HWB 005

bhate associates
ENGINEERING, SCIENCE AND CONSTRUCTION
1608 13th Avenue South Suite 300 Birmingham, Alabama 35205
205.918.4000 main 205.918.4050 fax 800.806.4001 toll free www.bhate.com
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July 20, 2005

Received
JUL 21 2005
District 1

Haz Waste Bureau
New Mexico Environment Department
550 San Antonio NE
Albuquerque, NM 87109

ATTN: Cornelius Amindyas

Subject: **Risked Based Evaluation**
Officer's Club, Site SS-57
Holloman Air Force Base, NM
Contract No.: DACA45-03-D-0023
Delivery Order No.: 02
Bhate Project Number: 9040002

Dear Mr. Amindyas:

Enclosed are two sets of drawings that were inadvertently left out of the above referenced report. Please inset them at the end of the tabbed section for Figures.

I apologize for any inconvenience. If you have any questions, please call me at 205-918-4000.

Sincerely,
Bhate Environmental Associates, Inc.

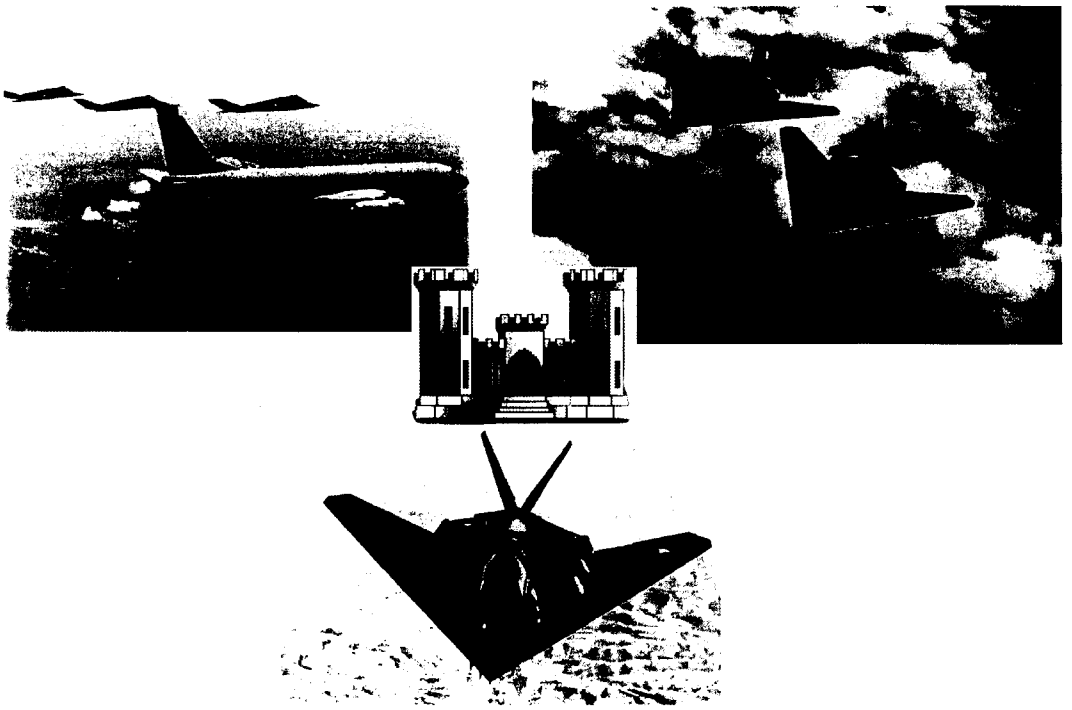
Karen J. Niebuhr, PE
Project Manager/Senior Engineer

Attachment (or Enclosures)

cc: Mr. Tom Zink (2 sets)
Mr. Chuck Schick (1 set)
Mr. Frank Gardner (1 set)
Mr. John Hymer (2 sets)

HAFB 05 7/1/05

RISK-BASED EVALUATION OFFICER'S CLUB, SITE SS-57



Holloman Air Force Base
New Mexico

July 2005

Contract No.: DACA45-03-D-0023
Delivery Order No.: 02
Bhate Project No.: 9040002

Headquarters, Air Combat Command
Langley Air Force Base, Virginia

49 CES/CEV
Holloman Air Force Base, New Mexico

RISK-BASED EVALUATION

Received
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OFFICER'S CLUB, SITE SS-57
HOLLOMAN AFB, NEW MEXICO

Prepared for:

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New Mexico

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Prepared by:

Risk Assessment and Management Group, Inc.
5433 Westheimer, Suite 725
Houston, Texas 77056

Subcontracted to:

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

Bhate Project No. 9040002

July 2005

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RISK-BASED EVALUATION

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LIST OF ACRONYMS

AMSL	Above Mean Sea Level
AS/SVE	Air sparging/soil-vapor extraction
ASTM	American Society for Testing and Materials
BTEX	Benzene, toluene, ethylbenzene, and xylenes (total)
bgs	Below ground surface
C	Complete
°C	Degrees Celsius
CFA	California Fertilizer Association
cm	Centimeter
COPCs	Chemicals of potential concern
CSM	Conceptual Site Model
E	Exceed
EM	Exposure model
EPA	Environmental Protection Agency
ERP	Environmental Restoration Program
°F	Degrees Fahrenheit
J&E	Johnson and Ettinger
HA	Health Advisory
HAFB	Holloman Air Force Base
HI	Hazard Index
HQ	Hazard Quotient
MCL	Maximum contaminant level
mg/L	Milligrams per liter
NA	Not available, not analyzed, or not applicable
ND	Non-detect
NE	Not exceed
NIOSH	National Institute for Occupational Safety and Health
NMED	New Mexico Environmental Department
NMRBCA	New Mexico Risk-Based Corrective Action
NOC	Not of concern
PAHs	Polycyclic aromatic hydrocarbons
ROEs	Routes of exposure
SCS	Soil Conservation Service
SSLs	Soil Screening Levels
SSTLs	Site-Specific Target Levels
SVOC	Semi-volatile organic compound
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
TPH	Total petroleum hydrocarbon
TPHCWG	Total Petroleum Hydrocarbon Criteria Working Group
TPH-DRO	Total Petroleum Hydrocarbon-Diesel Range Organic
TPH-GRO	Total Petroleum Hydrocarbon-Gasoline Range Organic
TPH-ORO	Total Petroleum Hydrocarbon-Oil Range Organic

μg/kg	Micrograms per kilogram
$\mu g/m^3$	Micrograms per cubic meter
μg/L	Micrograms per liter
USEPA	United States Environmental Protection Agency
UST	Underground storage tank
VOC	Volatile organic compound
WQCC	Water Quality Control Commission

EXECUTIVE SUMMARY

Environmental Restoration Program (ERP) Site SS-57 (The Officer's Club) is located at the corner of West 8th Street and West New Mexico Avenue, Holloman Air Force Base (HAFB), New Mexico. In response to hydrogen sulfide odors detected in the building in the fall of 1991, numerous investigations have been conducted at the site. These have resulted in the installation of several groundwater monitoring and soil-vapor wells, collection and analysis of groundwater samples, soil samples, and soil-vapor samples. Additionally, an air sparge/soil-vapor extraction system operated at the site from about 1996 to 2002.

This report presents a site-specific risk assessment conducted at the site to determine whether the residual soil and groundwater concentrations of petroleum hydrocarbons result in an unacceptable risk. The risk assessment consisted of the following steps:

- Review of site history and compilation of relevant data
- Development of an exposure model (EM) for the identification of the complete routes of exposure (ROEs)
- Comparison of maximum soil, groundwater and soil-vapor concentrations with New Mexico Environmental Department (NMED) soil screening levels (SSLs), lowest groundwater standards (refer to Section 3.2), and air inhalation target levels (New Mexico Underground Storage Tank Bureau, 2000), respectively
- Application of the Johnson and Ettinger (J&E) model to estimate soil and groundwater target levels protective of indoor inhalation
- Speciation of total petroleum hydrocarbon-diesel range organics (TPH-DRO) data into aromatic and aliphatic fractions using the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG) approach.
- Calculation of site-specific target levels (SSTLs) for each fraction for the primary ROEs

The results of the above tasks are summarized below:

1. The primary ROEs which have been quantitatively evaluated based on the site-specific receptors include:
   a. Commercial Worker
      i. Dermal contact with surficial soil
      ii. Ingestion of surficial soil
      iii. Outdoor inhalation from surficial soil
      iv. Indoor inhalation from subsurface soil
      v. Indoor inhalation from groundwater
   b. Resident
      i. Dermal contact with surficial soil
      ii. Ingestion of surficial soil
      iii. Outdoor inhalation from surficial soil
      iv. Indoor inhalation from subsurface soil

   v. Indoor inhalation from groundwater
c. Construction Worker
   i. Dermal contact with surficial soil
   ii. Ingestion of surficial soil
   iii. Outdoor inhalation from surficial soil
   iv. Indoor inhalation from groundwater
   v. Dermal contact with groundwater

2. Review of site-specific data indicates that the residual concentrations are "very low". As an example, the maximum detected concentration of benzene in groundwater is 0.35 micrograms per liter (μg/L), which is significantly less than the federal groundwater standard of 5 μg/L.
3. None of the maximum soil and groundwater concentrations exceed NMED SSLs and groundwater standards respectively except for TPH-DRO.
4. None of the soil and groundwater concentrations exceed target levels protective of indoor inhalation using the J&E model. Note this step was necessary because the NMED SSLs do not consider indoor inhalation as a pathway.
5. SSTLs were calculated for TPH-DRO and its carbon fractions. Maximum detected concentrations did not exceed any of the SSTLs for the above identified primary ROEs for neither the TPH-DRO nor the carbon fractions.

Based on the above evaluation, the residual soil, groundwater, and soil-vapor concentrations are protective of current and reasonable future receptors at the site. These concentrations are anticipated to reduce in time due to natural attenuation processes which are expected to further reduce the risk.

1 INTRODUCTION

This Section presents the background data and site-specific information for a risk-based evaluation for the Environmental Restoration Program (ERP) Site SS-57 (The Officer's Club) at Holloman Air Force Base (HAFB), New Mexico.

1.1 Site Description

1.1.1 Location and Vicinity

HAFB is located directly west of Alamogordo, New Mexico. The Officer's Club (Building No. 531) is located at the corner of West 8th Street and West New Mexico Avenue, HAFB. Figures 1-1, 1-2, and 1-3 show the general locations of HAFB and the Officer's Club.

The grounds around the Officer's Club are landscaped along the southwestern and western sides of the building while the northern and eastern portions of the site are paved with asphaltic concrete.

1.1.2 Source Area

The site was identified in 1991 when hydrogen sulfide odors were detected in the Officer's Club building. These were assumed to result from the natural anaerobic organic degradation of diesel fuel hydrocarbons which leaked from an underground storage tank (UST) prior to 1991. This tank was located near the southwestern corner of the Officer's Club and has been removed.

1.2 Chronology of Events

The chronology of significant events at the site, based on reports reviewed is outlined below. Boring and sampling locations are shown on Figure 1-4.

Fall 1991 Hydrogen sulfide odors were detected in the Officer's Club building and the site was designated as SS-57.

Oct. 1991 Nine soil borings (B-1 to B-9) were advanced to depths ranging from approximately 1 to 29 feet below existing grade. Three monitoring wells (MW05, MW07, and MW09) were installed at three of the nine borings. The following samples were collected and submitted for laboratory analysis:

- Nine water samples from nine borings for standard water analysis and organic halogen analysis.
- Three water samples from B-1, B-2, and B-3 for volatile organic compound (VOC) analysis. The VOC method is not known and also not critical for risk assessment since this is pre-remediation and 13 year old data.
- Three air samples from B-1, B-2, and B-3 for sulfur compounds analysis and VOC analysis.

- One water sample from the seep in the basement access stairwell for diesel fuel.

Geotechnical parameters such as moisture content, grain-size analysis, Atterberg limits tests, and consolidation tests were performed on selected samples. A positive pressure air-handling system was installed at the Officer's Club to prevent nuisance odors from accumulating in the building.

Nov. 1992 Four vertical borings (VB-01 to VB-04) and two angle boring (AB-01 and AB-02) were drilled near the southern corner of the Officer's Club. Twenty five soil samples were collected and analyzed for total petroleum hydrocarbon (TPH) as diesel using Modified American Society for Testing and Materials (ASTM) Method D3328. Also, 13 soil samples were analyzed for a bacteria enumeration study and a biological screening.

Mar. 1996 One triple-nested air sparge well SP-01 screened from 18 to 20 feet, 28 to 30 feet, and 37.5 to 39.5 feet below ground surface (bgs) was installed. Three sparge monitor wells (SMP-01, SMP-02, and SMP-03) were installed. Each of these wells has three nested monitoring points screened at 18 to 20 feet, 28 to 30 feet, and 38 to 40 feet bgs (except 37 to 39 feet bgs for SMP-02).

Four groundwater monitoring wells (MW01 to MW04) were advanced to depths between 14 and 17 feet bgs. Fourteen soil samples were collected and analyzed for the following:

- TPH as Diesel fuel by Modified ASTM Method D3328
- Alkalinity by Modified Environmental Protection Agency (EPA) Method 310.1
- pH by EPA Method 9045A
- Sulfate by Modified EPA Method 375.4
- Total Kjeldahl Nitrogen (TKN) by Modified EPA Method 351.2
- Total Organic Carbon (TOC) by California Fertilizer Association (CFA) Method 18.0
- Phosphorous (total) by Modified EPA Method 365.4
- Moisture Content by ASTM Method D2216-80
- Iron (total) by EPA Method 6010A

Apr. 1996 Eleven groundwater samples were collected and analyzed for TPH as diesel by Modified ASTM Method D3328, dissolved iron by EPA Method 6010A, and sulfate by Modified EPA Method 375.4.

An air sparging/soil vapor extraction (AS/SVE) pilot test was performed for a horizontal vapor extraction trench (VET-01) and a triple-nested air sparge well (SP-01). Soil vapor samples were collected while venting on the vapor extraction trench and analyzed using EPA Method TO-14 and ASTM Method D-5504.

Oct. 1997 Soil samples were collected and analyzed for TPH using EPA Method 418.1.

Results of the soil samples are not available and also not necessary for risk assessment (refer to Section 1.5).

May 1998 Soil samples were collected and analyzed for TPH using EPA Method 418.1. Results of the soil samples are not available and also not necessary for risk assessment (refer to Section 1.5).

Apr. 1999 Soil samples were collected and analyzed for TPH using EPA Method 418.1. Results of the soil samples are not available and also not necessary for risk assessment (refer to Section 1.5).

May 2002 The AS/SVE which operated from April 1996 was turned off.

Jul. 2002 Sixteen soil samples were collected from eight soil borings (DP01 to DP08). Samples were analyzed for VOCs by EPA Method 8260B, semi-volatile organic compounds (SVOCs) by EPA Method 8270C, TPH-diesel range organics (TPH-DRO) & TPH-oil range organics (TPH-ORO) by Modified EPA Method 8015D, and TPH-gasoline range organics (TPH-GRO) by Modified EPA Method 8015V. Data for 9 of the 16 samples are tabulated in Appendix A, the remaining were non-detects.

Feb. 2004 Five soil borings (SB01 to SB05) were drilled; 10 soil samples and 5 groundwater samples were collected. Three dual completion soil-vapor borings (SV01 to SV03) were drilled; six soil samples were collected for lab analysis as well as for analyzing geotechnical parameters. Boring GB-01 was drilled at a non-impacted area and also sampled for geotechnical data. Groundwater samples from MW01 to MW03, MW05, and MW07 were collected including a duplicate from MW07. The samples were analyzed for the following:

- VOCs (benzene, toluene, ethylbenzene, and xylenes [BTEX] only) using EPA Method 8260B
- Polycyclic aromatic hydrocarbons (PAHs) using EPA Method 8270C
- TPH using Texas Method 1005
- Carbon Fractions using Texas Method 1006

Apr. 2004 Six samples from dual completion soil-vapor borings (SV01 to SV03) were collected and sent for soil vapor analysis for the following:

- BTEX compounds using EPA Method TO-15
- TPH-DRO using National Institute for Occupational Safety and Health (NIOSH) Method 1550

Aug. 2004 Soil boring SB06 was drilled and two soil samples, including one duplicate sample, were collected and analyzed for the following:

- VOCs (BTEX only) using EPA Method 8260B
- PAHs using EPA Method 8270C
- TPH using Texas Method 1005

- Carbon Fractions using Texas Method 1006

A groundwater sample from MW04 was collected and analyzed for the following:

- VOCs (BTEX only) using EPA Method 8260B
- TPH using Texas Method 1005
- Carbon Fractions using Texas Method 1006

1.3 Data Used for Risk Analysis

Based on the chronology presented above, soil, groundwater, and soil-vapor analytical data have been collected at the site since 1991.

Data collected before June 2002 are not considered representative of current site conditions due to the natural biodegradation of petroleum hydrocarbons. Additionally, data collected during the operation of the AS/SVE system would be biased to the low end and not representative of static or current conditions. Although the pre June 2002 data was not used quantitatively, it was used qualitatively to develop the data acquisition plan for risk assessment (Bhate, 2004). The analytical data collected before June 2002 is presented in Appendix A. For risk assessment purposes, the soil, groundwater, and soil-vapor data collected between June 2002 and August 2004 are considered representative of the current site conditions and are presented in Tables 1-1, 1-2, and 1-3 respectively. Additionally, the data on these tables include values at ½ the method detection limit for all non detected analytes. Subsequent discussions refer only to these data collected after June 2002.

Duplicate samples were collected in borings SB02 at 2 feet bgs, SB06 at 3.5 feet bgs, and SV03 at 7 feet bgs for soil, in MW07 for groundwater and in SV03 at 8 feet bgs for soil-vapor. The duplicate samples were analyzed as follows:

- If both samples contained detectable concentrations, the average of the two were taken and considered as detected.
- If one of the sample contained detectable concentrations and the other was non-detect, the non-detect was replaced with ½ the detection limit and average of the two were taken and considered as detected.
- If both samples were non-detect, the non-detects were replaced with ½ the detection limit and average of the two were taken and considered as non-detect.
- If a chemical was analyzed in only one sample, the analyzed value is considered.

Based on the above conditions, the combined sample values were used for further analysis and are shown in Tables 1-1, 1-2, and 1-3.

The chemicals that were detected at least once in soil, groundwater, or soil-vapor samples are presented in Table 1-4.

1.4 Site Geology

Based on the soil boring logs (included in Appendix B), the soil underlying the site consists of the following units:

- 0-15 feet bgs silty sand
- 15-25 feet bgs varying layers of fine-grained, sandy clays and clay
- 25-40 feet bgs silt and silty sand

The site-specific soil geotechnical analytical results from boring SV01 to SV03 and GB-01 are tabulated in Table 1-5. Because all the data were collected in the unsaturated silty sand zone above the water table, the results for each geotechnical parameter were averaged for their use in the site-specific estimation of risk. Lab results from geotechnical analysis are included in Appendix C.

1.5 Site Hydrogeology

There are seven wells screened between 3 and 17 feet bgs. Tables 1-6 and 1-7 present the groundwater elevation data and monitoring well construction details, respectively. Historical depth to water ranges from approximately 8.5 to 12.5 feet bgs at the site. Hydraulic gradient ranges from approximately 0.013 to 0.025 feet per foot, and water flows south - southwest. The groundwater contours using the most recent water level data from October 19, 2004 are shown on Figure 1-5. Using a hydraulic conductivity of silty sand of 2.8 feet/day (Freeze and Cherry, 1979), the Darcy Velocity is estimated to be 0.0532 feet/day.

1.6 Distribution of COPCs in Soil

The soil samples collected have been analyzed for VOCs, SVOCs, TPH, and carbon fractions to identify chemicals of potential concern (COPCs). For risk assessment purposes, the vadose zone soil is divided into surficial soil and subsurface soil zones. The surficial soil zone is the zone of soil that a receptor can get exposed to by direct ingestion, dermal contact, and inhalation of vapors. The specific thickness of surficial soil is a policy choice. This is not defined in the Technical Background Document for Development of Soil Screening Levels (Revision 2) (NMED, 2002). However, based on Guidelines for Corrective Action (New Mexico Underground Storage Tank Bureau, 2000), the surficial soil zone was assigned a thickness of 1 foot.

Based on the review of soil data collected in July 2002, February 2004, and August 2004 (refer to Table 1-1) the following was observed:

Surficial Soil (0-1 feet bgs)

- Five surficial soil samples were collected from borings SB01 to SB05.
- TPH, acetone, carbon disulfide, hexane, and xylenes were detected in the surficial soil.

- Carbon disulfide was detected in SB02 at 3 µg/kg.
- Hexane was detected twice in SB02 and SB05. The higher concentration of 0.82 µg/kg of hexane was observed in SB05.
- Total xylenes were detected in all of the surficial soil samples and the highest total xylenes concentration was 3.3 µg/kg in SB03.
- TPH was detected in all of the five samples and the highest concentration was 685,000 µg/kg in SB02.

