECT LABORATORY

The analytical work for this project will be preformed by Associated Laboratories of Orange, California. The laboratory personnel who will be involved with this project include:

Ms. Danielle Roberts, Associated Laboratories Project Manager

Mr. Jim McCall, Associated Laboratories Quality Assurance / Quality Control Director

Associated Laboratories is certified by both the National Environmental Laboratory Accreditation Conference (NELAC) and the USACE. It has extensive previous experience in working on USACE projects. The Associated Laboratories Quality Assurance Manual (QAM) and Standard Operating Procedures (SOPs) have been reviewed by Bhate and found to meet all the requirements for this project. The QAM and SOPs are available for further review if required.

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3 DATA CATEGORIES

The data use determines the required levels of data quality. The two levels of data quality established by the USACE are screening and definitive. Under this QAPP Addendum, the data to be generated under each level in this investigation are presented in Table 3-1 (Screening) and Table 3-2 (Definitive). The Definitive data generated by the laboratory will be presented with limited data deliverables (i.e. Level II data packages), using a 21 day turn-around-time. All definitive data produced by the laboratory will also be presented in an Environmental Resources Program Information Management System (ERPIMS) format electronic data deliverable (EDD).

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4 DATA QUALITY ASSURANCE AND QUALITY CONTROL

The general data quality assurance (QA) and quality control (QC) requirements for HAFB are presented in the Basewide QAPP. The field QC requirements for this project are presented in Table 4-1. The project specific laboratory QC limits are listed in Table 4-2.

All final definitive data will be reviewed and validated by the Bhat Senior Chemist, Michael J. D'Auben, based on the national functional guidelines developed by U.S. Environmental Protection Agency (USEPA) for data validation and the site specific laboratory QC limits.

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5 REFERENCES

Bhate, November 2003. *Final Basewide Quality Assurance Project Plan*, Holloman Air Force Base, New Mexico.

Bhate, May 2005. *Additional Groundwater Monitoring Work Plan for SS-61 (AOC 1001)*, Holloman Air Force Base, New Mexico.

United States Environmental Protection Agency, July 2002. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*.

United States Environmental Protection Agency, October 1999. *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*.

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TABLES

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Table 3-1
Summary of Screening Data

Parameter	Matrix	Testing Method
pH	Water	Multi-parameter sonde and a flow-through cell
Oxidation Reduction Potential	Water	Multi-parameter sonde and a flow-through cell
Conductivity	Water	Multi-parameter sonde and a flow-through cell
Dissolved Oxygen	Water	Multi-parameter sonde and a flow-through cell
Temperature	Water	Multi-parameter sonde and a flow-through cell
Nitrate	Water	Hach Method 8039
Ferrous Iron	Water	Hach Method 8146
Total Iron	Water	Hach Method 8008
Sulfate	Water	Hach Method 8051

Table 3-2
Summary of Definitive Data

Parameter	Matrix	Testing Method
Volatile Organic Compounds (VOCs)	Water	USEPA SW-846 Method 8260B
Semivolatile Organic Compounds (SVOCs)	Water	USEPA SW-846 Method 8270C
RCRA Metals	Water	USEPA SW-846 Methods 6010B and 7470A
Total Dissolved Solids (TDS)	Water	USEPA Method 160.1
Methane, Ethane, and Ethene	Water	Method RSK 175
Chloride	Water	USEPA Method 300.0
Total Organic Carbon (TOC)	Water	USEPA Method 9060
Alkalinity	Water	USEPA Method 310.1

RCRA - Resource Conservation and Recovery Act
USEPA - United States Environmental Protection Agency
SW - Solid Waste

Table 4-1
Summary of Field QC Samples

Matrix	Analysis	Number of Field Samples	Equipment Blanks	Trip Blanks	Field Duplicates	Field Splits	MS/MSD	Total
Water	VOCs per EPA Method 8260B	10	0	2	1	0	1	15
	SVOCs per EPA Method 8270C	10	0	0	1	0	1	13
	RCRA Metals by EPA 6010B/7470A	10	0	0	1	0	1	13
	Total Dissolved Solids by EPA Method 160.1	10	0	0	1	0	1	13
	Methane, ethane, and ethene by RSK 175	10	0	0	1	0	0	12
	Chloride by EPA Method 300.0	10	0	0	1	0	1	13
	Total Organic Carbon by EPA Method 9060	10	0	0	1	0	1	13
	Alkalinity by EPA Method 130.1	10	0	0	1	0	1	13