Subsurface Soil (1 feet bgs to the water table)

- Twenty subsurface soil samples were collected from borings DP-01 to DP-07, SB01 to SB05, and SV01 to SV03.
- Chrysene, ethylbenzene, diethylphthalate, fluoranthene, 2-methylnaphthalene, phenanthrene, TPH, hexane, indeno (1,2,3-c,d) pyrene, isopropylbenzene, xylenes, benzo (a) anthracene, benzo (b) fluoranthene, benzo (k) fluoranthene, benzo (g,h,i) perylene, benzo (a) pyrene, and pyrene were detected in the subsurface soil.
- The maximum depth of soil analysis was at 12 feet bgs for boring DP-04. TPH-DRO and TPH-ORO were detected.
- The maximum TPH-DRO concentration observed was 9,350,000 µg/kg at 2 feet bgs in SB02.

1.7 Distribution of COPCs in Groundwater

The groundwater samples collected have been analyzed for TPH and VOCs. Based on the review of groundwater data collected in February and August 2004, the following was observed:

- Eleven groundwater samples were collected from borings SB01 to SB05 and monitoring wells MW01 through MW05, and MW07.
- TPH-DRO, acetone, benzene, 2-butanone, carbon disulfide, chloroform, cyclohexane, 1,3-dichlorobenzene, 1,4-dichlorobenzene, dichlorodifluoromethane, ethylbenzene, isopropylbenzene, methylcyclohexane, trichloroethene, trichlorofluoromethane, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and xylenes were detected in groundwater samples.
- The maximum TPH-DRO concentration of 3,600 mg/L was observed in SB03.

1.8 Distribution of CPOCs in Soil-Vapor

Three dual completion soil-vapor borings (SV01 to SV03) were drilled and analyzed for TPH and VOCs (Table 1-3).

- Six soil-vapor samples were collected from the soil-vapor borings (two each from SV01 to SV03).

- 2-Propanol, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, acetone, chloroform, toluene, m/p-xylene, o-xylene, and naphthalene were detected in soil-vapor samples.
- A toluene concentration of 5.2 micrograms per cubic meter ($\mu g/m^3$) was detected at 3 feet in soil-vapor boring SV03.

1.9 Water Use

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

Within the boundaries of SS-57, stormwater run-off is controlled by the minimal topographic relief as per the existing grade and landscaping. Appurtenances can be found along the perimeter for collection into the Base storm water drainage system.

The annual rainfall for Alamogordo is 12 inches per year (http://countrystudies.us/united-states/weather/new-mexico/).

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2 EXPOSURE MODEL

This Section presents the exposure model (EM) for the Officer's Club, Site SS-57. The EM identifies the potential receptors and the routes of exposure under current and anticipated future conditions.

2.1 Receptors

As per Sections 2.2 and 2.3 of the *Technical Background Document for Development of Soil Screening Levels* (Revision 2) (NMED, 2002), following are the definitions of the various receptors that should be considered:

- A residential receptor is assumed to be a long-term receptor occupying a dwelling within the site boundaries and thus is exposed to contaminants 24 hours per day, and is assumed to live at the site for 30 years, remaining on-site for 350 days per year.
- A commercial/industrial worker is assumed to be a long-term receptor exposed during the course of a work day as either (1) a full time employee of a company operating on-site who spends most of the workday conducting maintenance or manual labor activities outdoors or (2) a worker who is assumed to regularly perform grounds-keeping activities as a part of his/her daily responsibilities.
- A construction worker is assumed to be receptor that is exposed to contaminated soil during the work day for the duration of a single on-site construction project.

Based on the above definitions and the current land use in the vicinity of impacts, the commercial/industrial worker is considered as the current receptor for risk assessment. Assuming the future land use to be residential, the resident is considered as the future receptor for risk assessment. This is a very conservative assumption since it is highly unlikely that the site would become residential in the future. The construction worker is considered a receptor for both current and the future conditions. From the soil and groundwater analytical data, it appears that the impacts of the release were minimal and localized.

2.2 Conceptual Site Model

The conceptual site model (CSM) evaluates the various routes of exposure for each receptor. Table 2-1 presents the CSM for current conditions for the commercial/industrial worker. Table 2-2 presents the CSM for the future conditions for the residential receptor. Table 2-3 presents the CSM for both current and future conditions for the construction worker. Note that outdoor inhalation from surface and subsurface soil will not be quantified since indoor inhalation is being considered and is the more critical pathway.

2.3 Summary of Complete Exposure Pathways

The complete routes of exposure (refer to Tables 2-1, 2-2 and 2-3) that will be quantitatively evaluated are summarized below:

Current Non-residential Worker

1. Dermal contact with surficial soil
2. Ingestion of surficial soil
3. Outdoor inhalation from surficial soil
4. Indoor inhalation from subsurface soil
5. Indoor inhalation from groundwater

Future Resident

1. Dermal contact with surficial soil
2. Ingestion of surficial soil
3. Outdoor inhalation from surficial soil
4. Indoor inhalation from subsurface soil
5. Indoor inhalation from groundwater

Current/Future Construction Worker

1. Dermal contact with surficial soil
2. Ingestion of surficial soil
3. Outdoor inhalation from surficial soil
4. Indoor inhalation from groundwater
5. Dermal contact with groundwater

3 COMPARISON OF CONCENTRATIONS

This Section presents the comparison of soil, groundwater, and soil-vapor data with generic standards. The standards selected and the results of the comparison are explained in detail below. However, the standards used do not consider the indoor inhalation pathway from soil or groundwater. A quantitative evaluation of this pathway is presented in Section 4.

3.1 Comparison of Soil Concentrations

The maximum detected concentration from the July 2002, February 2004, and August 2004 soil data was compared with New Mexico Environmental Department (NMED) soil screening levels (SSLs) for residential and industrial/occupational land use (NMED, 2002). For TPH-DRO and TPH-ORO, the SSLs are as per the NMED TPH Screening Guidelines (NMED, 2003). SSLs for TPH-GRO are not required since the primary constituents of TPH-GRO (i.e., BTEX) have been evaluated separately. The comparisons presented in Table 3-1 indicate that none of the parameters, except TPH-DRO, exceed the NMED SSLs.

Two chemicals (2-methylnaphthalene and benzo (g,h,i) perylene) did not have NMED SSLs. For these chemicals, the SSLs were calculated using the methodology included in the NMED soil screening guidance (NMED, 2002).

3.2 Comparison of Groundwater Concentrations

The maximum detected concentration from the February 2004 and August 2004 groundwater data was compared with groundwater standards. Conservatively, the groundwater standard used is the lowest of the following groundwater standards:

- New Mexico's Water Quality Control Commission (WQCC)
- EPA-promulgated maximum contamination levels (MCLs)
- EPA-promulgated health advisory (HA)

For chemicals without groundwater standards in the above mentioned resources, groundwater standards were calculated based on risk levels for domestic consumption of water. TPH groundwater standards were taken from NMED TPH screening guidelines.

Five chemicals (1,2,4-trimethylbenzene, acetone, carbon disulfide, cyclohexane, methylcyclohexane) did not have the first three above mentioned groundwater standards. For these chemicals, the groundwater standards were calculated using the risk-based approach as presented in the *Guidelines for Corrective Action Document* (New Mexico UST Bureau, 2000) and assuming direct ingestion of water by an adult.

The TPH-DRO groundwater standard was not calculated using the risk-based approach. Instead this standard is taken from the *TPH Screening Guidelines* (NMED, 2003).

The groundwater comparison tabulated in Table 3-2 indicates that the maximum concentrations

for none of the chemicals, except TPH-DRO, exceeded the groundwater standards.

3.3 Comparison of Soil-Vapor Concentrations

The maximum detected concentration from the February 2004 soil-vapor data are compared with the allowable indoor inhalation levels for both the resident and the commercial worker included in the New Mexico *Underground Storage Tank Bureau Guidelines for Corrective Action.* Note that the allowable indoor inhalation levels are the allowable concentrations in the breathing zone. The comparison is very conservative since the soil-vapor concentrations will reduce as vapors migrate into the enclosed space, and mix with the air in the enclosed space resulting in significantly lower indoor air concentrations.

Four chemicals (1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, acetone, and chloroform) did not have allowable indoor inhalation standards. For these chemicals, the indoor inhalation standards were calculated using the risk-based approach.

The soil-vapor comparison is tabulated in Table 3-3 and indicates that none of the chemicals, except 1,2,4-trimethylbenzene for resident and 1,3,5-trimethylbenzene and chloroform for both resident and commercial worker, exceeded the indoor inhalation vapor levels.

Calculation of risk based standards used the exposure factors in Table 3-4, physical and chemical parameters in Table 3-5 and toxicity parameters Table 3-6.

3.4 Summary of Comparison with Target Levels

The above comparisons are summarized as follows:

1. The maximum detected TPH-DRO concentration in soil exceeded the NMED TPH target level. Therefore, site-specific levels for TPH-DRO were developed using the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG) approach for the complete pathways as per the CSM (Section 2). This is further discussed in Section 5.
2. The maximum detected TPH-DRO concentration in groundwater exceeded the NMED TPH target level. Therefore, site-specific levels for TPH-DRO were developed using the TPHCWG approach for the complete pathways as per the CSM (Section 2). This is further discussed in Section 5.
3. The maximum detected soil-vapor concentrations for 1,2,4-trimethylbenzene for resident and 1,3,5-trimethylbenzene and chloroform for both resident and commercial worker exceeded the inhalation vapor target levels. As discussed in Section 3.3, this is a very conservative comparison.
4. Since the NMED target levels do not account for soil and groundwater concentrations protective of indoor inhalation, this pathway is evaluated in Section 4.

4 INDOOR INHALATION

This Section describes the procedure used to calculate the site-specific risk-based target levels for the indoor inhalation pathway. Note this indoor inhalation pathway is not accounted for by NMED SSLs and groundwater standards. The Johnson and Ettinger (J&E) model (USEPA, 2003) is used for estimating screening levels for vapor intrusion pathways. USEPA used the J&E model as the basis to develop a spreadsheet to estimate the incremental risk level, hazard index (HI), or target soil and groundwater cleanup concentrations for prescribed risk and HI.

Specifically the calculation of risk-based target levels requires the following:

- Toxicity parameters
- Physical and chemical parameters
- Exposure factors
- Fate and transport parameters
- Soil and building characteristics

Each of these is discussed below.

4.1 Inputs Used to Calculate Target Levels

4.1.1 Toxicity Parameters

The toxicity of chemicals with carcinogenic adverse health effects associated with inhalation exposure is quantified using unit risk. For chemicals that cause non-carcinogenic adverse health effects, toxicity associated with inhalation exposure is typically quantified by reference concentration. The chemical-specific toxicity parameters for the COPCs used are the default values from the USEPA spreadsheet implementation of the J&E model and are presented in Table 4-1(a).

4.1.2 Physical and Chemical Parameters

The development of risk-based soil screening levels requires selected physical and chemical properties of the COPCs. The chemical-specific physical and chemical parameters for the COPCs used are the default values from the USEPA spreadsheet implementation of the J&E model and are presented in Table 4-1(a).

4.1.3 Exposure Factors

Exposure factors describe the physiological and behavioral characteristics of the receptors. The receptor-specific exposure factors and their values used to evaluate the risk-based soil and groundwater screening levels are presented in Table 3-4. The exposure factors were obtained from the *Technical Background Document for Development of Soil Screening Levels* (Revision

2) (NMED, 2002). For the Officer's Club, the site-specific receptor considered for the indoor inhalation pathway is a non-resident.

4.1.4 Fate and Transport Parameters

Fate and transport parameters are necessary to estimate the target levels for the indirect routes of exposure. These factors characterize the physical properties of vadose zone, saturated zone, building, and ambient air. Table 4-1(b) provides these values that were obtained from a combination of *Technical Background Document for Development of Soil Screening Levels* (Revision 2) (NMED, 2002) and site-specific values.

4.1.5 Soil and Building Characteristics

The site-specific soil and building parameters considered are as follows:

1. Depth below grade to bottom of enclosed space floor - For the Officer's club, due the presence of a basement, the default value of 200 centimeter (cm) is considered (USEPA, 2003). For residential land use, the default value of 15 cm (slab-on-grade construction) is considered (USEPA, 2003).
2. Average soil temperature - For New Mexico, the range of groundwater temperature is 52 to 62 degrees Fahrenheit (°F)(USEPA, 2003). The groundwater temperature of 62 °F (17 degrees Celsius [°C]) has been considered as the approximate average soil temperature.
3. Vadose zone Soil Conservation Service (SCS) soil type – For the Officer's Club, the vadose zone soil type is silty sand (Section 1.4). However, the most similar soil type to silty sand from the default SCS soil type listed in the USEPA spreadsheet is loamy sand.

4.2 Risk Assessment

The above input parameters are used in the USEPA spreadsheet implementation of the J&E model to evaluate the target levels. The risk value of 1E-05 and hazard quotient (HQ) value of 1 (NMED, 2002) are used to evaluate the target soil and groundwater cleanup concentrations.

However, the USEPA spreadsheet does not include several of the PAHs because PAHs have low Henry's law constant and vapor pressure and hence are not considered volatile. Additionally, the USEPA spreadsheet does not include TPH-DRO. To evaluate TPH-DRO, an alternative version of the J&E model, similar to the program incorporated into the New-Mexico Risk-Based Corrective Action (NMRBCA) program, was used. TPH-DRO was broken down into six individual carbon fraction ranges and the target levels for each fraction was calculated.

The target levels were compared with the maximum and average concentrations. To calculate the average concentrations, the non-detect values were replaced with ½ of the detection limits. The average concentrations were considered because the mass flux of volatile chemicals that enters the enclosed space is proportional to the average and not the maximum concentration. For calculating average soil concentrations, data from borings SB02, SB04, SB05, and SB06 were conservatively considered even though these borings are outside the Officer's Club property

boundary since they have detected concentrations and it is more conservative to include them.

For calculating the groundwater average concentration, data from SB05 was not considered since all the chemicals were non-detect. Groundwater data from MW07 was conservatively included in calculating the average concentration because, even though it is a periphery well, it had the highest chloroform concentration and detectable concentrations of of 1,3-dichlorobenzene and xylenes. Tables 4-2 through 4-5 present the comparison of the soil and groundwater concentrations with the indoor inhalation target levels. The comparison indicates that neither the maximum nor average concentrations for any of the volatile chemicals exceeded the target levels.

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5 EVALUATING COPCS FOR COMPLETE ROUTES OF EXPOSURE

As mentioned in Section 3.4, the maximum detected TPH-DRO concentration exceeded the generic screening levels in both soil and groundwater (Tables 3-1 and 3-2). This Section presents the calculation of site-specific target levels for TPH-DRO.

5.1 Methodology

The site-specific target levels (SSTLs) for all the complete routes of exposure presented in Section 2.3 for resident, commercial worker, and construction worker were developed using the methodology discussed in *Guidelines for Corrective Action* (New Mexico Underground Storage Tank Bureau, 2000) and *Risk Assessment Guidance for Superfund - Volume I, Human Health Evaluation Manual* (USEPA, 1989).

TPH-DRO was composed of three aliphatic (i.e., C10-C12, C12-16, C16-C21) and three aromatic (i.e., C10-C12, C12-16, C16-C21) carbon fractions. Target levels for each of these fractions were calculated. The sum of the target levels for each fraction was used to yield a target level for TPH-DRO. For additional details of this approach refer to TPHCWG Series (Volumes 1 through 5).

The physical, chemical, and toxicological parameters for TPH-DRO and the carbon fractions are taken from the TPHCWG. The exposure factors, physical and chemical parameters, and toxicological parameters for calculating the standards are presented in Tables 3-4 through 3-6.

5.2 Comparison with SSTLs

The comparison of the maximum detected TPH-DRO and the carbon fractions are presented in Tables 5-1 to 5-4. None of the concentrations exceeded the SSTLs for any of the complete routes of exposures (ROEs).

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6 RESULTS AND CONCLUSIONS

This Section summarizes the results and the conclusions of this risk-based evaluation.

The review of site history identified non-residential workers and commercial workers as the site-specific receptors. The primary ROEs which have been quantitatively evaluated include:

- Commercial Worker
  - Dermal contact with surficial soil
  - Ingestion of surficial soil
  - Outdoor inhalation from surficial soil
  - Indoor inhalation from subsurface soil
  - Indoor inhalation from groundwater
- Resident
  - Dermal contact with surficial soil
  - Ingestion of surficial soil
  - Outdoor inhalation from surficial soil
  - Indoor inhalation from subsurface soil
  - Indoor inhalation from groundwater
- Construction Worker
  - Dermal contact with surficial soil
  - Ingestion of surficial soil
  - Outdoor inhalation from surficial soil
  - Indoor inhalation from groundwater
  - Dermal contact with groundwater

The maximum soil, groundwater, and soil-vapor concentrations were compared with NMED SSLs, NMWQCC standards, and air inhalation target levels (New Mexico Underground Storage Tank Bureau, 2000), respectively. None of the concentrations exceeded the standards. However, NMED target levels do not account for indoor inhalation of vapors from soil or groundwater.

Therefore, the J&E model was used to estimate soil and groundwater target levels protective of indoor inhalation. None of the site soil and groundwater maximum concentrations exceed these target levels.

Speciation of TPH-DRO data into aromatic and aliphatic fractions was based on the TPHCWG approach. SSTLs were calculated for each fraction for the each complete ROE. Neither TPH-DRO nor the carbon fraction exceeded the SSTLs for the ROEs.

Based on the above evaluation, the residual soil, groundwater, and soil-vapor concentrations are protective of current and reasonable future receptors at the site. These concentrations are anticipated to reduce in time due to natural attenuation processes further reducing the risk.

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7 REFERENCES

7.1 Site-Specific References

Sergent, Hauskins & Beckwith, 1991. *Geotechnical Investigation, Officer's Club, Holloman Air Force Base, Alamogordo, New Mexico.*

Wilson & Company, 1991. *Engineering Report for Study to Determine Source of Odor at the Officer's Club SVS 91-0206.*

Foster Wheeler Environmental Corporation and Groundwater Technology, 1997. *Final Remedial Action Plan, Officer's Club, Site SS-57, Holloman Air Force Base, New Mexico.*

Foster Wheeler Environmental Corporation, 2002. TERC No. DACW45-94-D-003, Delivery Order 37, Work Authorization Directive 1; AF Project No. KWRD20027018; Submittal of Letter Report for the Risk Assessments Completed for SS-57-Officer's Club, Holloman Air Force Base, New Mexico.

Bhate Environmental Associates, Inc., 2004. *Data Acquisition Plan for Risk Assessment, Officer's Club, Site SS-57, Holloman Air Force Base, New Mexico.*

7.2 General References

Freeze, R.A., and J.A. Cherry, 1979. *Groundwater*, Prentice-Hall, Englewood Cliffs.

New Mexico Underground Storage Tank Bureau, 2000. *Guidelines for Corrective Action.*

New Mexico Environment Department, 2002. *Technical Background Document for Development of Soil Screening Levels* (Revision 2).