Estimated, one trip blank will accompany every shipment of volatile samples

VOCs - Volatile Organic compounds

SVOCs - Semi-volatile Organic Compounds

RCRA - Resource Conservation and Recovery Act

QC - Quality Control

MS/MSD - Matrix Spike/Matrix Spike Duplicate

EPA - Environmental Protection Agency

Table 4-2
Summary of Laboratory QC Limits

Parameter	EQL		LCS				Matrix Spike Water			Matrix Spike Soil		
	Water µg/L	Soil µg/L	Water		Soil		Recovery		MSD RPD	Recovery		MSD RPD
			LCL	UCL	LCL	UCL	LCL	UCL		LCL	UCL	
VOCs per EPA Method 8260B			%	%	%	%	%	%	%	%	%	%
1,1,1,2-Tetrachloroethane	5	5	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	5	5	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	5	5	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	5	5	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichlorotrifluoroethane	5	5	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	5	5	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	5	5	59	172	59	172	59	172	22	59	172	22
1,1-Dichloropropene	5	5	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichlorobenzene	5	5	--	--	--	--	--	--	--	--	--	--
1,2,3-Trichloropropane	5	5	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	5	5	--	--	--	--	--	--	--	--	--	--
1,2,4-Trimethylbenzene	5	5	--	--	--	--	--	--	--	--	--	--
1,2-Dibromo-3-chloropropane	5	5	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane	5	5	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	5	5	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	5	5	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	5	5	--	--	--	--	--	--	--	--	--	--
1,3,5-Trimethylbenzene	5	5	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	5	5	--	--	--	--	--	--	--	--	--	--
1,3-Dichloropropane	5	5	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	5	5	--	--	--	--	--	--	--	--	--	--
1-Chlorohexane	5	5	--	--	--	--	--	--	--	--	--	--
2,2-Dichloropropane	5	5	--	--	--	--	--	--	--	--	--	--
2-Butanone (MEK)	100	100	--	--	--	--	--	--	--	--	--	--
2-Chloroethyl vinyl ether	5	5	--	--	--	--	--	--	--	--	--	--
2-Chlorotoluene	5	5	--	--	--	--	--	--	--	--	--	--
2-Hexanone	20	5	--	--	--	--	--	--	--	--	--	--
4-Chlorotoluene	5	5	--	--	--	--	--	--	--	--	--	--
4-Methyl-2-pentanone	10	5	--	--	--	--	--	--	--	--	--	--
Acetone	100	50	--	--	--	--	--	--	--	--	--	--
Acetonitrile	50	5	--	--	--	--	--	--	--	--	--	--
Acrolein	200	200	--	--	--	--	--	--	--	--	--	--
Acrylonitrile	10	5	--	--	--	--	--	--	--	--	--	--
Allyl chloride	5	5	--	--	--	--	--	--	--	--	--	--
Benzene	1	5	62	137	62	137	62	137	24	62	137	24
Benzyl chloride	5	5	--	--	--	--	--	--	--	--	--	--
Bromobenzene	5	5	--	--	--	--	--	--	--	--	--	--

Table 4-2
Summary of Laboratory QC Limits

Parameter	EQL		LCS				Matrix Spike Water			Matrix Spike Soil		
	Water	Soil	Water LCL	Water UCL	Soil LCL	Soil UCL	Recovery LCL	Recovery UCL	MSD RPD	Recovery LCL	Recovery UCL	MSD RPD
Bromochloromethane	5	5	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	5	5	--	--	--	--	--	--	--	--	--	--
Bromoform	5	5	--	--	--	--	--	--	--	--	--	--
Bromomethane	5	5	--	--	--	--	--	--	--	--	--	--
Carbon disulfide	5	5	--	--	--	--	--	--	--	--	--	--
Carbon tetrachloride	5	5	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	5	5	60	133	60	133	60	133	21	60	133	21
Chloroethane	5	5	--	--	--	--	--	--	--	--	--	--
Chloroform	5	5	--	--	--	--	--	--	--	--	--	--
Chloromethane	5	5	--	--	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	5	5	--	--	--	--	--	--	--	--	--	--
cis-1,3-Dichloropropene	5	5	--	--	--	--	--	--	--	--	--	--
cis-1,4-Dichloro-2-butene	5	5	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	5	5	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	5	5	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	5	5	--	--	--	--	--	--	--	--	--	--
Methylene chloride	5	5	--	--	--	--	--	--	--	--	--	--
Methyl-tert-butylether	1	5	62	137	62	137	62	137	24	62	137	24
Styrene	5	5	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene	5	5	--	--	--	--	--	--	--	--	--	--
Toluene	5	5	59	139	59	139	59	139	21	59	139	21
trans-1,2-Dichloroethen	5	5	--	--	--	--	--	--	--	--	--	--
trans-1,3-Dichloroprope	5	5	--	--	--	--	--	--	--	--	--	--
Trichloroethene	5	5	66	142	66	142	66	142	21	66	142	21
Vinyl chloride	5	5	--	--	--	--	--	--	--	--	--	--
Xylene (total)	5	5	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane-d4 (surr)	--	--	70	135	70	135	--	--	--	--	--	--
4-Bromofluorobenzene (surr)	--	--	70	135	70	135	--	--	--	--	--	--
Dibromofluoromethane (surr)	--	--	70	135	70	135	--	--	--	--	--	--
Toluene-d8 (surr)	--	--	70	135	70	135	--	--	--	--	--	--
SVOCs by EPA Method 8270C	ug/L	ug/kg	%	%	%	%	%	%	%	%	%	%
2,4,5-Trichlorophenol	50	1665	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	50	1665	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	10	333	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	10	333	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	50	1665	--	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	10	333	57	129	27	139	57	129	50	82	125	43
2,6-Dinitrotoluene	10	333	--	--	--	--	--	--	--	--	--	--