New Mexico Environment Department, 2003. *TPH Screening Guidelines.*

Total Petroleum Hydrocarbon Criteria Working Group Series, 1997:

Volume No. 1, Analysis of Petroleum Hydrocarbon in Environmental Media

Volume No. 2, Composition of Petroleum Mixtures

Volume No. 3, Selection of Representative TPH Fractions Based on Fate and Transport Considerations

Volume No. 4, Development of Fraction Specific Reference Doses (RfDs) and Reference Concentrations (RfCs) for Total Petroleum Hydrocarbons (TPH)

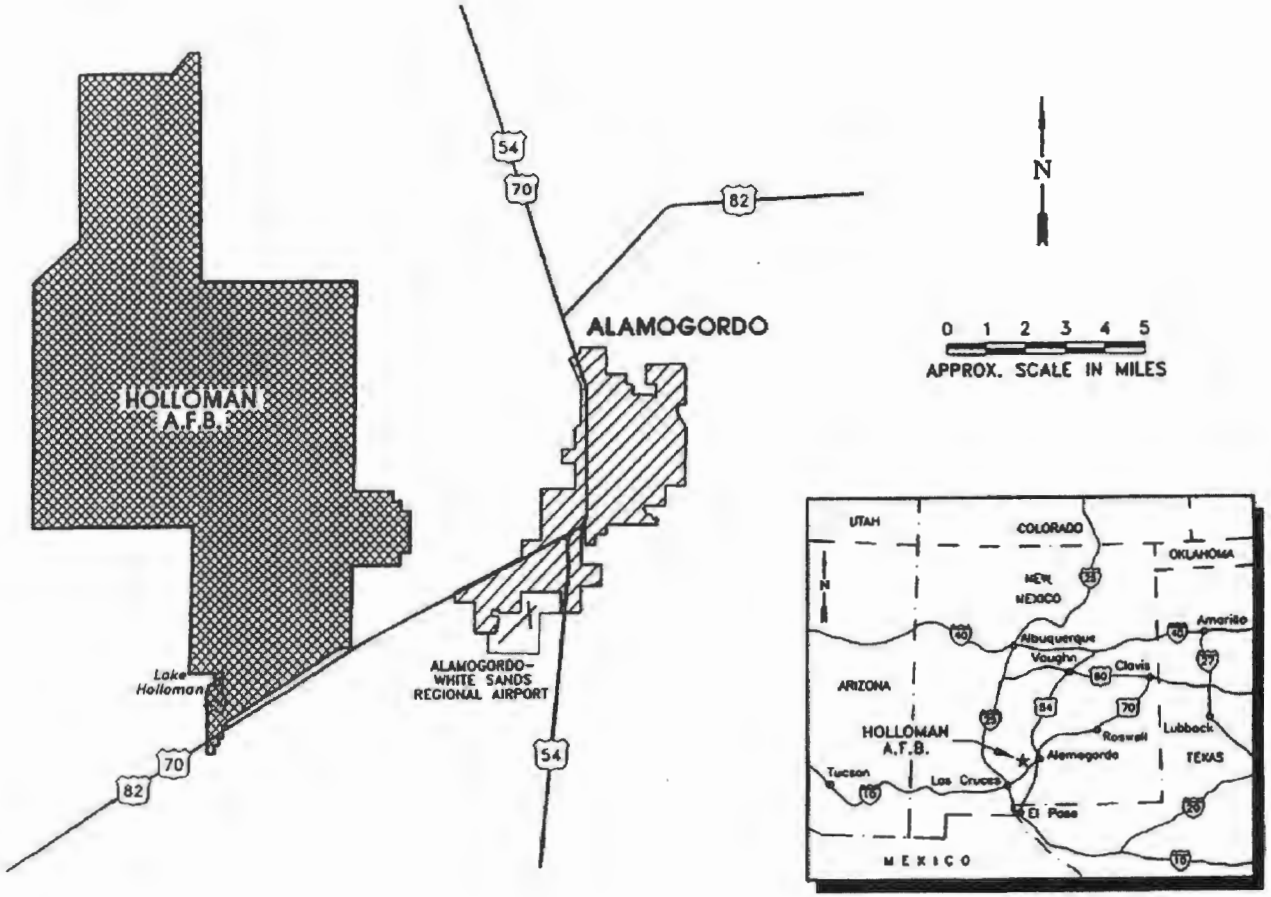
Volume No. 5, Human Health Risk-Based Evaluation of Petroleum Release Sites: Implementing the Working Group Approach

US EPA, 1989. *Risk Assessment Guidance for Superfund - Volume I, Human Health Evaluation Manual* (Part A).

US EPA, 2002. EPA Region 9 Preliminary Remediation Goals.

US EPA, 2003. *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings.*

FIGURES



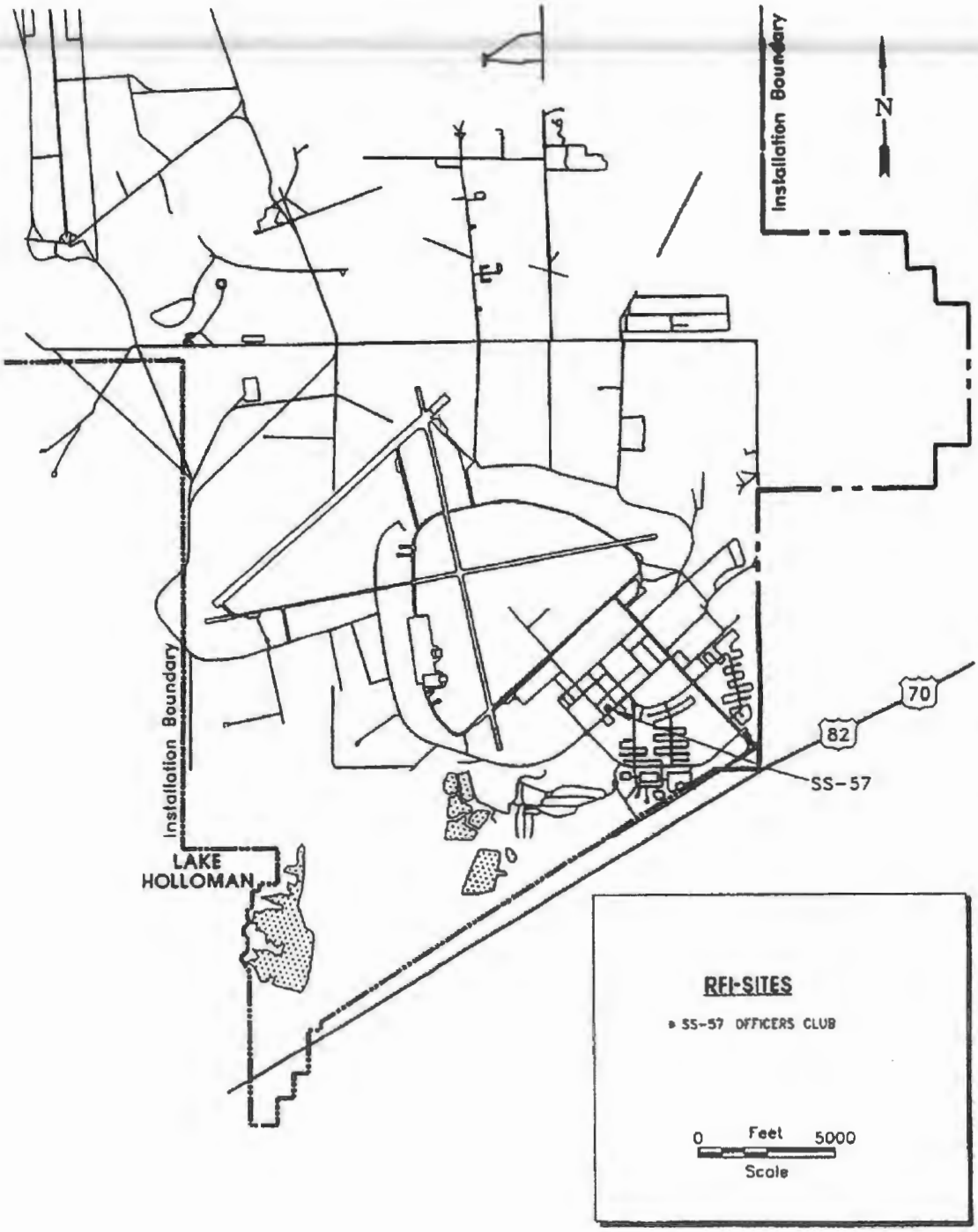
BHATE
Environmental Engineers and Scientists

LOCATION MAP

PROJECT NO.	SCALE	DATE	DRAWN BY:
9040002	SHOWN	10/20/04	MRM
			DRAWING NO: 9040002-01

SITE SS-57
HOLLOMAN AFB
NEW MEXICO

Figure 1-1



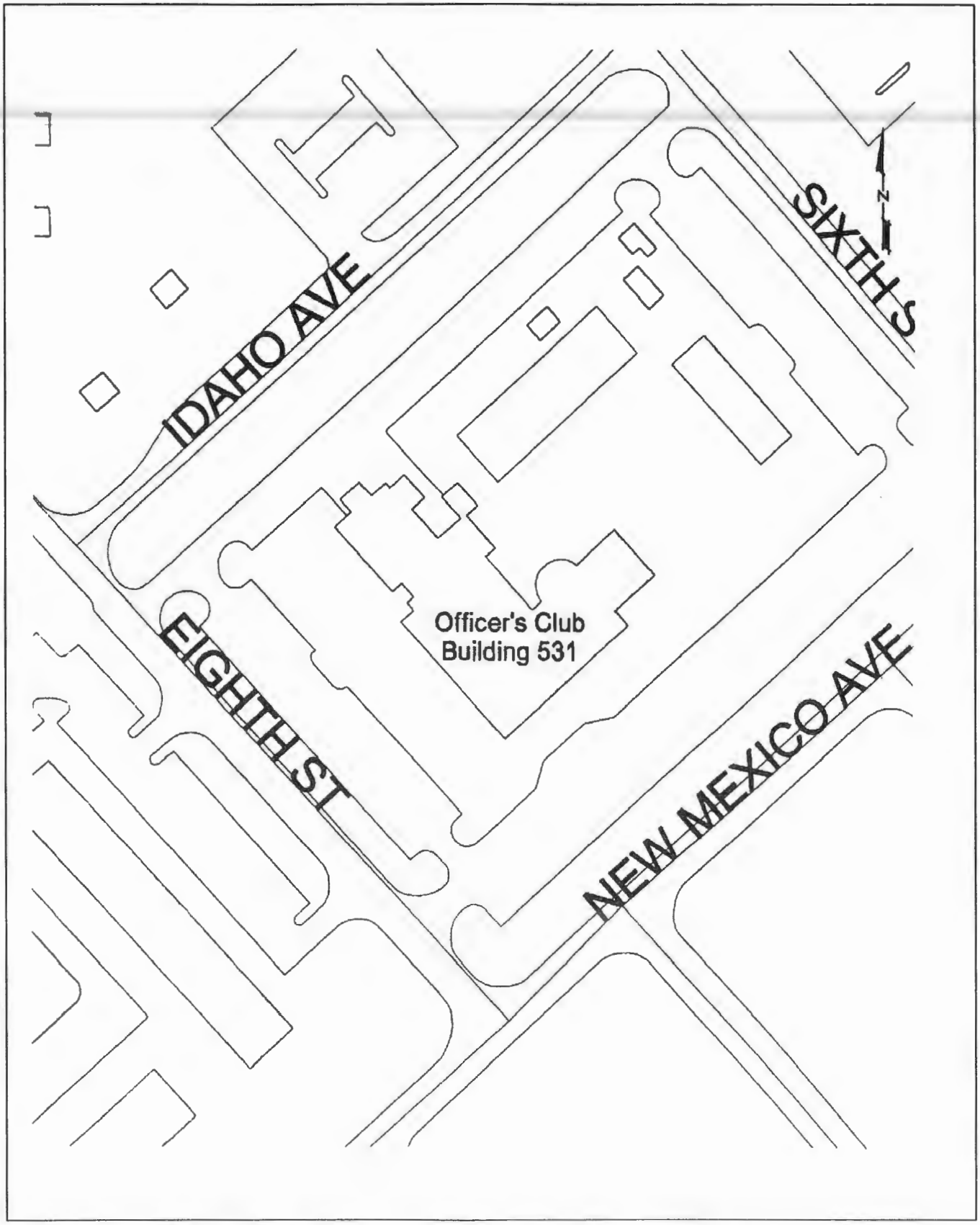
BHATE
Environmental Engineers and Scientists

FACILITY MAP

PROJECT NO.	SCALE	DATE	DRAWN BY: MRM
9040002	SHOWN	10/20/04	DRAWING NO: 9040002-02

SITE SS-57
HOLLOMAN AFB
NEW MEXICO

Figure 1-2



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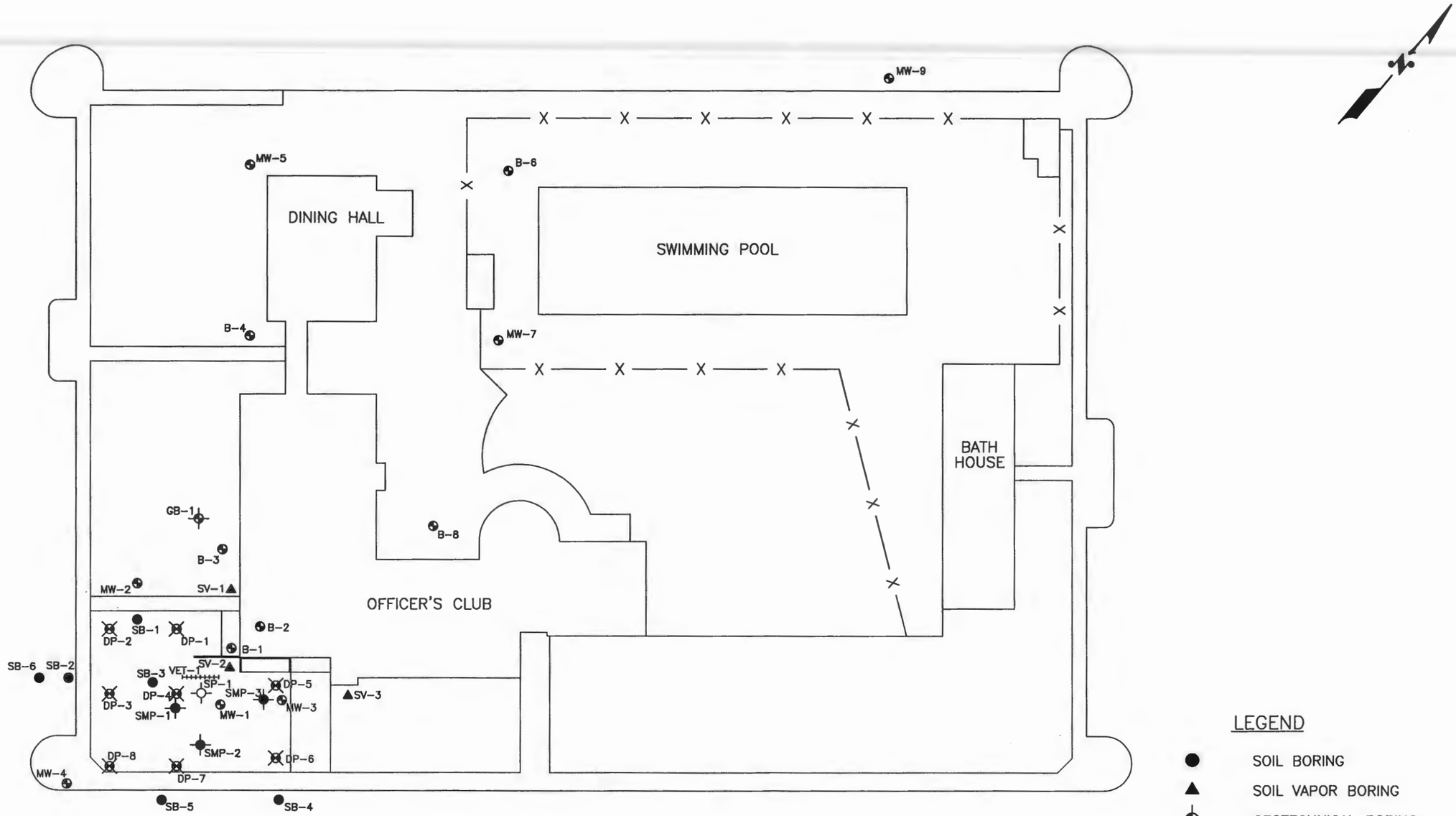
SITE LOCATION MAP

PROJECT NO.	SCALE	DATE	DRAWN BY: MRM
9040002	SHOWN	10/20/04	DRAWING NO: 9040002-03

SITE SS-57
HOLLOMAN AFB
NEW MEXICO

Figure 1-3



LEGEND

- SOIL BORING
- SOIL VAPOR BORING
- GEOTECHNICAL BORING
- MW-2 MONITOR WELL
- B-2 BORING
- SPARGE POINT
- SPARGE MONITOR POINT
- DIRECT PUSH WELL
- VAPOR EXTRACTION TRENCH

NOTES:

This information is depicted to provide visual aid within the context of this report and should not be used as a sole reference in precise dimensioning of features indicated. Please verify the location of all features including underground and aboveground utilities prior to conducting any subsurface exploration or site assessment.

Drawing source: RAM GROUP INC.

SITE SS-57
HOLLOMAN AFB
NEW MEXICO

Figure 1-4

SAMPLE LOCATION MAP

PROJECT NO.	SCALE	DATE	DRAWN BY:	DRAWING NO:
9040002	NTS	8/17/04	TES	9040002-04A

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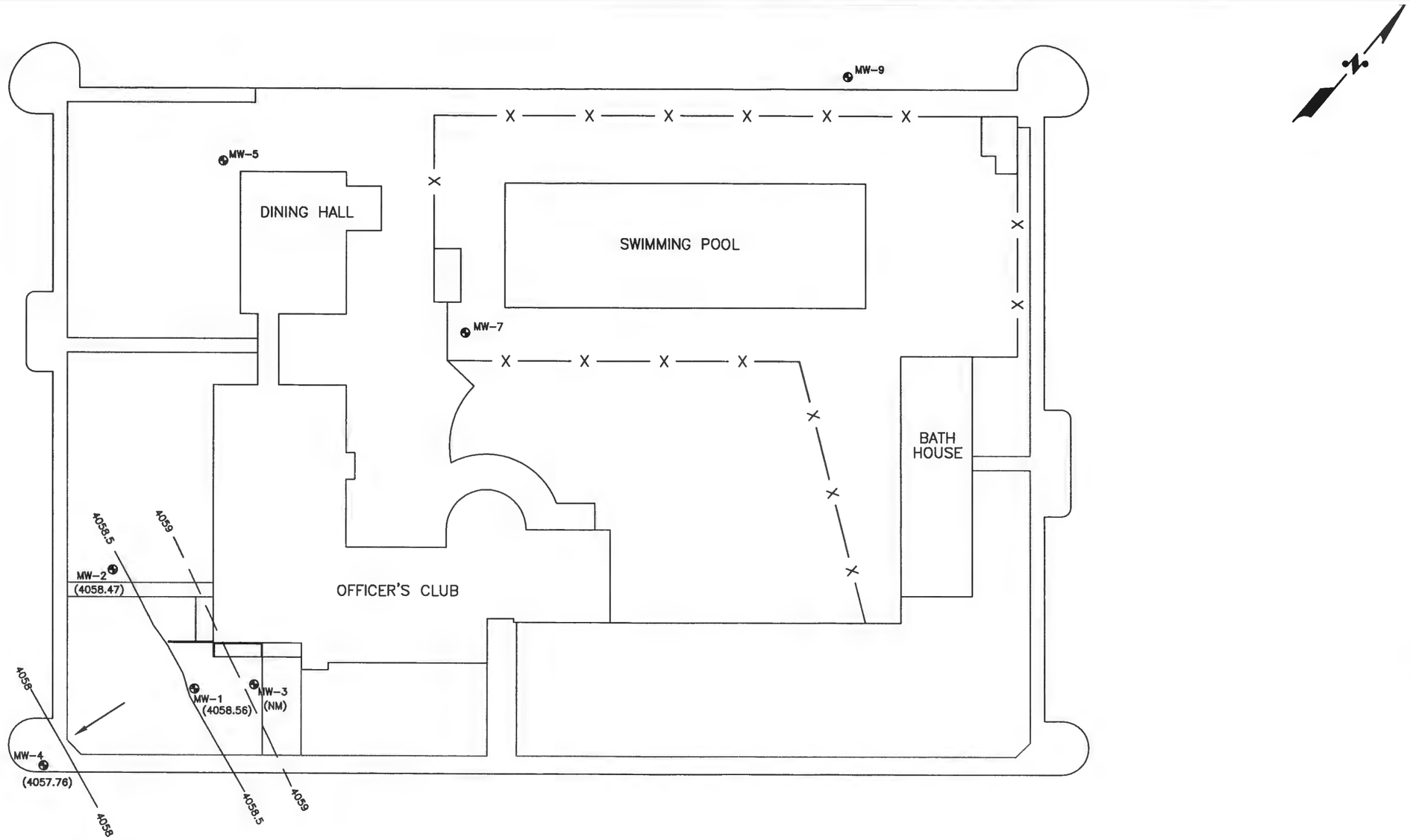

NOTES:

This information is depicted to provide visual aid within the context of this report and should not be used as a sole reference in precise dimensioning of features indicated. Please verify the location of all features including underground and aboveground utilities prior to conducting any subsurface exploration or site assessment.

Drawing source: RAM GROUP INC.

LEGEND

MW-2	MONITOR WELL
———	GROUNDWATER CONTOUR LINES
4057.80	GROUNDWATER ELEVATION (APRIL 9, 1996)
←	GROUNDWATER FLOW DIRECTION

SITE SS-57
HOLLOMAN AFB
NEW MEXICO

Figure 1-5

GROUNDWATER CONTOUR MAP

PROJECT NO.	SCALE	DATE	DRAWN BY:	DRAWING NO:
9040002	NTS	8/17/04	TES	9040002-05

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TABLES

Soil Analytical Data (July 2002, February and August 2004)
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Sample	NMED Residential SSLs	NMED Industrial/ Occupational SSLs	SB01		SB02		SB03	
Depth (ft bgs)			1	2	1	2**	1	2
Date Sampled			2/11/2004	2/11/2004	2/10/2004	2/10/2004	2/11/2004	2/11/2004
Carbon Chain TX1005								
Date Analyzed			**2/25/2004**	**2/25/2004**	**2/24/2004**	**2/27/2004**	**2/25/2004**	**2/25/2004**
C6 - C12 (GRO)	NA	NA	47,000	65,000	55,000	**485,000**	50,000	60,000
>C12 - C28 (DRO)	880,000	2,200,000	47,000	65,000	**630,000**	**9,350,000**	50,000	60,000
>C28 - C36 (ORO)	2,500,000	5,000,000	47,000	65,000	55,000	**79,500**	50,000	60,000
Total (C12 - C36)	NA	NA	94,000	130,000	685,000	9,429,500	100,000	120,000
Carbon Fractions TX1006								
Aliphatics								
C6-C8	NA	NA	NA	NA	**28,600**	**161,000**	NA	NA
>C8-C10	NA	NA	NA	NA	4,500	21,200	NA	NA
C10-C12	NA	NA	NA	NA	**14,300**	**525,000**	NA	NA
C12-C16	NA	NA	NA	NA	**33,900**	**1,360,000**	NA	NA
C16-C21	NA	NA	NA	NA	**16,100**	**856,000**	NA	NA
C21-C35	NA	NA	NA	NA	6,650	**144,000**	NA	NA
Aromatics								
>C6-C8	NA	NA	NA	NA	4,500	**37,300**	NA	NA
>C8-C10	NA	NA	NA	NA	4,500	8,450	NA	NA
C10-C12	NA	NA	NA	NA	**12,500**	**71,200**	NA	NA
C12-C16	NA	NA	NA	NA	**17,800**	**597,000**	NA	NA
C16-C21	NA	NA	NA	NA	**69,600**	**702,000**	NA	NA
C21-C35	NA	NA	NA	NA	6,650	**285,000**	NA	NA
Hydrocarbons								
C6-C35	NA	NA	NA	NA	**290,000**	**9,430,000**	NA	NA
>C6-C12	NA	NA	NA	NA	**51,800**	**1,080,000**	NA	NA
>C12-C28	NA	NA	NA	NA	**223,000**	**8,290,000**	NA	NA
>C28-C35	NA	NA	NA	NA	22,350	42,350	NA	NA
VOCs								
Date Analyzed			**2/18/2004**	**2/18/2004**	**2/12/2004**	**2/12/2004**	**2/18/2004**	**2/18/2004**
Acetone	70,400,000	100,000,000*	25.5	35	**22**	1,200	27.5	32.5
Benzene	27,000	73,600	2.6	3.5	2.8	120	2.75	3.25
2-Butanone (MEK)	573,000	2,100,000	25.5	35	28	1,200	27.5	32.5
Carbon disulfide	3,760,000	21,400,000	2.6	3.5	**3**	120	2.75	3.25
Cyclohexane	NA	NA	5.0	7	5.5	245	5.5	6.5
1,3-Dichlorobenzene	70,400	73,900	2.6	3.5	2.8	120	2.75	3.25
1,4-Dichlorobenzene	36,000	81,400	2.6	3.5	2.8	120	2.75	3.25
Ethylbenzene	10,600,000	25,400,000	2.6	3.5	2.8	120	2.75	3.25
Hexane	38,000*	38,000*	2.6	**2.3**	**0.61**	**79**	2.75	**1.2**
Isopropylbenzene (cumene)	700,000	2,730,000	2.6	3.5	2.8	**87**	2.75	3.25
Methylcyclohexane	2,100,000	7,630,000	2.6	3.5	2.8	120	2.75	3.25
Toluene	248,000	248,000	2.6	3.5	2.8	120	2.75	3.25
1,2,4-Trimethylbenzene	52,200	191,000	2.6	3.5	2.8	120	2.75	3.25
1,3,5-Trimethylbenzene	22,300	68,900	2.6	3.5	2.8	120	2.75	3.25
Xylenes, total*	132,000*	132,000*	**2.3**	**4.4**	**1.2**	120	**3.3**	**2.9**

Soil Analytical Data (July 2002, February and August 2004)
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Sample	NMED Residential SSLs	NMED Industrial/ Occupational SSLs	SB01		SB02		SB03	
Depth (ft bgs)			1	2	1	2**	1	2
Date Sampled			2/11/2004	2/11/2004	2/10/2004	2/10/2004	2/11/2004	2/11/2004
SVOCs								
Date Analysed			2/16/2004	2/16/2004	2/17/2004	2/17/2004	2/13/2004	2/16/2004
Acetophenone	1,310,000	1,310,000	185	235	4,100	3,800	205	210
Benzo (a) anthracene	6,210	23,000	185	**530**	4,100	3,800	205	210
Benzo (b) fluoranthene	6,210	23,400	185	**460**	4,100	3,800	205	210
Benzo (k) fluoranthene	62,100	234,000	185	**370**	4,100	3,800	205	210
Benzo (g,h,i) perylene	618*	618*	185	**260**	4,100	3,800	205	210
Benzo (a) pyrene	621	2,340	185	**530**	4,100	3,800	205	210
1,1'-Biphenyl	89,000	89,000	185	235	4,100	3,800	205	210
Chrysene	621,000	2,340,000	185	**660**	4,100	3,800	205	210
Dibenzofuran	313,000	3,170,000	185	235	4,100	3,800	205	210
Diethylphthalate	48,000,000	100,000,000	NA	NA	NA	NA	NA	NA
Fluoranthene	2,250,000	24,400,000	185	**830**	4,100	3,800	NA	210
Fluorene	3,130,000	29,400,000	185	235	4,100	3,800	NA	210
Indeno (1,2,3-c,d) pyrene	6,210	23,400	185	**220**	4,100	3,800	NA	210
2-Methylnaphthalene	165,000	175,000*	185	235	4,100	3,800	NA	210
Naphthalene	71,900	98,300	185	235	4,100	3,800	NA	210
Phenanthrene	1,800,000	20,500,000	185	**170**	4,100	3,800	NA	210
Pyrene	2,300,000	31,300,000	185	**790**	4,100	3,800	NA	210

Notes:

1. All concentrations are in micrograms per kilogram (µg/kg).
2. Values in bold are detected values or J values, all other values are non-detect.
3. Values in regular font are 1/2 the detection limit of the non-detect values.
4. To calculate total TPH (C12 - C36), non-detect values were replaced with 1/2 detection limit.
5. * NMED soil screening level (SSL) exceeds the soil saturation limit. The soil saturation limit is shown.
6. TPH-DRO and TPH-ORO SSLs are taken from NMED TPH Screening Guidelines.
7. ** Combined value for duplicate samples.
8. Half the detection limits for benzo (g,h,i) perylene and benzo (a) pyrene exceed the NMED SSLs.
9. NA: Not analyzed/not available
10. ND: Not detected at method detection limit
11. ft bgs: Feet below ground surface
12. GRO: Gasoline range organics
13. DRO: Diesel range organics
14. ORO: Oil range organics
15. VOCs: Volatile organic compounds
16. SVOCs: Semivolatile organic compounds

Soil Analytical Data (July 2002, February and August 2004)
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Sample	NMED Residential SSLs	NMED Industrial/ Occupational SSLs	SB04		SB05		SB06	
Depth (ft bgs)			1	2	1	2	2	3.5**
Date Sampled			2/10/2004	2/10/2004	2/10/2004	2/10/2004	8/4/2004	8/4/2004
Carbon Chain TX1005								
Date Analyzed			**2/24/2004**	**2/24/2004**	**2/24/2004**	**2/24/2004**	**8/5/2004**	**8/5/2004**
C6 - C12 (GRO)	NA	NA	60,000	65,000	47,000	55,000	NA	NA
>C12 - C28 (DRO)	880,000	2,200,000	60,000	65,000	47,000	55,000	NA	NA
>C28 - C36 (ORO)	2,500,000	5,000,000	60,000	65,000	47,000	55,000	NA	NA
Total (C12 - C36)	NA	NA	120,000	130,000	94,000	110,000	NA	NA
Carbon Fractions TX1006								
Aliphatics								
C6-C8	NA	NA	NA	NA	NA	NA	3000	3100
>C8-C10	NA	NA	NA	NA	NA	NA	3000	3100
C10-C12	NA	NA	NA	NA	NA	NA	3000	3100
C12-C16	NA	NA	NA	NA	NA	NA	3000	3100
C16-C21	NA	NA	NA	NA	NA	NA	3000	3100
C21-C35	NA	NA	NA	NA	NA	NA	4450	4650
Aromatics								
>C6-C8	NA	NA	NA	NA	NA	NA	**6,000**	**6800**
>C8-C10	NA	NA	NA	NA	NA	NA	**15,500**	**16100**
C10-C12	NA	NA	NA	NA	NA	NA	3,000	3100
C12-C16	NA	NA	NA	NA	NA	NA	3,000	3100
C16-C21	NA	NA	NA	NA	NA	NA	4,450	4650
C21-C35	NA	NA	NA	NA	NA	NA	**20,200**	**51950**
Hydrocarbons								
C6-C35	NA	NA	NA	NA	NA	NA	**80,800**	**85950**
>C6-C12	NA	NA	NA	NA	NA	NA	14,900	15450
>C12-C28	NA	NA	NA	NA	NA	NA	14,900	15450
>C28-C35	NA	NA	NA	NA	NA	NA	**54,600**	**56300**
VOCs								
Date Analyzed			**2/12/2004**	**2/12/2004**	**2/12/2004**	**2/12/2004**	**8/5/2004**	**8/5/2004**
Acetone	70,400,000	100,000,000*	30.5	36	32.5	30	NA	NA
Benzene	27,000	73,600	3.05	3.6	3.25	3	63	30.6
2-Butanone (MEK)	573,000	2,100,000	30.5	36	32.5	30	NA	NA
Carbon disulfide	3,760,000	21,400,000	3.05	3.6	3.25	3	NA	NA
Cyclohexane	NA	NA	6	7	6.5	6	NA	NA
1,3-Dichlorobenzene	70,400	73,900	3.05	3.6	3.25	3	NA	NA
1,4-Dichlorobenzene	36,000	81,400	3.05	3.6	3.25	3	NA	NA
Ethylbenzene	10,600,000	25,400,000	3.05	3.6	3.25	3	63	30.6
Hexane	38,000*	38,000*	3.05	3.6	**0.82**	3	NA	NA
Isopropylbenzene (cumene)	700,000	2,730,000	3.05	3.6	3.25	3	NA	NA
Methylcyclohexane	2,100,000	7,630,000	3.05	3.6	3.25	3	NA	NA
Toluene	248,000	248,000	3.05	3.6	3.25	3	63	30.6
1,2,4-Trimethylbenzene	52,200	191,000	3.05	3.6	3.25	3	NA	NA
1,3,5-Trimethylbenzene	22,300	68,900	3.05	3.6	3.25	3	NA	NA
Xylenes, total*	132,000*	132,000*	**2.7**	**1.7**	**2.8**	**1.2**	63	30.6

Soil Analytical Data (July 2002, February and August 2004)
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Sample	NMED Residential SSLs	NMED Industrial/ Occupational SSLs	SB04		SB05		SB06	
Depth (ft bgs)			**1**	**2**	**1**	**2**	**2**	**3.5****
Date Sampled			**2/10/2004**	**2/10/2004**	**2/10/2004**	**2/10/2004**	**8/4/2004**	**8/4/2004**
SVOCs								
Date Analysed			**2/16/2004**	**2/16/2004**	**2/16/2004**	**2/17/2004**	**8/5/2004**	**8/5/2004**
Acetophenone	1,310,000	1,310,000	220	225	200	205	NA	NA
Benzo (a) anthracene	6,210	23,000	220	225	200	205	39.5	41
Benzo (b) fluoranthene	6,210	23,400	220	225	200	205	39.5	41
Benzo (k) fluoranthene	62,100	234,000	220	225	200	205	39.5	41
Benzo (g,h,i) perylene	618*	618*	220	225	200	205	39.5	68.75
Benzo (a) pyrene	621	2,340	220	225	200	205	39.5	41
1,1'-Biphenyl	89,000	89,000	220	225	200	205	NA	NA
Chrysene	621,000	2,340,000	220	225	200	205	39.5	41
Dibenzofuran	313,000	3,170,000	220	225	200	205	NA	NA
Diethylphthalate	48,000,000	100,000,000	NA	NA	NA	NA	NA	NA
Fluoranthene	2,250,000	24,400,000	220	225	200	205	39.5	41
Fluorene	3,130,000	29,400,000	220	225	200	205	39.5	41
Indeno (1,2,3-c,d) pyrene	6,210	23,400	220	225	200	205	39.5	41
2-Methylnaphthalene	165,000	175,000*	220	225	200	205	NA	NA
Naphthalene	71,900	98,300	220	225	200	205	39.5	41
Phenanthrene	1,800,000	20,500,000	220	225	200	205	39.5	41
Pyrene	2,300,000	31,300,000	220	225	200	205	39.5	41

Notes:

1. All concentrations are in micrograms per kilogram (µg/kg).
2. Values in bold are detected values or J values, all other values are non-detect.
3. Values in regular font are 1/2 the detection limit of the non-detect values.
4. To calculate total TPH (C12 - C36), non-detect values were replaced with 1/2 detection limit.
5. * NMED soil screening level (SSL) exceeds the soil saturation limit. The soil saturation limit is shown.
6. TPH-DRO and TPH-ORO SSLs are taken from NMED TPH Screening Guidelines.
7. ** Combined value for duplicate samples.
8. Half the detection limits for benzo (g,h,i) perylene and benzo (a) pyrene exceed the NMED SSLs.
9. NA: Not analyzed/not available
10. ND: Not detected at method detection limit
11. ft bgs: Feet below ground surface
12. GRO: Gasoline range organics
13. DRO: Diesel range organics
14. ORO: Oil range organics
15. VOCs: Volatile organic compounds
16. SVOCs: Semivolatile organic compounds

Soil Analytical Data (July 2002, February and August 2004)
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Sample	NMED Residential SSLs	NMED Industrial/ Occupational SSLs	SV01		SV02		SV03	
Depth (ft bgs)			2-3	7-8	2-3	7-8	2-3	7-8**
Date Sampled			2/16/2004	2/16/2004	2/16/2004	2/16/2004	2/16/2004	2/16/2004
Carbon Chain TX1005								
Date Analyzed			**2/27/2004**	**2/27/2004**	**2/27/2004**	**2/27/2004**	**2/27/2004**	**2/27/2004**
C6 - C12 (GRO)	NA	NA	65,000	55,000	55,000	60,000	55,000	62,500
>C12 - C28 (DRO)	880,000	2,200,000	65,000	55,000	55,000	60,000	55,000	62,500
>C28 - C36 (ORO)	2,500,000	5,000,000	65,000	55,000	55,000	60,000	55,000	62,500
Total (C12 - C36)	NA	NA	130,000	110,000	110,000	120,000	110,000	125,000
Carbon Fractions TX1006								
Aliphatics								
C6-C8	NA	NA	NA	NA	NA	NA	NA	NA
>C8-C10	NA	NA	NA	NA	NA	NA	NA	NA
C10-C12	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16	NA	NA	NA	NA	NA	NA	NA	NA
C16-C21	NA	NA	NA	NA	NA	NA	NA	NA
C21-C35	NA	NA	NA	NA	NA	NA	NA	NA
Aromatics								
>C6-C8	NA	NA	NA	NA	NA	NA	NA	NA
>C8-C10	NA	NA	NA		NA	NA	NA	NA
C10-C12	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16	NA	NA	NA	NA	NA	NA	NA	NA
C16-C21	NA	NA	NA	NA	NA	NA	NA	NA
C21-C35	NA	NA	NA	NA	NA	NA	NA	NA
Hydrocarbons								
C6-C35	NA	NA	NA	NA	NA	NA	NA	NA
>C6-C12	NA	NA	NA	NA	NA	NA	NA	NA
>C12-C28	NA	NA	NA	NA	NA	NA	NA	NA
>C28-C35	NA	NA	NA	NA	NA	NA	NA	NA
VOCs								
Date Analyzed			**2/19/2004**	**2/19/2004**	**2/19/2004**	**2/20/2004**	**2/19/2004**	**2/19/2004**
Acetone	70,400,000	100,000,000*	31	30	31	35	25.5	28
Benzene	27,000	73,600	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	573,000	2,100,000	NA	NA	NA	NA	NA	NA
Carbon disulfide	3,760,000	21,400,000	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	70,400	73,900	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	36,000	81,400	NA	NA	NA	NA	NA	NA
Ethylbenzene	10,600,000	25,400,000	3.1	3	3.1	3.5	2.55	2.75
Hexane	38,000*	38,000*	3.1	3	3.1	**0.81**	**0.82**	2.75
Isopropylbenzene (cumene)	700,000	2,730,000	NA	NA	NA	NA	NA	NA
Methylcyclohexane	2,100,000	7,630,000	NA	NA	NA	NA	NA	NA
Toluene	248,000	248,000	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	52,200	191,000	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	22,300	68,900	NA	NA	NA	NA	NA	NA
Xylenes, total*	132,000*	132,000*	**2.9**	**1.2**	**1.2**	**3.6**	**1.4**	1.25

Soil Analytical Data (July 2002, February and August 2004)
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Sample	NMED Residential SSLs	NMED Industrial/ Occupational SSLs	SV01		SV02		SV03	
Depth (ft bgs)			**2-3**	**7-8**	**2-3**	**7-8**	**2-3**	**7-8****
Date Sampled			**2/16/2004**	**2/16/2004**	**2/16/2004**	**2/16/2004**	**2/16/2004**	**2/16/2004**
SVOCs								
Date Analysed			**2/24/2004**	**2/24/2004**	**2/24/2004**	**2/24/2004**	**2/24/2004**	**2/24/2004**
Acetophenone	1,310,000	1,310,000	NA	NA	NA	NA	NA	NA
Benzo (a) anthracene	6,210	23,000	NA	NA	NA	NA	NA	NA
Benzo (b) fluoranthene	6,210	23,400	NA	NA	NA	NA	NA	NA
Benzo (k) fluoranthene	62,100	234,000	NA	NA	NA	NA	NA	NA
Benzo (g,h,i) perylene	618*	618*	NA	NA	NA	NA	NA	NA
Benzo (a) pyrene	621	2,340	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl	89,000	89,000	NA	NA	NA	NA	NA	NA
Chrysene	621,000	2,340,000	NA	NA	NA	NA	NA	NA
Dibenzofuran	313,000	3,170,000	NA	NA	NA	NA	NA	NA
Diethylphthalate	48,000,000	100,000,000	NA	NA	NA	NA	NA	NA
Fluoranthene	2,250,000	24,400,000	NA	NA	NA	NA	NA	NA
Fluorene	3,130,000	29,400,000	NA	NA	NA	NA	NA	NA
Indeno (1,2,3-c,d) pyrene	6,210	23,400	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	165,000	175,000*	NA	NA	NA	NA	NA	NA
Naphthalene	71,900	98,300	NA	NA	NA	NA	NA	NA
Phenanthrene	1,800,000	20,500,000	NA	NA	NA	NA	NA	NA
Pyrene	2,300,000	31,300,000	NA	NA	NA	NA	NA	NA

Notes:

1. All concentrations are in micrograms per kilogram (µg/kg).
2. Values in bold are detected values or J values, all other values are non-detect.
3. Values in regular font are 1/2 the detection limit of the non-detect values.
4. To calculate total TPH (C12 - C36), non-detect values were replaced with 1/2 detection limit.
5. * NMED soil screening level (SSL) exceeds the soil saturation limit. The soil saturation limit is shown.
6. TPH-DRO and TPH-ORO SSLs are taken from NMED TPH Screening Guidelines.
7. ** Combined value for duplicate samples.
8. Half the detection limits for benzo (g,h,i) perylene and benzo (a) pyrene exceed the NMED SSLs.
9. NA: Not analyzed/not available
10. ND: Not detected at method detection limit
11. ft bgs: Feet below ground surface
12. GRO: Gasoline range organics
13. DRO: Diesel range organics
14. ORO: Oil range organics
15. VOCs: Volatile organic compounds
16. SVOCs: Semivolatile organic compounds

Soil Analytical Data (July 2002, February and August 2004)
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Sample	NMED Residential SSLs	NMED Industrial/ Occupational SSLs	DP-01	DP-02	DP-02	DP-03	DP-03	DP-04	DP-05	DP-06	DP-07
Depth (ft bgs)			10	7	10	4	10	12	2	11	9
Date Sampled			Jul-02	Jul-02	Jul-02	Jul-02	Jul-02	Jul-02	Jul-02	Jul-02	Jul-02
Carbon Chain TX1005											
Date Analyzed											
C6 - C12 (GRO)	NA	NA	**2,900**	ND	**11,000**	**120**	**79,000**	ND	ND	**4,400**	ND
>C12 - C28 (DRO)	880,000	2,200,000	**1,700,000**	**26,000**	**9,100,000**	ND	**6,200,000**	**980,000**	ND	**3,600,000**	**1,700,000**
>C28 - C36 (ORO)	2,500,000	5,000,000	**420,000**	ND	**1,700,000**	ND	**1,200,000**	**250,000**	ND	**600,000**	**480,000**
Total (C12 - C36)	NA	NA	2,120,000	NA	10,800,000	ND	7,400,000	1,230,000	ND	4,200,000	2,180,000
Carbon Fractions TX1006											
Aliphatics											
C6-C8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
>C8-C10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C10-C12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C16-C21	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C21-C35	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aromatics											
>C6-C8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
>C8-C10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C10-C12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C12-C16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C16-C21	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C21-C35	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hydrocarbons											
C6-C35	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
>C6-C12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
>C12-C28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
>C28-C35	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
VOCs											
Date Analyzed											
Acetone	70,400,000	100,000,000*	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	27,000	73,600	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	573,000	2,100,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	3,760,000	21,400,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	70,400	73,900	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	36,000	81,400	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	10,600,000	25,400,000	ND	ND	ND	ND	**280**	ND	ND	ND	ND
Hexane	38,000*	38,000*	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene (cumene)	700,000	2,730,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	2,100,000	7,630,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	248,000	248,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	52,200	191,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	22,300	68,900	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, total*	132,000*	132,000*	NA	NA	NA	NA	NA	NA	NA	NA	NA