**Table 4-2
Summary of Laboratory QC Limits**

Parameter	EQL		LCS				Matrix Spike Water			Matrix Spike Soil		
	Water	Soil	Water		Soil		Recovery		MSD	Recovery		MSD
			LCL	UCL	LCL	UCL	LCL	UCL	RPD	LCL	UCL	RPD
2-Chloronaphthalene	10	333	--	--	--	--	--	--	--	--	--	--
2-Chlorophenol	10	333	28	100	28	88	28	100	36	28	100	36
2-Methylnaphthalene	10	333	--	--	--	--	--	--	--	--	--	--
2-Methylphenol	10	333	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	50	1665	--	--	--	--	--	--	--	--	--	--
2-Nitrophenol	10	333	--	--	--	--	--	--	--	--	--	--
3,3'-Dichlorobenzidine	10	333	--	--	--	--	--	--	--	--	--	--
3-Nitroaniline	50	1665	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-2-methylphe	50	1665	--	--	--	--	--	--	--	--	--	--
4-Bromophenyl-phenyleth	10	333	--	--	--	--	--	--	--	--	--	--
4-Chloro-3-methylphenol	10	333	32	103	27	96	32	103	42	26	117	37
4-Chloroaniline	10	333	--	--	--	--	--	--	--	--	--	--
4-Chlorophenyl-phenylet	10	333	--	--	--	--	--	--	--	--	--	--
4-Methylphenol	10	333	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	50	1665	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	50	333	0	103	8	123	0	103	57	53	143	73
Acenaphthene	10	333	42	107	31	101	42	107	60	46	113	41
Acenaphthylene	10	333	--	--	--	--	--	--	--	--	--	--
Anthracene	10	333	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	10	333	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	10	333	--	--	--	--	--	--	--	--	--	--
Benzo(b)fluoranthene	10	333	--	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	10	333	--	--	--	--	--	--	--	--	--	--
Benzo(k)fluoranthene	10	333	--	--	--	--	--	--	--	--	--	--
Benzoic acid	10	333	--	--	--	--	--	--	--	--	--	--
bis(2-Chloroethoxy)meth	10	333	--	--	--	--	--	--	--	--	--	--
bis(2-Chloroethyl)ether	10	333	--	--	--	--	--	--	--	--	--	--
bis(2-Chloroisopropyl)e	10	333	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthal	10	333	--	--	--	--	--	--	--	--	--	--
Butylbenzylphthalate	10	333	--	--	--	--	--	--	--	--	--	--
Chrysene	10	333	--	--	--	--	--	--	--	--	--	--
Dibenz(a,h)anthracene	10	333	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	10	333	--	--	--	--	--	--	--	--	--	--
Diethylphthalate	10	333	--	--	--	--	--	--	--	--	--	--
Dimethylphthalate	10	333	--	--	--	--	--	--	--	--	--	--
Di-n-butylphthalate	10	333	--	--	--	--	--	--	--	--	--	--
Di-n-octylphthalate	10	333	--	--	--	--	--	--	--	--	--	--