Soil Analytical Data (July 2002, February and August 2004)
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Sample	NMED Residential SSLs	NMED Industrial/ Occupational SSLs	DP-01	DP-02	DP-02	DP-03	DP-03	DP-04	DP-05	DP-06	DP-07
Depth (ft bgs)			**10**	**7**	**10**	**4**	**10**	**12**	**2**	**11**	**9**
Date Sampled			**Jul-02**	**Jul-02**	**Jul-02**	**Jul-02**	**Jul-02**	**Jul-02**	**Jul-02**	**Jul-02**	**Jul-02**
SVOCs											
Date Analysed											
Acetophenone	1,310,000	1,310,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo (a) anthracene	6,210	23,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo (b) fluoranthene	6,210	23,400	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo (k) fluoranthene	62,100	234,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo (g,h,i) perylene	618*	618*	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo (a) pyrene	621	2,340	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl	89,000	89,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	621,000	2,340,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	313,000	3,170,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	48,000,000	100,000,000	ND	**330**	ND	ND	ND	ND	**360**	ND	ND
Fluoranthene	2,250,000	24,400,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	3,130,000	29,400,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno (1,2,3-c,d) pyrene	6,210	23,400	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	165,000	175,000*	ND	ND	ND	ND	**1,400**	ND	ND	ND	ND
Naphthalene	71,900	98,300	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	1,800,000	20,500,000	ND	ND	ND	ND	**730**	ND	ND	ND	ND
Pyrene	2,300,000	31,300,000	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

1. All concentrations are in micrograms per kilogram (µg/kg).
2. Values in bold are detected values or J values, all other values are non-detect.
3. Values in regular font are 1/2 the detection limit of the non-detect values.
4. To calculate total TPH (C12 - C36), non-detect values were replaced with 1/2 detection limit.
5. * NMED soil screening level (SSL) exceeds the soil saturation limit. The soil saturation limit is shown.
6. TPH-DRO and TPH-ORO SSLs are taken from NMED TPH Screening Guidelines.
7. ** Combined value for duplicate samples.
8. Half the detection limits for benzo (g,h,i) perylene and benzo (a) pyrene exceed the NMED SSLs.
9. NA: Not analyzed/not available
10. ND: Not detected at method detection limit
11. ft bgs: Feet below ground surface
12. GRO: Gasoline range organics
13. DRO: Diesel range organics
14. ORO: Oil range organics
15. VOCs: Volatile organic compounds
16. SVOCs: Semivolatile organic compounds

Table 1-2
Groundwater Analytical Data
Officer's Club, Site SS-57, Holloman Air Force Base, New Mexico

Sample	Groundwater Standards	Source	SB01	SB02	SB03	SB04	SB05	MW01	MW02	MW03	MW05	MW07**	MW04
Date sampled			**2/11/2004**	**2/10/2004**	**2/12/2004**	**2/11/2004**	**2/11/2004**	**2/13/2004**	**2/12/2004**	**2/13/2004**	**2/14/2004**	**2/13/2004**	**8/4/2004**
Carbon Chain													
Date analyzed			**2/27/2004**	**2/27/2004**	**2/26/2004**	**2/27/2004**	**2/27/2004**	**2/26/2004**	**2/26/2004**	**2/26/2004**	**2/26/2004**	**2/26/2004**	**8/5/2004**
C6 - C12 (GRO)	NA	NA	2,200	2,250	2,250	2,200	2,200	2,250	2,150	2,200	2,150	2,200	895
C12 - C28 (DRO)	1800	5	2,200	**3,400**	**3,600**	**3,200**	2,200	2,250	2,150	2,200	2,150	2,200	895
C28 - C36 (ORO)	NA	NA	2,200	2,250	2,250	2,200	2,200	2,250	2,150	2,200	2,150	2,200	895
Total (C12 - C36)	NA	NA	4,400	5,650	5,850	5,400	4,400	4,500	4,300	4,400	4,300	4,400	1,790
VOCs													
Date analyzed			**2/19/2004**	**2/19/2004**	**2/20/2004**	**2/19/2004**	**2/19/2004**	**2/24/2004**	**2/20/2004**	**2/24/2004**	**2/24/2004**	**2/24/2004**	**8/5/2004**
Acetone	61320	4	**5.6**	5	5	0.5	5	5	5	5	**120**	5	NS
Benzene	5	2	0.5	0.5	**0.23**	0.5	0.5	0.5	0.5	**0.3**	**0.35**	0.5	0.5
2-Butanone (methyl ethyl ketone)	4000	3	**44**	**11**	5	5	5	5	5	5	5	5	NS
Carbon disulfide	6813	4	**0.48**	**3.5**	0.5	0.5	0.5	0.5	0.5	**1.3**	0.5	0.5	NS
Chloroform	70	3	0.5	0.5	0.5	0.5	0.5	**0.36**	0.5	0.5	0.5	**3.55**	NS
Cyclohexane	388360	4	1	**0.79**	1	1	1	1	1	**0.86**	1	1	NS
1,3-Dichlorobenzene	600	3	**0.38**	0.5	0.5	**0.58**	0.5	**0.37**	**0.43**	**0.42**	0.5	**0.6**	NS
1,4-Dichlorobenzene	75	2	**0.93**	0.5	0.5	0.5	0.5	0.5	**0.69**	0.5	0.5	0.5	NS
Dichlorodifluoromethane	1000	3	1	1	1	1	1	0.5	1	**11**	1	1	NS
Ethylbenzene	700	2	**0.26**	**40**	0.5	0.5	0.5	0.5	**0.54**	**8.4**	0.5	0.5	**0.7**
Hexane	4000	3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	NS
Isopropylbenzene (cumene)	4000	3	0.5	**6**	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	NS
Methylcyclohexane	58595	4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	**0.55**	0.5	0.5	NS
Toluene	1000	2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Trichloroethene	5	2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	**3.5**	0.5	0.5	NS
Trichlorofluoromethane	2000	3	1	1	1	1	1	**0.63**	1	0.5	1	1	NS
1,2,4-Trimethylbenzene	3407	4	0.5	**0.56**	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	NS
1,3,5-Trimethylbenzene	10000	3	0.5	**0.53**	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	NS
Xylenes, total	620	1	0.5	**2.1**	0.5	0.5	0.5	0.5	0.5	**0.28**	0.5	**0.26**	0.5

Notes:

1. All concentrations are in micrograms per liter (µg/l).
2. Values in bold are detected values or J values, all other values are non-detect.
3. Values in regular font are 1/2 the detection limit of the non-detect values.
4. To calculate total TPH (C12 - C36), non-detect values were replaced with 1/2 detection limit.
5. NS - Not Sampled
6. NA - Not Available
7. Groundwater Standard Sources:
   1 - Water Quality Control Commission (WQCC)
   2 - Safe Drinking Water Act MCL
   3 - EPA Health Advisory
   4 - Calculated risk-based levels for domestic consumption of water
   5 - NMED TPH Screening Guidelines.
8. ** Combined value for duplicate samples.
9. GRO: Gasoline range organics
11. DRO: Diesel range organics
12. ORO: Oil range organics
13. VOCs: Volatile organic compounds

Table 1-3
Soil Vapor Analytical Data
Officer's Club, Site SS-57, Holloman Air Force Base, New Mexico

Sample	**SV01**	**SV01**	**SV02**	**SV02**	**SV03**	**SV03**
Depth (ft bgs)	**3**	**8**	**3**	**8**	**3**	**8****
Date Sampled	**4/19/2004**	**4/19/2004**	**4/20/2004**	**4/20/2004**	**4/20/2004**	**4/20/2004**
Carbon Chain						
Date Analyzed	**4/23/2004**	**4/23/2004**	**4/23/2004**	**4/23/2004**	**4/23/2004**	**4/23/2004**
TPH (GRO)	**310**	**300**	**340**	**530**	**200**	**210**
TPH (DRO)	35714	35714	35714	35714	35714	35714
VOCs						
Date Analyzed	**4/26/2004**	**4/26/2004**	**4/26/2004**	**4/26/2004**	**4/26/2004**	**4/26/2004**
Benzene	1.3	1.3	1.35	1.35	1.35	1.3
Toluene	1.5	1.5	1.6	1.6	**5.2**	**1.5**
Ethylbenzene	1.75	1.75	1.85	1.85	1.8	1.75
m,p-Xylene	1.75	**5.4**	1.85	1.85	1.8	1.75
o-Xylene	**3.9**	**10**	1.85	1.85	1.8	1.75
2-Propanol	3.95	**20**	4.2	4.2	4.1	3.95
Methyl tert-butyl ether	6	6	6	6	6	6
1,2,4-Trimethylbenzene	1.95	**5.9**	2.1	2.1	2.05	1.95
1,3,5-Trimethylbenzene	1.95	**19**	2.1	2.1	2.05	1.95
Acetone	3.95	3.8	4.05	4.05	3.95	**18**
Carbon disulfide	1.25	1.25	1.3	1.3	1.3	1.25
Chloroform	**43**	**18**	**20**	**380**	**12**	**8**
Cumene	1.95	1.95	2.1	2.1	2.05	1.95
2-Butanone (methyl ethyl ketone)	1.2	1.2	1.25	1.25	1.2	1.2
1,4-Dichlorobenzene	2.4	2.4	2.55	2.55	2.5	2.4
Cyclohexane	1.4	1.4	1.45	1.45	1.45	1.4
Hexane	1.4	1.4	1.5	1.5	1.45	1.4
1,3-Dichlorobenzene	2.4	2.4	2.55	2.55	2.5	2.4
Trichloroethene	2.15	2.15	2.3	2.3	2.25	2.15
Naphthalene	**51**	8.5	9	9	8.5	8.5

Notes:

1. All concentrations are in micrograms per cubicmeter ($\mu g/m^3$).
2. Values in bold are detected values or J values, all other values are non-detect.
3. Values in regular font are 1/2 the detection limit of the non-detect values.
4. Concentration for TPH (DRO) was obtained as mass/volume. Volume was obtained by multiplying the flow rate (0.2 L/min x 7 min=1.4 L).
5. ft bgs : Feet below ground surface
6. ** Combined value for duplicate samples.
7. GRO: Gasoline range organics
8. DRO: Diesel range organics
9. ORO: Oil range organics
10. VOCs: Volatile organic compounds

Table 1-4
Contaminants of Potential Concern
Officer's Club, Site SS-57, Holloman Air Force Base, New Mexico

Parameters	Soil	Groundwater	Soil-vapor
1,2,4-Trimethylbenzene	ND	D	D
1,3,5-Trimethylbenzene	ND	D	D
1,3-Dichlorobenzene	ND	D	ND
1,4-Dichlorobenzene	ND	D	ND
2-Butanone	ND	D	ND
2-Methylnaphthalene	D	NA	NA
2-Propanol	NA	NA	D
Acetone	D	D	D
Benzene	ND	D	ND
Benzo (a) anthracene	D	NA	NA
Benzo (a) pyrene	D	NA	NA
Benzo (b) fluoranthene	D	NA	NA
Benzo (g,h,i) perylene	D	NA	NA
Benzo (k) fluoranthene	D	NA	NA
Carbon disulfide	D	D	ND
Chloroform	ND	D	D
Chrysene	D	NA	NA
Cyclohexane	ND	D	ND
Dichlorodifluoromethane	ND	D	NA
Diethylphthalate	D	NA	NA
Ethylbenzene	D	D	ND
Fluoranthene	D	NA	NA
Hexane	D	ND	ND
Indeno (1,2,3-c,d) pyrene	D	NA	NA
Isopropylbenzene	D	D	ND
m/p-Xylene	NA	NA	D
Methyl cyclohexane	ND	D	NA
Naphthalene	ND	NA	D
o-Xylene	NA	NA	D
Phenanthrene	D	NA	NA
Pyrene	D	NA	NA
Toluene	ND	ND	D
TPH-DRO	D	D	ND
TPH-GRO	D	ND	ND
TPH-ORO	D	ND	NA
Trichloroethene	ND	D	ND
Trichlorofluoromethane	ND	D	NA
Xylenes (total)	D	D	NA
Total Detected	**21**	**18**	**9**

Notes:

1. D - Detected at least once
2. NA - Not Analyzed
3. ND - Not Detected
4. Concentrations with J lab qualifiers were assumed as detected values.

Table 1-5
Soil Geotechnical Parameters
Officer's Club, Site SS-57, Holloman Air Force Base, New Mexico

Parameters	**Unit**	**GB-0106**	**SV01-ST**		**SV02-ST**		**SV03-ST**		**Average**
Depth (ft bgs)		**4-6**	**2-4**	**7-9**	**2-4**	**7-9**	**2-4**	**7-9**	
Date analyzed		**2/25/2004**	**2/25/2004**	**2/25/2004**	**2/25/2004**	**2/25/2004**	**2/25/2004**	**2/25/2004**	
Volumetric air	cm^3-air/cm^3-soil	0.244	0.138	0.142	0.190	0.152	0.183	0.233	0.183
Volumetric water content	cm^3-water/cm^3-soil	0.092	0.288	0.252	0.192	0.253	0.255	0.054	0.198
Total soil porosity	cm^3-void/cm^3-soil	0.336	0.426	0.394	0.382	0.405	0.438	0.287	0.381
Bulk density	g-soil/cm^3-soil	1.73	1.53	1.59	1.66	1.57	1.47	1.86	1.630
Fractional organic carbon	g-oc/g-soil	0.013	0.016	0.012	0.007	0.006	0.008	0.011	0.010

Notes:

1. ft bgs: Feet below ground surface
2. cm^3: cubic centimeter
3. g: grams

Table 1-6
Groundwater Elevation Summary
Officer's Club, Site SS-57, Holloman Air Force Base, New Mexico

Well No.	Elevation	Groundwater Elevation (feet AMSL)			
		3/31/96	4/1/96	4/9/96	10/19/04
MW-01	4071.323	4057.56	4057.55	4057.79	4058.56
MW-02	4069.912	4057.56	4057.87	4057.51	4058.47
MW-03	N/A	NM	4057.70	4057.96	NM
MW-04	4067.26	4056.66	4056.66	5056.72	4057.76
SP-01S	N/A	4057.24	4057.29	4057.48	NM
SP-01M	N/A	4057.15	4057.24	4057.37	NM
SP-01D	N/A	4057.05	4057.20	4057.29	NM
SMP-01S	N/A	4057.18	4057.22	4057.45	NM
SMP-01M	N/A	4057.12	4057.15	4057.27	NM
SMP-01D	N/A	4057.14	4057.17	4057.28	NM
SMP-02S	N/A	4057.21	4057.27	4057.46	NM
SMP-02M	N/A	4056.98	4057.14	4057.27	NM
SMP-02D	N/A	4056.98	4057.14	4057.27	NM
SMP-03S	N/A	4057.39	4057.41	4057.63	NM
SMP-03M	N/A	4057.50	4057.52	4057.75	NM
SMP-03D	N/A	4057.42	4057.44	4057.61	NM

Notes:

1. AMSL - Above mean sea level
2. NM - Not measured
3. S - Shallow zone (18 - 20 ft)
4. M - Medium zone (28 - 30 ft)
5. D - Deep zone (37.5 - 39.5 ft)
6. N/A - Not applicable

Table 1-7
Monitoring Well Construction Details
Officer's Club, Site SS-57, Holloman Air Force Base, New Mexico

Well ID	Installation Date	# Sampled	Diameter	Screen Interval	Depth to Water	Total depth	Status
			(inch)	(ft bgs)	(ft bcl)	(ft)	
MW-01	3/27/1996	1	2	5-15	13.76	17	Active
MW-02	3/30/1996	1	2	4-14	12.35	15	Active
MW-03	3/25/1996	1	2	7-17	NA	17.5	Active
MW-04	3/30/1996	1	2	3-13	10.60	14	Active
MW-05	10/24/1991	2	2	NA*	NA	NA	Active
MW-07	10/23/1991	2	2	NA*	NA	NA	Active
MW-09	10/22/1991	2	2	NA*	NA	NA	Active

Notes:

1. NA - Not Available
2. * Although the screen interval and total depth are not known, the construction summaries suggest that the wells are screened approximately 5 feet above and below the water table (10' screen).
3. ft bgs: Feet below ground surface
4. ft bcl: Feet below casing level (based on 10/19/04 groundwater elevation)

Table 2-1
Exposure Model for Commercial/Industrial Worker
Officer's Club, Site SS-57, Holloman Air Force Base, New Mexico

No.	Route of Exposure	C/NC	Justification
1	**Dermal contact with surficial soil**	**C**	**Surficial soil has been impacted. Therefore, this exposure pathway is complete.**
2	**Ingestion of surficial soil**	**C**	**Surficial soil has been impacted. Therefore, this exposure pathway is complete.**
3	**Outdoor inhalation of vapors from surficial soil**	**C**	**Vapors from surficial soil may migrate upwards through the ground surface and into the ambient air. Note this pathway is generally not the "risk driver" due to considerable mixing and dilution in ambient air.**
4	**Indoor inhalation of vapors from subsurface soil**	**C**	**Soil has been impacted near the vicinity of the Officer's Club. Also, a new building may be built over the area where subsurface soil is impacted, therefore, this exposure pathway is complete.**
5	Outdoor inhalation of vapors from subsurface soil	C	Vapors from subsurface soil may migrate upwards through the vadose zone and into the ambient air through cracks in the pavement. Note this pathway is generally not the "risk driver" due to considerable mixing and dilution in ambient air.
6	**Indoor inhalation of vapors from groundwater**	**C**	**The groundwater flows in the south to south-west direction of the site. Also, a new building may be built over an area where impacted groundwater exists, therefore this pathway is complete.**
7	Outdoor inhalation of vapors from groundwater	C	Vapors from groundwater may migrate upwards through the capillary fringe, the vadose zone, and into the ambient air through the ground surface. Note this pathway is generally not the "risk driver" due to considerable mixing and dilution in ambient air.
8	Ingestion of groundwater	NC	The facility receives water from Lake Bonito. Workers do not ingest impacted ground water. Therefore, this exposure pathway is not complete.
9	Dermal contact with groundwater	NC	The facility receives water from Lake Bonito. Workers do not ingest impacted groundwater. Therefore, this exposure pathway is not complete.

Notes:

1. NC - Not Complete
2. C - Complete
3. Pathways shown in bold will be quantitatively evaluated. Those that are not in bold are either not complete or not a critical pathway.

Table 2-2
Exposure Model for Resident
Officer's Club, Site SS-57, Holloman Air Force Base, New Mexico

No.	Route of Exposure	C/NC	Justification
1	**Dermal contact with surficial soil**	**C**	**Surficial soil has been impacted. Therefore, this exposure pathway is complete.**
2	**Ingestion of surficial soil**	**C**	**Surficial soil has been impacted. Therefore, this exposure pathway is complete.**
3	**Outdoor inhalation of vapors from surficial soil**	**C**	**Vapors from surficial soil may migrate upwards through the ground surface and into the ambient air. Therefore, this exposure pathway is complete.**
4	**Indoor inhalation of vapors from subsurface soil**	**C**	**Subsurface soil has been impacted and a residential building may be built over the area where subsurface soil is impacted. Therefore, this exposure pathway is complete.**
5	Outdoor inhalation of vapors from subsurface soil	C	Vapors from subsurface soil may migrate upwards through the vadose zone and into the ambient air through cracks in the pavement. Note this pathway is generally not the "risk driver" due to considerable mixing and dilution in ambient air.
6	**Indoor inhalation of vapors from groundwater**	**C**	**The groundwater flows toward the south to south-west direction of the site. A residential building may be built over an area where impacted groundwater exists. Therefore, this pathway is complete.**
7	Outdoor inhalation of vapors from groundwater	C	Vapors from groundwater may migrate upwards through the capillary fringe, the vadose zone, and into the ambient air through the ground surface. Note this pathway is generally not the "risk driver" due to considerable mixing and dilution in ambient air.
8	Ingestion of groundwater	NC	The facility receives water from the Lake Bonito. Workers do not ingest impacted ground water. Therefore, this exposure pathway is not complete.
9	Dermal contact with groundwater	NC	The facility receives water from the Lake Bonito. Workers do not ingest impacted ground water. Therefore, this exposure pathway is not complete.

Notes:

1. NC - Not Complete
2. C - Complete
3. Pathways shown in bold will be quantitatively evaluated. Those that are not in bold are either not complete or not a critical pathway.

Table 2-3
Exposure Model for Construction Worker
Officer's Club, Site SS-57, Holloman Air Force Base, New Mexico

No.	Route of Exposure	C/NC	Justification
1	**Dermal contact with soil**	**C**	**Soil is impacted at the site. Therefore, this pathway is complete.**
2	**Ingestion of soil**	**C**	**Soil is impacted at the site. Therefore, this pathway is complete.**
3	**Outdoor inhalation of vapors from soil**	**C**	**Soil is impacted at the site. Therefore, this pathway is complete.**
4	Indoor inhalation of vapors from soil	NC	Typically construction would not be expected to occur indoors over an extended period of time.
5	Indoor inhalation of vapors from groundwater	NC	Typically construction would not be expected to occur indoors over an extended period of time.
6	**Dermal contact with groundwater**	**C**	**Depth to groundwater fluctuates between 8 to 12 feet bgs which is within the anticipated depth of construction. Therefore, this pathway is complete.**
7	**Inhalation of vapors from groundwater**	**C**	**Depth to groundwater fluctuates between 8 to 12 feet bgs which is within the anticipated depth of construction. Therefore, this pathway is complete.**

Notes:
1. NC - Not Complete
2. C - Complete
3. Pathways shown in bold will be quantitatively evaluated. Those that are not in bold are either not complete or not a critical pathway.

Table 3-1
Comparison of Soil Concentrations with NMED SSLs
Officer's Club, Site SS-57, Holloman Air Force Base, New Mexico

Parameter	NMED Residential SSLs	NMED Industrial/ Occupational SSLs	Maximum Detected	Maximum Detected Boring Location (depth)	Maximum Exceed/ Not Exceed SSLs?
Carbon Chain TX1005					
C6 - C12 (GRO)	NA	NA	485,000	SB02 [1]	NE
>C12 - C28 (DRO)	880,000	2,200,000	9,350,000	SB02 [1]	E
>C28 - C36 (ORO)	2,500,000	5,000,000	1,700,000	DP02 (10)	NE
VOCs					
Acetone [3]	70,400,000	100,000,000	22	SB02 (1)	NE
Carbon disulfide	3,760,000	21,400,000	3	SB02 (1)	NE
Ethylbenzene	10,600,000	25,400,000	280	DP03 (10)	NE
Hexane [2,3]	38,000	38,000	79	SB02 (2)	NE
Isopropylbenzene (cumene)	700,000	2,730,000	87	SB02 (2)	NE
Xylenes, total [2,3]	132,000	132,000	4	SB01 (2)	NE
SVOCs					
Benzo (a) anthracene	6,210	23,000	530	SB01 (2)	NE
Benzo (b) fluoranthene	6,210	23,400	460	SB01 (2)	NE
Benzo (k) fluoranthene	62,100	234,000	370	SB01 (2)	NE
Benzo (g,h,i) perylene [2,3]	618	618	260	SB01 (2)	NE
Benzo (a) pyrene	621	2,340	530	SB01 (2)	NE
Chrysene	621,000	2,340,000	660	SB01 (2)	NE
Diethylphthalate	48,000,000	100,000,000	360	DP05 (2)	NE
Fluoranthene	2,250,000	24,400,000	830	SB01 (2)	NE
Indeno (1,2,3-c,d) pyrene	6,210	23,400	220	SB01 (2)	NE
2-Methylnaphthalene [3]	165,000	175,000	1,400	DP-03 (10)	NE
Phenanthrene	1,800,000	20,500,000	730	DP03 (10)	NE
Pyrene	2,300,000	31,300,000	790	SB01 (2)	NE

Notes:

1. All concentrations are in micrograms per kilogram (µg/kg).
2. NMED Soil Screening Levels (SSLs) taken from NMED Soil Screening Guidance
3. The NMED SSLs for TPH-DRO and TPH-ORO are taken from the NMED TPH Screening Guidelines
4. [1]Average of SB02 (2) and SB02 (2-dup)
5. [2] NMED Residential SSL exceeds the soil saturation limit. The soil saturation limit is shown.
6. [3] NMED Industrial/Occupational SSL exceeds the soil saturation limit. The soil saturation limit is shown.
7. NA - Not applicable/available
8. NE - Not Exceed
9. E - Exceed

Table 3-2
Comparison of Groundwater Concentrations with Groundwater Standards
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Parameter	WQCC	MCL	HA	Calculated Risk Based Levels	NMED TPH	Minimum of Groundwater Standards	Maximum Detected	Maximum Detected Boring Location (depth)	Maximum Exceed/Not Exceed GW Standards?
Carbon Chain									
C12 - C28 (DRO)	NA	NA	NA	NA	1,800	**1800**	3600	SB03	E
VOCs									
Acetone	NA	NA	NA	61,320	NA	**61320**	120	MW05	NE
Benzene	10	5	100	NA	NA	**5**	0.35	MW05	NE
2-Butanone (MEK)	NA	NA	4,000	NA	NA	**4000**	44	SB01 (2)	NE
Carbon disulfide	NA	NA	NA	6,813	NA	**6813**	3.5	SB02	NE
Chloroform	100	80	70	NA	NA	**70**	3.55	MW07[1]	NE
Cyclohexane	NA	NA	NA	388,360	NA	**388360**	0.86	MW03	NE
1,3-Dichlorobenzene	NA	NA	600	NA	NA	**600**	0.585	MW07	NE
1,4-Dichlorobenzene	NA	75	75	NA	NA	**75**	0.93	SB01 (2)	NE
Dichlorodifluoromethane	NA	NA	1,000	NA	NA	**1000**	11	MW03	NE
Ethylbenzene	750	700	700	NA	NA	**700**	40	SB02	NE
Isopropylbenzene (cumene)	NA	NA	4,000	NA	NA	**4000**	6	SB02	NE
Methylcyclohexane	NA	NA	NA	58,595	NA	**58595**	0.55	MW03	NE
Trichloroethene	100	5	200	NA	NA	**5**	3.5	MW03	NE
Trichlorofluoromethane	NA	NA	2,000	NA	NA	**2000**	0.63	MW01	NE
1,2,4-Trimethylbenzene	NA	NA	NA	3,407	NA	**3407**	0.56	SB02	NE
1,3,5-Trimethylbenzene	NA	NA	10,000	NA	NA	**10000**	0.53	SB02	NE
Xylenes, total	620	10000	700	NA	NA	**620**	2.1	SB02	NE

Notes:

1. All concentrations are in micrograms per liter (µg/l).
2. [1]Average of MW07 and MW07-dup
3. Groundwater Standard Sources:
   1 - Water Quality Control Commission (WQCC)
   2 - Safe Drinking Water Act MCL
   3 - EPA Health Advisory
   4 - Calculated risk-based levels for domestic consumption of water
   5 - NMED TPH Screening Guidelines.
4. NE - Not exceed
5. E - Exceed
6. NA - Not available

Table 3-3
Comparison of Soil-Vapor Concentrations with Allowable Concentrations in Breathing Zone
Officer's Club, Site SS-57, Holloman Air Force Base, New Mexico

Parameter	Indoor Inhalation Residential RBSLs	Indoor Inhalation Commercial Worker RBSLs	Maximum Detected	Maximum Detected Boring Location (depth)	Maximum Exceed/Not Exceed Indoor Inhalation RBSLs?
VOCs					
Toluene	172	749	5.2	SV03 (3)	NE
m,p-Xylene	134	586	5.4	SV01 (8)	NE
o-Xylene	134	586	10	SV01 (3)	NE
2-Propanol*	NA	NA	20	SV01 (8)	NE
1,2,4-Trimethylbenzene	2.66	9.65	5.9	SV01 (8)	E
1,3,5-Trimethylbenzene	2.66	9.65	19	SV01 (8)	E
Acetone	156	568	18	SV03 (8)	NE
Chloroform	1.32	1.97	380	SV02 (8)	E
Naphthalene	62.5	273	51	SV01 (3)	NE

Notes:

1. All concentrations are in micrograms per cubicmeter (ug/m^3)
2. Indoor Inhalation Risk based screening levels (RBSLs) are taken from NMED - UST Bureau - Guidelines for Corrective Action
3. NA - Not Available
4. NE - Not Exceed
5. E - Exceed
6. * Not a site-related COPC

Table 3-4
Exposure Factors
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Parameter	Symbol	Unit	Values Used	Source
Averaging time for carcinogen	ATc	days	25550	SSG
Averaging time for non-carcinogen	ATnc	days	=ED * 365	SSG
Body weight				
Child	BW	kg	15	SSG
Adult	BW	kg	70	SSG
Exposure duration:				
Child	ED	year	6	SSG
Adult	ED	year	24	SSG
Commercial worker	ED	year	25	SSG
Construction worker	ED	year	1	SSG
Exposure frequency:				
Resident	EF	day/year	350	SSG
Commercial worker	EF	day/year	225	SSG
Construction worker	EF	day/year	250	SSG
Soil Ingestion Rate				
Child	IRS	mg/day	200	SSG
Adult	IRS	mg/day	100	SSG
Commercial worker	IRS	mg/day	100	SSG
Construction worker	IRS	mg/day	330	SSG
Soil to skin adherence factor				
Child	M	mg/cm^2	0.2	SSG
Adult	M	mg/cm^2	0.07	SSG
Commercial worker	M	mg/cm^2	0.2	SSG
Construction worker	M	mg/cm^3	0.3	SSG
Skin surface area for dermal contact with soil				
Child	SA	cm^2/day	2800	SSG
Adult	SA	cm^2/day	5700	SSG
Commercial/Construction worker	SA	cm^2/day	3300	SSG
Skin surface area for dermal contact with groundwater				
Commercial/Construction worker	Sagw	cm^2/day	4714	RAGS
Outdoor inhalation rate				
Resident	IRao	m^3/day	10	NMED UST
Commercial/Construction worker	IRao	m^3/day	20	NMED UST
Indoor inhalation rate				
Child	IRai	m^3/day	10	SSG
Adult	IRai	m^3/day	20	SSG
Commercial/Construction worker	IRai	m^3/day	20	SSG

Notes:

1. SSG - NMED Soil Screening Guidance
2. NMED UST - NMED Guidelines for Corrective Action, UST
3. RAGS - Risk Assessment Guidance for Superfund - Volume I
4. cm^2/day: Cubic centimeter per day
5. mg/day: Milligrams per day
6. L/day: Liters per day
7. m^3/day: Cubic meters per day

Table 3-5
Physical and Chemical Parameters
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Chemical	MW	S	H	K_{oc}	D_a	Dw
	(g/mole)	(mg/L-water)	(dimension-less)	(cm^3/g)	(cm^2/s)	(cm2/s)
1,2,4-Trimethylbenzene	1.2E+02	5.68E+01	1.84E-01	9.33E+02	6.22E-02	7.28E-06
1,3,5-Trimethylbenzene	1.2E+02	5.15E+01	2.72E-01	1.02E+03	6.21E-02	7.23E-06
2-Methylnaphthalene	1.4E+02	2.54E+01	1.85E-02	4.37E+03	6.29E-02	7.20E-06
Acetone	5.8E+01	6.00E+05	1.61E-03	5.70E-01	1.24E-01	1.14E-05
Benzo (g,h,i) perylene	2.8E+02	2.60E-04	5.82E-06	1.58E+06	4.90E-02	5.65E-05
Carbon disulfide	7.6E+01	2.30E+03	6.13E-01	5.25E+01	1.04E-01	1.00E-05
Chloroform	1.2E+02	7.92E+03	1.53E-01	4.68E+01	1.04E-01	1.00E-05
Cyclohexane	8.4E+01	4.25E+01	6.68E+00	7.41E+02	7.84E-02	8.39E-06
Methyl cyclohexane	9.8E+01	1.04E+01	1.59E+01	2.14E+03	6.97E-02	7.59E-06
>C10 - C12 (Aliphatics)	1.6E+02	3.40E-02	1.20E+02	2.51E+05	1.00E-01	1.00E-05
>C12 - C16 (Aliphatics)	2.0E+02	7.60E-04	5.20E+02	5.01E+06	1.00E-01	1.00E-05
>C16 - C21 (Aliphatics)	2.7E+02	2.50E-06	4.90E+03	6.31E+08	1.00E-01	1.00E-05
>C10 - C12 (Aromatics)	1.3E+02	2.50E+01	1.40E-01	2.51E+03	1.00E-01	1.00E-05
>C12 - C16 (Aromatics)	1.5E+02	5.80E+00	5.30E-02	5.01E+03	1.00E-01	1.00E-05
>C16 - C21 (Aromatics)	1.9E+02	6.50E-01	1.30E-02	1.58E+04	1.00E-01	1.00E-05

Notes:

1. Above parameters are taken from Table for Texas Risk Reduction Program, March 2004
2. Carbon fraction properties are taken from TPHCWG
3. NA - Not Available
4. g/mole: Grams per mole
5. cm^3/g: Cubic centimeters per gram
6. cm^2/s: Centimeters squared per second

Table 3-6
Toxicity Parameters
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Chemical	SF_o	SF_i	RfD_o	RfD_i	ABS
	$(mg/kg\text{-}day)^{-1}$	$(mg/kg\text{-}day)^{-1}$	(mg/kg-day)	(mg/kg-day)	
1,2,4-Trimethylbenzene	NA	NA	5.00E-02	1.70E-03	NA
1,3,5-Trimethylbenzene	NA	NA	5.00E-02	1.70E-03	NA
2-Methylnaphthalene	NA	NA	**4.00E-03**	**4.00E-03**	**0.13**
Acetone	NA	NA	9.00E-01	***1.00E-01***	NA
Benzo (g,h,i) perylene	NA	NA	**3.00E-02**	**3.00E-02**	**0.13**
Carbon disulfide	NA	NA	1.00E-01	2.45E+00	NA
Chloroform	NA	8.05E-02	1.00E-02	8.60E-04	NA
Cyclohexane	NA	NA	***5.70E+00***	***5.70E+00***	NA
Methyl cyclohexane	NA	NA	***8.60E-01***	8.60E-01	NA
>C10 - C12 (Aliphatics)	NA	NA	0.1	0.286	0.1
>C12 - C16 (Aliphatics)	NA	NA	0.1	0.286	0.1
>C16 - C21 (Aliphatics)	NA	NA	2	NA	0.1
>C10 - C12 (Aromatics)	NA	NA	0.04	0.0571	0.1
>C12 - C16 (Aromatics)	NA	NA	0.04	0.0571	0.1
>C16 - C21 (Aromatics)	NA	NA	0.03	NA	0.13

Notes:

1. Above parameters are taken from NMED SSL guidance document
2. Parameters in bold and italics are from US EPA Region IX
3. Parameters in bold are from Table for Texas Risk Reduction Program, March 2004
4. Carbon fraction properties are taken from TPHCWG
5. NA - Not Available
6. mg/kg-day: Milligrams per kilogram per day

Table 4-1(a)
Chemical Specific Parameters Used for Calculating Indoor Inhalation Target Levels (for J&E Model)
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

CAS No.	Chemical	Organic carbon partition coefficient	Diffusivity in air,	Diffusivity in water,	Pure component water solubility	Henry's law constant	Henry's law constant at reference temperature	Henry's law constant reference temperature	Normal boiling point	Critical temperature	Enthalpy of vaporization at the normal boiling point	Unit risk factor	Reference concentration	Physical state at soil temperature
		K_{oc}	D_a	D_w	S	H'	H	T_R	T_B	T_C	$DH_{v,b}$	URF	RfC	
		(cm^3/g)	(cm^2/s)	(cm^2/s)	(mg/L)	(unitless)	(atm-m^3/mol)	(°C)	(°K)	(°K)	(cal/mol)	$(mg/m^3)^{-1}$	(mg/m^3)	(S,L,G)
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01	L
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00	L
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	7.8E-06	0.0E+00	L
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	L
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	L
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	L
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	1.0E+00	L
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	7.0E-02	S
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	6.0E-03	L
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	0.0E+00	4.0E-01	L
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	1.1E-06	1.0E+00	L
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	0.0E+00	8.0E-01	S
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	L
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	L
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	2.0E-01	L
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	S
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	2.1E-04	0.0E+00	S
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	2.1E-06	0.0E+00	S
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	L

Notes:

1. cm^3/g: cubic centimeters per gram
2. mg/L: milligrams per liter
3. atm-m^3/mol: ?? per mole
4. °C: degrees Celcius
5. °K: degrees Kelvin
6. cal/mol: ??
7. $mg/m^3)^{-1}$: ???
8. mg/m^3: milligrams per cubic meter

Table 4-1(b)
Fate and Transport Parameters
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Parameter	Symbol	Unit	Value Used
Vadose Zone:			
Total Soil Porosity	θ_T	cm^3/cm^3-soil	0.381
Volumetric Water Content	θ_{ws}	cm^3/cm^3	0.198
Volumetric Air Content	θ_{as}	cm^3/cm^3	0.183
Thickness	h_v	cm	362.2
Dry Soil Bulk Density	ρ_s	g/cm^3	1.63
Fractional Organic Carbon Content	f_{ocv}	g-C/g-soil	0.01
Soil in Cracks:			
Total Soil Porosity	θ_{Tcrack}	cm^3/cm^3-soil	0.381
Volumetric Water Content	θ_{wcrack}	cm^3/cm^3	0.198
Volumetric Air Content	θ_{acrack}	cm^3/cm^3	0.183
Capillary Fringe:			
Total Soil Porosity	θ_{Tcap}	cm^3/cm^3-soil	0.381
Volumetric Water Content	θ_{wcap}	cm^3/cm^3	0.34
Volumetric Air Content	θ_{acap}	cm^3/cm^3	0.0381
Thickness	h_c	cm	18.8
Groundwater Parameters:			
Depth to Groundwater	L_{gw}	cm	381
Enclosed Space Parameters:			
Enclosed Space Air Exchange Rate			
Residential	ER	1/day	6
Non Residential	ER	1/day	6
Enclosed Space Volume/Infiltration Area Ratio			
Residential	L_B	cm	244
Non Residential	L_B	cm	366
Enclosed Space Foundation or Wall Thickness			
Residential	L_{crack}	cm	10
Non Residential	L_{crack}	cm	10
Area Fraction of Cracks in Foundation/Walls			
Residential	η	cm^2/cm^2	0.000377
Non Residential	η	cm^2/cm^2	0.00022

Notes:

1. cm^3/cm^3: Cubic centimeter per cubic centimeter
2. cm: Centimeter
3. cm^2/cm^2: Centimeters squared per centimeters squared
4. g-C/g-soil: Grams of carbon per gram of soil
5. g/cm^3: Grams per cubic centimeter

Table 4-2
Comparison of Soil Concentrations with Target Concentrations Protective of Indoor Inhalation
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Parameter	Residential Target Level (Calculated)	Commercial Worker Target Level (Calculated)	Maximum Detected	Maximum Exceed/Not Exceed Target Level?	Average	Average Exceed/Not Exceed Target Level?
Carbon Chain TX1005						
C6 - C12 (GRO)	NA	NA	485,000	NE	68,520	NE
>C12 - C28 (DRO)	NA	NA	9,350,000	NE	1,482,065	NE
>C28 - C36 (ORO)	NA	NA	1,700,000	NE	253,909	NE
VOCs						
Acetone	5,200,000	12,100,000	22	NE	103	NE
Carbon disulfide	90,400	211,000	3	NE	15	NE
Ethylbenzene	638,000	638,000	280	NE	28	NE
Hexane	2,270	5290	79	NE	7	NE
Isopropylbenzene (cumene)	33,500	7.82E+04	87	NE	11	NE
Xylenes, total	NA	NA	4	NE	14	NE
SVOCs						
Benzo (a) anthracene	NA	NA	530	NE	830	NE
Benzo (b) fluoranthene	NOC	NOC	460	NE	824	NE
Benzo (k) fluoranthene	NA	NA	370	NE	817	NE
Benzo (g,h,i) perylene	NA	NA	260	NE	810	NE
Benzo (a) pyrene	NA	NA	530	NE	830	NE
Chrysene	NOC	NOC	660	NE	841	NE
Diethylphthalate*	NA	NA	360	NE	345	NE
Fluoranthene	NA	NA	830	NE	914	NE
Indeno (1,2,3-c,d) pyrene	NA	NA	220	NE	859	NE
2-Methylnaphthalene	NOC	NOC	1,400	NE	1,078	NE
Phenanthrene	NA	NA	730	NE	844	NE
Pyrene	NOC	NOC	790	NE	911	NE

Notes:

1. All concentrations are in micrograms per kilogram (ug/kg).
2. NOC - Not of Concern. The contaminant is a solid at the soil temperature (17 °C) and not of concern for this pathway.
3. For average concentration, the non-detects are replaced with 1/2 the detection limit.
4. NA - Not Available
5. NE - Not Exceed
6. E - Exceed
7. * Not a site-related COPC

Table 4-3
TPH-DRO Soil SSTLs Protective of Indoor Inhalation
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Parameter	Residential Target Level (Calculated)	Commercial Worker Target Level (Calculated)	Maximum Detected	Maximum Exceed/Not Exceed Target Level?	Average	Average Exceed/Not Exceed Target Level?
TPH-DRO	2.86E+07	2.67E+08	9,350,000	NE	1,482,065	NE
Aliphatics						
C10-C12	1.76E+06	1.64E+07	525,000	NE	136,350	NE
C12-C16	8.06E+06	7.51E+07	1,360,000	NE	350,000	NE
C16-C21	NA	NA	856,000	NE	219,550	NE
Aromatics						
C10-C12	3.01E+06	2.80E+07	71,200	NE	22,450	NE
C12-C16	1.58E+07	1.47E+08	597,000	NE	155,225	NE
C16-C21	NA	NA	702,000	NE	195,175	NE