Table 4-2
Summary of Laboratory QC Limits

Parameter	EQL		LCS				Matrix Spike Water Recovery			Matrix Spike Soil Recovery		
	Water	Soil	Water LCL	Water UCL	Soil LCL	Soil UCL	LCL	UCL	MSD RPD	LCL	UCL	MSD RPD
Fluoranthene	10	333	--	--	--	--	--	--	--	--	--	--
Fluorene	10	333	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	10	333	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	10	333	--	--	--	--	--	--	--	--	--	--
Hexachlorocyclopentadiene	10	333	--	--	--	--	--	--	--	--	--	--
Hexachloroethane	10	333	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	10	333	--	--	--	--	--	--	--	--	--	--
Isophorone	10	333	--	--	--	--	--	--	--	--	--	--
Naphthalene	10	333	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	10	333	--	--	--	--	--	--	--	--	--	--
N-Nitroso-di-n-propylamine	10	333	8	151	9	130	8	151	55	5	149	42
N-Nitrosodiphenylamine	10	333	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	50	1665	6	148	0	151	6	148	42	0	151	52
Phenanthrene	10	333	--	--	--	--	--	--	--	--	--	--
Phenol	10	333	0	75	17	99	0	75	47	6	117	42
Pyrene	10	333	52	108	34	127	52	108	49	47	136	36
2,4,6-Tribromophenol (surr)	--	--	10	123	17	122	--	--	--	--	--	--
2-Fluorobiphenyl (surr)	--	--	43	116	30	115	--	--	--	--	--	--
2-Fluorophenol (surr)	--	--	21	110	25	121	--	--	--	--	--	--
Nitrobenzene-d5 (surr)	--	--	34	114	23	120	--	--	--	--	--	--
Phenol-d5 (surr)	--	--	10	110	24	113	--	--	--	--	--	--
Terphenyl-d14 (surr)	--	--	3	141	18	137	--	--	--	--	--	--
RCRA Metals by EPA Method 6010B/7470A	mg/L	mg/kg	--	--	--	--	--	--	--	--	--	--
Arsenic	0.005	1	80	120	80	120	75	125	20	75	125	20
Barium	0.01	1	80	120	80	120	75	125	20	75	125	20
Chromium	0.01	1	80	120	80	120	75	125	20	75	125	20
Cadmium	0.005	0.5	80	120	80	120	75	125	20	75	125	20
Lead	0.005	0.5	80	120	80	120	75	125	20	75	125	20
Mercury	0.0004	0.14	80	120	80	120	75	125	20	75	125	20
Selenium	0.006	1	80	120	80	120	75	125	20	75	125	20
Silver	0.005	0.5	80	120	80	120	75	125	20	75	125	20
Total Dissolved Solids (TDS) by EPA Method 160.1	mg/L	mg/kg	%	%	%	%	%	%	%	%	%	%
TDS	6	50	90	110	--	--	--	--	--	--	--	--
Methane, Ethane and Ethene by Method RSK 175	mg/L	mg/kg	%	%	%	%	%	%	%	%	%	%
Methane	0.005	--	--	--	--	--	--	--	20	--	--	--
Ethane	0.005	--	--	--	--	--	--	--	20	--	--	--
Ethene	0.005	--	--	--	--	--	--	--	20	--	--	--
Chloride by EPA Method 300.0	mg/L	mg/kg	%	%	%	%	%	%	%	%	%	%
Chloride	1	10	90	110	--	--	80	120	20	80	120	20

Table 4-2
Summary of Laboratory QC Limits

Parameter	EQL		LCS				Matrix Spike Water Recovery			Matrix Spike Soil Recovery		
	Water	Soil	Water LCL	Water UCL	Soil LCL	Soil UCL	LCL	UCL	MSD RPD	LCL	UCL	MSD RPD
Total Organic Carbon (TOC) by EPA Method 9060	mg/L	mg/kg	%	%	%	%	%	%	%	%	%	%
TOC	0.3	--	80	120	--	--	80	120	20	--	--	--
Alkalinity by EPA Method 310.1	mg/L	mg/kg	%	%	%	%	%	%	%	%	%	%
Alkalinity	5	50	--	--	--	--	--	--	20	--	--	20

µg/kg = micrograms per kilogram
 µg/L = micrograms per liter
 EPA = United States Environmental Protection Agency
 EQL = Estimated Quantitation Limit
 LCL = Lower Control Limit
 LCS = Laboratory Control Sample
 mg/kg = milligrams per kilogram
 mg/L = milligrams per liter
 MS = Matrix Spike
 MSD = Matrix Spike Duplicate
 RCRA = Resource Conservation and Recovery Act
 RPD = Relative Percent Difference
 SVOCs = Semi-volatile organic compounds
 VOCs = Volatile organic compounds
 UCL = Upper Control Limit