Notes:

1. All concentrations are in micrograms per kilogram (ug/kg).
2. For average concentration, the non-detects are replaced with 1/2 the detection limit.
3. SSTLs - Site-specific target levels based on J&E model
4. NA - Not Available
5. NE - Not Exceed
6. E - Exceed

Table 4-4
Comparison of Groundwater Concentrations with Target Concentrations Protective of Indoor Inhalation
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Parameter	Residential Target Level (Calculated)	Commercial Worker Target Level (Calculated)	Maximum Detected	Maximum Exceed/Not Exceed Target Level?	Average	Average Exceed/Not Exceed Target Level?
Carbon Chain						
C12 - C28 (DRO)	NA	NA	3600	NE	2425	NE
VOCs						
Acetone	41,400,000	95,700,000	120	NE	17	NE
Benzene	4,990	11,000	0.35	NE	0.44	NE
2-Butanone (MEK)	132,000,000	NOC	44	NE	10	NE
Carbon disulfide	136,000	312,000	3.5	NE	0.92	NE
Chloroform	2,110	4,650	3.55	NE	0.82	NE
Cyclohexane	NA	NA	0.86	NE	0.96	NE
1,3-Dichlorobenzene	NOC	NOC	0.585	NE	0.47	NE
1,4-Dichlorobenzene	NOC	NOC	0.93	NE	0.57	NE
Dichlorodifluoromethane	575,000	13,200	11	NE	2.06	NE
Ethylbenzene	NOC	NOC	40	NE	5.24	NE
Isopropylbenzene (cumene)	4,260	9,810	6	NE	1.1	NE
Methylcyclohexane	NOC	NOC	0.55	NE	0.51	NE
Trichloroethene	NA	NA	3.5	NE	0.83	NE
Trichlorofluoromethane	49,300	114,000	0.63	NE	0.90	NE
1,2,4-Trimethylbenzene	12,200	28,200	0.56	NE	0.51	NE
1,3,5-Trimethylbenzene	NOC	NOC	0.53	NE	0.50	NE
Xylenes, total	NA	NA	2.1	NE	0.61	NE

Notes:

1. All concentrations are in micrograms per liter (ug/l).
2. NOC - Not of Concern. The groundwater concentration at or above solubility limit is not of concern for this pathway.
3. For average concentration, the non-detects are replaced with 1/2 the detection limit.
4. NA - Not Available
6. NE - Not Exceed
7. E - Exceed

Table 4-5
TPH-DRO Groundwater SSTLs Protective of Indoor Inhalation
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Parameter	Residential Target Level (Calculated)	Commercial Worker Target Level (Calculated)	Maximum Detected	Maximum Exceed/Not Exceed Target Level?	Average	Average Exceed/Not Exceed Target Level?
TPH-DRO	4.58E+05	4.17E+06	3600	NE	2425	NE
Aliphatics						
C10-C12	7.96E+02	7.04E+03	NA	NA	NA	NA
C12-C16	1.84E+02	1.62E+03	NA	NA	NA	NA
C16-C21	NA	NA	NA	NA	NA	NA
Aromatics						
C10-C12	1.28E+05	1.16E+06	NA	NA	NA	NA
C12-C16	3.29E+05	3.01E+06	NA	NA	NA	NA
C16-C21	NA	NA	NA	NA	NA	NA

Notes:

1. All concentrations are in micrograms per liter (ug/l).
2. For average concentration, the non-detects are replaced with 1/2 the detection limit.
3. SSTLs - Site-specific target levels
4. NE - Not Exceed
5. E - Exceed

Table 5-1
TPH-DRO SSTLs for Surficial Soil for Resident
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Parameter	Dermal Contact SSTL	Maximum Detected Concentration*	E/NE	Ingestion SSTL	Maximum Detected Concentration*	E/NE	Outdoor Inhalation SSTL	Maximum Detected Concentration*	E/NE
TPH-DRO	4.21E+08	630,000	NE	1.81E+08	630,000	NE	1.65E+07	630,000	NE
Aliphatics									
C10-C12	1.83E+07	14,300	NE	7.82E+06	14,300	NE	3.27E+06	14,300	NE
C12-C16	1.83E+07	33,900	NE	7.82E+06	33,900	NE	6.99E+06	33,900	NE
C16-C21	3.66E+08	16,100	NE	1.56E+08	16,100	NE	NA	16,100	NA
Aromatics									
C10-C12	7.32E+06	12,500	NE	3.13E+06	12,500	NE	1.91E+06	12,500	NE
C12-C16	4.22E+06	17,800	NE	3.13E+06	17,800	NE	4.37E+06	17,800	NE
C16-C21	4.22E+06	69,600	NE	2.35E+06	69,600	NE	NA	69,600	NA

Notes:

1. * The maximum detectected concentrations are for surficial soil (0-1 ft bgs).
2. All concentrations are in micrograms per kilogram (ug/kg).
3. SSTL - site-specific target level
4. NA - Not available
5. NE - Not exceed
6. E - Exceed

Table 5-2
TPH-DRO SSTLs for Surficial Soil for Commercial Worker
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Parameters	Dermal Contact SSTL	Maximum Detected Concentration*	E/NE	Ingestion SSTL	Maximum Detected Concentration*	E/NE	Outdoor Inhalation SSTL	Maximum Detected Concentration*	E/NE
TPH-DRO	3.96E+09	630,000	NE	2.62E+09	630,000	NE	1.23E+08	630,000	NE
Aliphatics									
C10-C12	1.72E+08	14,300	NE	1.14E+08	14,300	NE	2.42E+07	14,300	NE
C12-C16	1.72E+08	33,900	NE	1.14E+08	33,900	NE	5.18E+07	33,900	NE
C16-C21	3.44E+09	16,100	NE	2.27E+09	16,100	NE	NA	16,100	NA
Aromatics									
C10-C12	6.88E+07	12,500	NE	4.54E+07	12,500	NE	1.41E+07	12,500	NE
C12-C16	6.88E+07	17,800	NE	4.54E+07	17,800	NE	3.24E+07	17,800	NE
C16-C21	3.97E+07	69,600	NE	3.41E+07	69,600	NE	NA	69,600	NA

Notes:

1. * The maximum detectected concentrations are for surficial soil (0-1 ft bgs).
2. All concentrations are in micrograms per kilogram (ug/kg).
3. SSTL - Site-specific target level
4. NA - Not available
5. NE - Not exceed
6. E - Exceed

Table 5-3
TPH-DRO SSTLs for Soil for Construction Worker
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Parameters	Dermal Contact SSTL	Maximum Detected Concentration	E/NE	Ingestion SSTL	Maximum Detected Concentration	E/NE	Outdoor Inhalation SSTL	Maximum Detected Concentration	E/NE
TPH-DRO	2.38E+09	9,350,000	NE	7.15E+08	9,350,000	NE	2.21E+07	9,350,000	NE
Aliphatics									
C10-C12	1.03E+08	525,000	NE	3.10E+07	525,000	NE	4.36E+06	525,000	NE
C12-C16	1.03E+08	1,360,000	NE	3.10E+07	1,360,000	NE	9.33E+06	1,360,000	NE
C16-C21	2.06E+09	856,000	NE	6.19E+08	856,000	NE	NA	856,000	NA
Aromatics									
C10-C12	4.13E+07	71,200	NE	1.24E+07	71,200	NE	2.55E+06	71,200	NE
C12-C16	4.13E+07	597,000	NE	1.24E+07	597,000	NE	5.83E+06	597,000	NE
C16-C21	2.38E+07	702,000	NE	9.29E+06	702,000	NE	NA	702,000	NA

Notes:

1. All concentrations are in micrograms per kilogram (ug/kg).
2. SSTLs - Site-specific target levels
3. NA - Not Available
4. NE - Not Exceed
5. E - Exceed

Table 5-4
TPH-DRO SSTLs for Groundwater for Construction Worker
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Parameters	Outdoor Inhalation SSTL	Maximum Detected Concentration	E/NE	Dermal Contact SSTL	Maximum Detected Concentration	E/NE
TPH-DRO	2.94E+08	3,600	NE	3.20E+04	3,600	NE
Aliphatics						
C10-C12	1.22E+06	NA	NA	2.17E+03	NA	NA
C12-C16	2.81E+05	NA	NA	5.03E+02	NA	NA
C16-C21	NA	NA	NA	1.02E+03	NA	NA
Aromatics						
C10-C12	1.11E+08	NA	NA	1.23E+04	NA	NA
C12-C16	1.82E+08	NA	NA	1.01E+04	NA	NA
C16-C21	NA	NA	NA	5.93E+03	NA	NA

Notes:

1. All concentrations are in micrograms per liter (ug/l).
2. SSTLs - Site-specific target levels
3. NA - Not Available
4. NE - Not Exceed
5. E - Exceed

APPENDIX A

HISTORIC DATA

Ambient Air Analytical Results
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Sample ID	**B-1**	**B-2**	**B-3**
Date Sampled	**Oct-91**	**Oct-91**	**Oct-91**
Sulfur Compounds Analysis (ppb, v/v)			
Hydrogen sulfide	<200	<200	<200
Carbonyl sulfide	<0.05	<0.05	<0.05
Methylmercaptan	<0.05	<0.05	<0.05
Ethylmercaptan	<0.05	<0.05	<0.05
Dimethyl sulfide	<0.05	<0.05	<0.05
Carbon disulfide	0.02	<0.02	<0.02
Dimethyl disulfide	<0.02	<0.02	<0.02
Volitile Organic Analysis (mg/m^3)			
Chloroform	0.02	ND	ND
Trichloroethene	ND	0.09	ND
Acetone	ND	ND	2
Ethylbenzene	ND	ND	0.08
A-Methyl-2-pentanone	ND	ND	0.1

Notes:
ND - Not detected

Groundwater Analytical Results
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Sample ID	B-1	B-2	B-3	B-4	MW-5	B-6	MW-7	B-8	MW-9
Date Sampled	**Oct-91**	**Oct-91**	**Oct-91**	**Oct-91**	**Oct-91**	**Oct-91**	**Oct-91**	**Oct-91**	**Oct-91**
Standard Water Analysis									
Alkalinity (mg/L)	262	292	472	248	352	220	220	240	216
Chloride (mg/L)	56	62	68	39	350	65	42	50	90
Fluoride (mg/L)	1.1	2	2.9	1.6	2.2	1.1	1.1	1.3	2.2
Nitrate/Nitrite (mg/L)	ND	ND	0.4	0.5	0.3	0.5	0.2	0.3	1.1
Orthphosphate (mg/L)	0.1	0.1	ND	ND	0.1	ND	0.2	0.3	ND
pH	6.9	6.9	6.9	7	6.9	7	7	7	7.3
Spec. Conductance	2840	2550	2580	2320	2320	2750	2070	2150	2320
Sulfate (mg/L)	1300	1200	2450	1600	1600	1950	1400	1620	1550
Sulfide (mg/L)	ND	0.2	ND	ND	ND	ND	ND	ND	ND
Calcium (mg/L)	2800	890	790	730	1400	790	930	3300	1020
Iron	117	102	5	2.77	23.6	5.18	6.7	127	5.76
Magnesium (mg/L)	104	69.7	151	93.9	139	62.7	63.6	210	74.5
Manganese (mg/L)	1.5	0.01	0.44	0.11	0.59	0.12	0.2	2.7	0.15
Potassium	21.1	7.3	9.6	9.7	24.6	14.2	19.4	41	8.1
Silicon	150	41.9	46.9	37.9	128	36.1	33.3	152	43.2
Socium	76.9	84.5	113	68.9	75	84.3	76.7	79.3	116
Volatile Organic Analysis									
Chloroform (mg/L)	11	ND	9.1	NA	NA	NA	NA	NA	NA
Methylene chloride (mg/L)	ND	8.6	ND	NA	NA	NA	NA	NA	NA
Trichloroethene (mg/L)	ND	34	ND	NA	NA	NA	NA	NA	NA
Organic Halogen Aanalysis									
Tox Concentration (mg/L)	37	456	58	31	33	68	<10	NA	<10

Notes:
NA - Not analyzed
ND - Not detected

Ambient Air Analytical Results
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Pilot Test Number	3[1]	3[2]	4	5	5	5[3]	6
Sample ID	VET-01-1	VET-01-2	18-20-AS	28-30-AS	28-30-DS	28-30-EFF	38-40-AS
Date Sampled	4/16/1996	4/16/1996	4/16/1996	4/17/1996	4/17/1996	4/17/1996	4/18/1996
Analysis by Modified EPA Method TO-3							
TPH (ug/L)	140	130	200	170	280	130	220
TPH (ppmv)	33	32	48	42	67	31	53
Analysis by ASTM Method d-5504 (ppbv)							
Hydrogen Sulfide	<4.0	NA	NA	250	NA	NA	4.1
Caibonyl Sulfide	5	NA	NA	<4.0	NA	NA	7.3
Dimethyl Sulfide	15	NA	NA	<4.0	NA	NA	<4.0
Carbon Disulfide	<4.0	NA	NA	<4.0	NA	NA	4.4
Analysis by Modified EPA Method TO-14 (ppbv)							
TNMOC	2200	3000	9400	3900	5300	230	6300
Freon 12	<2.9	<1.6	1.2	17	18	0.95	30
Freon 11	<2.9	<1.6	0.83	3.3	3.6	0.95	43
Freon 113	<2.9	<1.6	0.73	<1.2	<1.5	<0.95	2
Methylene Chloride	<2.9	<1.6	<0.73	<1.2	<1.5	2.5	0.78
1,1,1-Trichloroethane	<2.9	<1.6	<0.73	<1.2	<1.5	0.98	0.78
Benzene	9.7	11	14	15	22	<0.95	14
Trichloroethene	35	29	18	20	18	2.8	17
Toluene	4.8	5.7	9.5	9.9	16	6.2	13
Ethyl Benzene	<2.9	<1.6	1.2	<1.2	<1.5	0.95	0.78
m,p -Xylene	3.1	3.2	2.7	2.9	3.3	3.1	2.7
o-Xylene	<2.9	<1.6	1.2	<1.2	<1.5	1.1	1.5
1,3,5-Trimethylbenzene	<2.9	<1.6	0.83	<1.2	<1.5	0.95	1.2
1,2,4-Trimethylbenzene	6.3	4.3	3.1	3.2	3.4	1.7	4.3
Acetone	14	22	26	40	18	4.4	73
Carbon Disulfide	<11	<6.5	7	<5.0	<6.0	<3.8	<3.1
2-Propanol	<11	<6.5	<2.9	<5.0	<6.0	5.4	<3.1
2-Butanone (MEK)	<11	<6.5	4.5	5.3	<6.0	<3.8	14
Hexane	120	160	180	150	230	<3.8	210
Tetrahydrofuran	140	89	39	22	23	5.1	<3.1
Cyclohexane	79	110	300	120	160	<3.8	140
Ethanol	<11	<6.5	4.4	6.1	<6.0	8.5	<3.1
Heptane	33	40	58	60	92	<3.8	78

Notes:

Air samples were collected while venting on vapor extraction trench VET-01.

Only detected compounds for ASTM Method D-5504 and EPA Method TO-14 are reported in table.

[1] Sample collected after 40 minutes

[2] Sample collected after 140 minutes

[3] Sample collected after carbon treatment

< - Analyte not detected above stated reporting limit

ASTM - American Society for Testing and Materials

DS - Duplicate sample

EPA - Environmental Protection Agency

MEK - Methyl ethyl ketone

NA - Not analyzed

ppbv - Part per billion by volume

ppmv - Parts per million by volume

TPH - Total Petroleum Hydrocarbons referenced to gasoline

TNMOC - Total Non-Methane Organic Compounds referenced to heptane

ug/L - Micrograms per liter

Soil Analytical Results
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Sample No.	MW01	MW-02	MW-03	MW-04	SP-01		SMP-01			SMP-02			SMP-03	
Sample Depth	14.5'	13.5'	14'	9'	34'	38.5'	19'	19.5'	39'	19'	19.5'	38.5'	9'	34'
Date Sampled	Mar-96	Mar-96	Mar-96	Mar-96	Mar-96	Mar-96	Mar-96	Mar-96	Mar-96	Mar-96	Mar-96	Mar-96	Mar-96	Mar-96
TPH as Diesel (mg/kg)	16	2,400	1,400	<10	95	110	1,100	630	<10	3,700	55	<10	4,800	<10
Alkalinity (mg/kg)	18,000	32,000	8,300	51,000	6,500	NA	69,000	NA	NA	40,000	20,000	NA	84,000	NA
Phenanthrene (mg/kg)	7.4	7.2	6.9	7.2	7.5	NA	7.4	NA	NA	7.6	7.5	NA	7.0	NA
Sulfate (mg/kg)	64,000	55,000	83,000	61,000	12,000	22,000	23,000	NA	13,000	24,000	39,000	20,000	110,000	NA
TKN (mg/kg)	54	71	56	44	25	NA	66	NA	NA	52	50	NA	58	NA
TOC (mg/kg)	1,600	3,800	4,200	850	660	NA	4,300	NA	NA	4,500	690	NA	7,300	NA
Phosphorous (total) (mg/kg)	78	96	66	66	140	NA	98	NA	NA	82	68	NA	85	NA
Moisture content (%)	33.3	19	29	25	15	NA	20	NA	NA	26.7	NA	NA	21	NA
Percent solids (%)	66.7	81	71	75	85	84	81	NA	77	73.3	76	81	79	NA
Iron (mg/kg)	2,800	3,600	3,000	2,300	1,500	NA	6,200	NA	NA	2,400	3,000	NA	4,200	NA

Notes:
NA - No analyzed

Groundwater Analytical Results
Officers Club, Site SS-57, Holloman Air Force Base, New Mexico

Sample No.	MW-01	MW-01	MW-03	MW-04	MW-05	MW-07	MW-09	SP-01S	SP-01S (Dup)	SP-01 M	SP-01D
Date Sampled	4/9/1996	4/9/1996	4/10/1996	4/9/1996	4/12/1996	4/12/1996	4/12/1996	4/10/1996	4/10/1996	4/10/1996	4/11/1996
TPH as Diesel (mg/L)	2,500	4,100	9,700	250	<100	<100	<100	3,300	3,400	790	1,200
Dissolution Iron (mg/L)	110	<100	<100	3,100	NA	NA	NA	190	230	<100	140
Sulfate (mg/L)	1,700	1,700	2,100	1,700	1,700	1,500	1,800	1,800	2,000	NA	NA

Notes:

NA - Not analyzed

S - Shallow zone (18 - 20 ft)

M - Medium zone (28 - 30 ft)

D - Deep zone (37.5 - 39.5 ft)

APPENDIX B

SOIL BORING LOGS

PROJECT Officers Club - Holloman Air Force Base
Alamogordo, New Mexico

JOB NO. E91-1191 DATE 10/25/91

LOG OF TEST BORING NO. 1

Bottom of stair well

RIG TYPE N/A
BORING TYPE Hand Auger
SURFACE ELEV. 87.62
DATUM Top of Fire Hydrant

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								SM		4.5" Concrete
										SILTY SAND, fine, nonplastic, tan brown
5								SM		SILTY SAND, fine, nonplastic, light gray to dark gray
10									*	note: strong hydrocarbon and sewage odor
										Auger Refused @ 7'
15										
20										
25										
30										
35										
40										
45										
50										

GROUNDWATER

DEPTH	HOUR	DATE
0.0	0935	10/25/91

SAMPLE TYPE

A - Auger Cuttings B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.

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LOG OF TEST BORING NO. 2

Inside of basement

JOB NO. E91-1191 DATE 10/25/91

RIG TYPE N/A
BORING TYPE Hand Auger
SURFACE ELEV. -
DATUM Top of Fire Hydrant

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				A				SM		4.5" Concrete
										SILTY SAND, fine, nonplastic, black Note: strong sewage and hydrocarbon odor; could not keep hole open.
5										
10										Stopped Auger @ 1'
15										
20										
25										
30										
35										
40										
45										
50										

PROJECT Officers Club - Holloman Air Force Base
Alamogordo, New Mexico

JOB NO. E91-1191 DATE 10/24/91

LOG OF TEST BORING NO. 3

SW side of center line club

RIG TYPE CME-75
BORING TYPE 6-1/2" Hollw Stem Auger
SURFACE ELEV. 96.70
DATUM Top of Fire Hydrant

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	12		20		moderately firm	6" Turf
				S	21		23	SM		
				S	5		23	CL	firm	SILTY SAND, fine, some clay, nonplastic to low plasticity, tan
							18			
5				U	22	89	38			
								ML	medium stiff	CLAYEY SAND, fine, trace of silt, fine, low to medium plasticity, tan
10				S	31		19			
								SM	firm	INTERBEDDED SANDY SILT, fine, clayey sand, fine, tan
15				S	61/11"				very firm	SILTY SAND, trace of clay, nonplastic, tan
									hard	SILTY CLAYEY SAND, fine, dark gray
20				S	50/5.5"			SM		note: dark sand with a strong hydrocarbon odor @ 15'
25				S	50/6"					
30				S	45		19	CL		note: very sharp transition of colors @ 30' note: 30' sand is clearly less contaminated
35									dense	SANDY CLAY, fine, 1/8" gypsum granules, low to medium plasticity, tanish brown
40										Stopped Auger @ 29' 6" Stopped Sampler @ 31'
45										
50										

GROUNDWATER

DEPTH	HOUR	DATE
6.0	1510	10/24/91
9.6	1830	10/24/91

SAMPLE TYPE

A - Auger Cuttings B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.

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Alamogordo, New Mexico

LOG OF TEST BORING NO. 4

W. center of center line club in turf

JOB NO. E91-1191 DATE 10/24/91

RIG TYPE CME-75
BORING TYPE 6-1/2" Hollow Stem Auger
SURFACE ELEV. 98.29
DATUM Top of Fire Hydrant

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	21		17			6" Turf
				S	14		13	CL	stiff	CLAYEY SILT, fine, low plasticity, tan
				S	11		12			
5				S	19	86	9 26			SANDY SILT, fine, nonplastic, tan
				U	13			ML	moderately firm	
10				S	30		23		firm	
15				U	21		29	CH	very stiff	CLAY, fine, high plasticity, dark brown
20				S	50/5"		36	ML	hard	SANDY SILT, fine, some sand, low plasticity, dark brown
25				S	50/5"			CL	hard	SILTY CLAY, fine, considerable gypsum granules, low plasticity, gray
30				S	50/5"		17	CL	hard	CLAYEY SILT, gypsum, fine to medium, possible plasticity, light gray
35										Stopped Auger @ 29' 6" Stopped Sampler @ 30' 6"
40										
45										
50										

GROUNDWATER

DEPTH	HOUR	DATE
5.5	5.5	10/24/91
9.5	9.5	10/24/91

SAMPLE TYPE

A - Auger Cuttings B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.

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Alamogordo, New Mexico

LOG OF TEST BORING NO. 5

N.W. side of center line club in turf

JOB NO. E91-1191 DATE 10/24/91

RIG TYPE CME-75
BORING TYPE 6-1/2" Hollow Stem Auger
SURFACE ELEV. 98.16
DATUM Top of Fire Hydrant

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content of Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	14		16			2" Grass 4" Turf
				S	4		15	SM CL	very soft	**SILTY SAND**, fine, nonplastic, tan
				S	17		10			
5				S	23		10	CL	stiff	**SANDY CLAY**, low plasticity, tan
				U	20		23	SM		
									firm	**SILTY CLAY**, low to medium plasticity, tan
10				S	67		14		hard	**SILTY SAND**, fine, trace of clay, nonplastic, tan
15				U	12		29	CL	moderately firm	**SANDY CLAY**, interbedded with silty sands, low plasticity, tan to dark brown
20				S	42		17	CL	hard	**CLAYEY SAND**, fine, low plasticity, tan
25				S	70			CL	hard	**CLAY WITH SILT**, occasional gypsum granules, low to medium plasticity, light gray
30				S	80		16			
35										Stopped Auger @ 29' 6" Sampler Refused @ 30' 10"
40										
45										
50										

GROUNDWATER

DEPTH	HOUR	DATE
6.0		10/24/91
9.5		10/2491

SAMPLE TYPE

A - Auger Cuttings B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.

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LOG OF TEST BORING NO. 6

JOB NO. E91-1191 DATE 10/23/91

N.W. side of pool area

RIG TYPE CME-75
BORING TYPE 6-1/2" Hollow Stem Auger
SURFACE ELEV. 98.22
DATUM Top of Fire Hydrant

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	18		5	SM	firm	SILTY SAND, trace of clay and gravel, dark brown
				S	9		12			
				S	30		8	SM	soft to firm	SILTY SAND, fine, nonplastic, light brown
5				S	33		5			
				U	40		14			
▽								SM	very firm	SILTY SAND, interbedded with clayey sand, occasional small gravel
▼ 10				S	32		20		very firm	SILTY SAND, fine to medium, nonplastic, light brown
								SM		
15				S	25					
20				S	25				firm	
25				S	50/5"		16		hard	CLAY, with trace of gypsum granules, medium plasticity, tan
								CL		
30				U	100/11"		16			
35										Stopped Auger @ 29' Sampler Refused @ 29' 11"
40										
45										
50										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	7.5		10/23/91
▼	9.5		10/23/91

SAMPLE TYPE

A - Auger Cuttings B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.

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LOG OF TEST BORING NO. 7

S.W. side of pool area

JOB NO. E91-1191 DATE 10/23/91

RIG TYPE CME-75
BORING TYPE 6-1/2" Hollow Stem Auger
SURFACE ELEV. 98.55
DATUM Top of Fire Hydrant

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	15		14	CL	stiff	CLAYEY SAND, fine to medium, low plasticity, dark brown
				S	12		11			
				S	22		10	SM	moderately firm	SILTY SAND, fine, occasional small gravel, brown
5				S	67		13			
▽				U	30				hard	SILTY SAND, very fine, nonplastic, light brown
								SM		
▼ 10				S	4		36			
									very soft	
15				U	23				firm	SILTY SAND, fine to medium, occasional gypsum granules Note: clay lense @ 15' 6" approximately 1-1/2" thick
								SM		
20				S	38		37		hard	CLAYEY SAND, gypsum, granules, low to medium plasticity, brown
								CL		
25				S	85/9"					
									hard	SILTY SAND, fine to medium, trace of clay, nonplastic, light brown
								SM		
30				S	62		17			
								CL	hard	SANDY CLAY, gypsum granules, low to medium plasticity, brown
35										Stopped Auger @ 29' 6" Stopped Sampler @ 31'
40										
45										
50										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	7.2	0930	10/23/91
▼	9.8	1015	10/23/91

SAMPLE TYPE

A - Auger Cuttings B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.

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Alamogordo, New Mexico

JOB NO. E91-1191 DATE 10/25/91

LOG OF TEST BORING NO. 8

Courtyard area next to dining room

RIG TYPE NA
BORING TYPE Hand Auger
SURFACE ELEV. 99.00
DATUM Top of Fire Hydrant

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	6		50			3" Concrete
							38	ML		
				S	6				loose	SILT, fine, low plasticity, tan
				S	6		22	SM		
				S	6		12	CL	medium stiff	INTERBEDDED DARK CLAY WITH SILTY SAND
5				S	6					
				S	6		18			
				S	6				loose	SILTY SAND, fine, nonplastic, tan
				S	6		23			
10				S	6					
				S	6					CLAYEY SILT, fine, some sand, low plasticity, tan
				S	6				soft	
				S	6			SM		
				S	6				loose	SILTY SAND, fine, nonplastic, tan
15										
										Stopped Sampler/Auger @ 13' 6"
20										
25										
30										
35										
40										
45										
50										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	9.0	1359	10/23/91
▼	9.1	1540	10/25/91

SAMPLE TYPE

A - Auger Cuttings B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.

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PROJECT Officers Club - Holloman Air Force Base
Alamogordo, New Mexico

LOG OF TEST BORING NO. 9

N.E. of pool area

JOB NO. E91-1191 DATE 10/27/91

RIG TYPE CME-75
BORING TYPE 6-1/2" Hollow Stem Auger
SURFACE ELEV. 95.41
DATUM Top of Fire Hydrant

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/foot 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	10		29	CL	stiff	4" Asphalt
				S	14		20	ML	moderately firm	CLAY, low to medium plasticity, light gray
				S	10		20			
5				S	3		33	SM	very soft	SILT, fine, low plasticity, light brown
				U	10			SM	moderately firm	SILTY SAND, fine, trace of clay
10				S	22		28	SM	firm	INTERBEDDED SILTY SAND & CLAY, low plasticity, light brown to dark brown
15				S	42			SM	very firm	INTERBEDDED SILTY SAND AND CLAY, low plasticity, light brown to dark brown
20				U	100/6"			SM	hard	SILTY SAND, fine to medium, occasional small gypsum granules, brown
25				S	50/5"				hard	SILTY SAND, fine to medium, occasional gypsum granules, trace of clay, light brown
30				S	34		19	CL	hard	CLAY, fine, considerable gypsum grains, low to medium plasticity, brown
35										Stopped Auger @ 29' 6" Stopped Sampler @ 31'
40										
45										
50										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	5.2	1300	10/22/91
▼	9.3	1500	10/22/91

SAMPLE TYPE

A - Auger Cuttings B - Block sample.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.

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HTRW DRILLING LOG

DISTRICT: OMAHA	HOLE NUMBER: MW-01	
1. COMPANY NAME: GROUNDWATER TECHNOLOGY GVT. SVC	2. DRILL SUBCONTRACTOR: LAYNE ENVIRONMENTAL	SHEET 1 OF SHEETS 2
3. PROJECT: DO 8 WAD 35 Contract DACW-45-94-D0003-5557	4. LOCATION: OFFICER'S CLUB - HOLLOMAN AFB, N.M.	
5. NAME OF DRILLER: DON KIRSNIS	6. MANUFACTURER'S DESIGNATION OF DRILL: FAILING F-10	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8" HSA; 24" Calif. STYLE SPLIT SPOONS	8. HOLE LOCATION: SEE MAP	
	9. SURFACE ELEVATION: ~4070' AMSL	
	10. DATE STARTED: 27 MARCH 1996	11. DATE COMPLETED: 27 MARCH 1996
12. OVERBURDEN THICKNESS:	15. DEPTH GROUNDWATER ENCOUNTERED: ~9.5'-10'	
13. DEPTH DRILLED INTO ROCK: NONE	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 11.86' on 1 Apr 1996	
14. TOTAL DEPTH OF HOLE: 17'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NONE			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
14.5'-15'						

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		L.S. STEVENSON

LOCATION SKETCH/COMMENTS

SCALE:

PROJECT: DACW-45-94-D0003; DO 8 WAD 35-5557-REMED. @ O'CLUB

HOLE NO. MW-01

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: MW-01

PROJECT: DOB WAD35 - 5557-O'CLUB
CONTRACT: DACW-45-94-D0003

INSPECTOR: L.S. STEVENSON

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)
		SAND, SOD; Brown ish					
	1	silty fine sand (SM) tan (10YR 7/2)					
	2						
	3						
	4	gypsum cemented sand, (SM), very hard, w/ crystals!	0.3ppm				hand auger refusal.
	5						
	6	silty sand (SM), tan (10YR 6/4), with gypsum nodules					
	7						
	8		0.2ppm			7	
	9					10 14 19	becoming wet ▽
	10	silty sand (SM), dense, moist, grey (5Y 6/1)					
	11						
	12						no odors noticable.
	13						
	14	sand w/ silt (SM), grey (5Y 6/1)	0.7ppm		5557-MW01-14.5-15	12 17 23 29	
	15	TD					
	16						
	17						

PROJECT: HOLLOMAN AFB.
DO 8 WAD35-5557-REMED. AT OFFICERS CLUB.

HOLE NO. MW-01

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

DISTRICT	OMAHA
HOLE NUMBER	MW-02
1. COMPANY NAME	GROUNDWATER TECHNOLOGY GOT. SVC
2. DRILL SUBCONTRACTOR	LAYNE ENVIRONMENTAL
SHEET / SHEETS	1 OF 2
3. PROJECT	DO8WAD35 contract DACW-45-94-D0003-5557
4. LOCATION	OFFICER'S CLUB - HOLLOMAN AFB, N.M.
5. NAME OF DRILLER	DON KIRSNIS
6. MANUFACTURER'S DESIGNATION OF DRILL	FAILING F-10
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	8" HSA w/ 24" CALIF STYLE SPLIT SPOONS.
8. HOLE LOCATION	SEE MAP.
9. SURFACE ELEVATION	4068' AMSL
10. DATE STARTED	30 MARCH 1996
11. DATE COMPLETED	30 MARCH 1996.
12. OVERBURDEN THICKNESS	
13. DEPTH DRILLED INTO ROCK	NONE
14. TOTAL DEPTH OF HOLE	15'
15. DEPTH GROUNDWATER ENCOUNTERED	~8.75'
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	10.01 on 1 Apr. 1996
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NONE			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
13.5-14.						

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		L.S. STEVENSON

LOCATION SKETCH/COMMENTS

SCALE:

PROJECT: DACW-45-94-D0003: DO8WAD35-5557-REMED. @ O'CLUB

HOLE NO. MW-02

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: MW-02

PROJECT: DO 8 WAD 35 - 5557 - O'CLUB
CONT. DACW-45-94-D0003

INSPECTOR: L. S. STEVENSON

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)
	1	RUBBLE + FILL					
	2						
	3	silty sand, fine (SM), light tan (10 YR 8/4)	0.0 ppm				
	4						
	5						
	6						
	7						
	8						
	9	fine silty sand (SM), tan (7 YR 7/4), wet.	0.0 ppm			6 9 14 19	▽
	10						
	11						
	12	very fine silty sand (SM), grey (5 Y 6/1), wet					
	13	~~orange~~ fine sand and clay, orange, w/ gypsum crystals, v. hard			5557-MW02-13.5-14		
	14	very fine sand (SP), grey (5 Y 7/1)				24 65/4"	18" recovery strong odor.
	15	TD	10.2 ppm				

PROJECT: 5557 - REMOD. AT OFFICERS CLUB
DACW-45-94-D0003 - DO 8 - WAD 35

HOLE NO. MW-02

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

DISTRICT: OMAHA		HOLE NUMBER: MW-03
1. COMPANY NAME: GROUNDWATER TECHNOLOGY GVT. SVC	2. DRILL SUBCONTRACTOR: LAYNE ENVIRONMENTAL	SHEET 1 OF 2 SHEETS
3. PROJECT: DO8WAD35 contract DACW-45-94-D0003-5557	4. LOCATION: OFFICER'S CLUB - HOLLOMAN AFB, N.M.	
5. NAME OF DRILLER: DON KIRSNIS	6. MANUFACTURER'S DESIGNATION OF DRILL: FAILING F-10	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8" HSA w/ 24" Calif. Style Split spoons.	8. HOLE LOCATION: SEE MAP.	
	9. SURFACE ELEVATION: 4070' AMSL.	
	10. DATE STARTED: 25 MAR 1996	11. DATE COMPLETED: 25 MAR 1996.
12. OVERBURDEN THICKNESS:	15. DEPTH GROUNDWATER ENCOUNTERED:	
13. DEPTH DRILLED INTO ROCK: NONE	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 12.21' on 1 Apr 1996	
14. TOTAL DEPTH OF HOLE: 15'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NONE			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
14-14.5'						

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		L. S. STEVENSON

LOCATION SKETCH/COMMENTS

SCALE:

PROJECT: DACW-45-94-D0003; DO8WAD35-5557-REMED. @ O'CLUB.

HOLE NO. MW-03.

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: MW-03

PROJECT: SS 57 - REMED. AT O'CLUB
DACW-45-94-D0003: D08 WAD 35

INSPECTOR: C.S. STEVENSON

SHEET ___ OF ___ 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)
	1	silty sand (SM), tan (10 YR 7/2)					
	2		...				
	3						
	4		0.1 ppm				
	5						
	6						
	7						
	8	fine sand w. tr. silt (SM) tan (10 YR 8/4)				9	
						17	
	9					24	
						36	
	10						
	11						
	12						▽
	13	silty sand (SM) gray (5 Y 6/1) moist	102.5 ppm			12	strong odor reminiscent of cleaning chemicals
						17	
	14					27	
					SS57-MW03-14-14.5	35	
	15	TD					100 ppm H_2S in Headspace
	16						
	17						
	18						
	19						
	20						

PROJECT: SS57 - REMED. at Officers CLUB.
DACW-45-94-D0003: D08 WAD 35

HOLE NO. MW-03

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

DISTRICT	OMAHA
HOLE NUMBER	MW-04
1. COMPANY NAME	GROUNDWATER TECHNOLOGY GOV. SVC
2. DRILL SUBCONTRACTOR	LAYNE ENVIRONMENTAL
SHEET / SHEETS	1 OF 2
3. PROJECT	DO 8 WAD 35 Contract DACW-45-94-D0003-5557
4. LOCATION	OFFICER'S CLUB - HOLLOMAN AFB, N.M.
5. NAME OF DRILLER	DON KIRSNIS
6. MANUFACTURER'S DESIGNATION OF DRILL	FAILING F-10
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	8" HSA w/ 24" Calif. Style Split Spoons.
8. HOLE LOCATION	SEE MAP
9. SURFACE ELEVATION	4066' AMSL
10. DATE STARTED	30 MAR 1996
11. DATE COMPLETED	30 MAR 1996.
12. OVERBURDEN THICKNESS	
13. DEPTH DRILLED INTO ROCK	NONE
14. TOTAL DEPTH OF HOLE	14'
15. DEPTH GROUNDWATER ENCOUNTERED	
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	8.53 on 1 Apr 1996
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NONE			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
9-9.5'						

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		L. S. STEVENSON

LOCATION SKETCH/COMMENTS SCALE:

PROJECT	HOLE NO.
DACW-45-94-D0003; DO 8 WAD 35-5557-REMED. @ O'CLUB	MW-04

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: MW-04

PROJECT: 5557 - REMED at O'Club. ACW-45-94-D0003 & D08WAD35

INSPECTOR: L. S. STEVENSON

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)
	1	coarse river rock + pavement base					
	2						
	3	silty, v. fine sand (SM) tan (10YR 7/3), slightly moist	0.0ppm				
	4						
	5						
	6						
	7	silty fine sands (SM), mottled tan + brown w/ gyp nodules					
	8	silty fine sand (SM), orange (10YR 6/6), moist to wet @ 8.5ft	0.1ppm			9 14 29 33	18" recovery.
	9						
	10						
	11						
	12	clayey fine sand (SC) orange (2.5YR 4/6) very hard, dry, w/ large (3/8") gypsum crystals	0.0ppm			9 22 56/2"	15" recovery
	13						
	14	TD					

PROJECT: DACW-45-94-D0003; D08WAD35 - 5557 - REMED at O'Club.

HOLE NO. MW-04

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

DISTRICT: OMAHA.		HOLE NUMBER: SP-01
1. COMPANY NAME: GROUNDWATER TECHNOLOGY GOV. SVC	2. DRILL SUBCONTRACTOR: LAYNE ENVIRONMENTAL	SHEET 1 OF SHEETS 3
3. PROJECT: DO 8 WAD 35 contract DACW-45-94-D0003-5557	4. LOCATION: OFFICER'S CLUB - HOLLOMAN AFB, N.M.	
5. NAME OF DRILLER: DON KIRSNIS	6. MANUFACTURER'S DESIGNATION OF DRILL: FAILING F-10	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8" HSA w/ 24" Calif. Style Split spoons — ovmd-illed w/ 15" HSA	8. HOLE LOCATION: See MAP.	
	9. SURFACE ELEVATION: 4069' AMSL	
	10. DATE STARTED: 27 MAR 1996	11. DATE COMPLETED: 31 MAR 1996
12. OVERBURDEN THICKNESS:	15. DEPTH GROUNDWATER ENCOUNTERED:	
13. DEPTH DRILLED INTO ROCK: NONE	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 11.5'	
14. TOTAL DEPTH OF HOLE: 41'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
18', 28', 38'		X	

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
3) 34' & 39'						

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			See comments.	C.S. STEVENSON

LOCATION SKETCH/COMMENTS SCALE:

Sparge well: cluster of 3 installed in hole;
Pilot hole w/ 8" HSA, completed 27 MAR 1996.
ovmd-illed w/ 15" HSA on 29 MAR 1996.
& Well installation completed 31 MAR 1996.

PROJECT	HOLE NO.
DACW-45-94-D0003: DO 8 WAD 35-5557-REMED. @ O'CLUB	SP-01

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: SP01

PROJECT: 5557-REMEDIATION AT O CLUB
DACW-45-94-D0003 D08 WAD 35

INSPECTOR: L.S. STEVENSON

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)
	1						
	2	silty fine sands (SM), tan (10 YR 8/2), w/ gypsum nodules	...				
	3						
	4						
	5		0.2				
	6	silty fine sands (SM), tan (10 YR ~~7/2~~ 7/4) w/ small (0.1") gypsum crystals					
	7						
	8					3	
	9		0.5			7	
	10					11	
						19	
	11	fine sand (SP), grey (5Y 6/1)					▽
	12						
	13						
	14		4.4			12 17	some odor
	15					25 33	
	16						
	17						
	18	clayey sand (SC), grey and tan (5Y 7/1), moist, slightly plastic	6.6			7	
	19	clayey sand (SC), tan (5Y 8/1), dry, hard, gypsum nodules		5557 SP01 19-19.5		13 26	
	20					50/4"	

PROJECT: ~~D08~~ DACW-45-94-D0003 ; D08 WAD 35 ; 5557-REMED. @ O'Club

HOLE NO.

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: SP-01

PROJECT: 5557-REMEDIATION AT O CLUB
DACW-45-94-D0003 DO8 WAD 35

INSPECTOR: L.S. STEVENSON

SHEET 3 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)
	21	medium to coarse silty sand (SM), grey (5Y 6/1), wet					
	22		...				
	23		5.8ppm				
	24	clay (CL), orange (10 YR 7/4), soft				37 70+ for 5"	18" recovery
	25	fine sand (SP), grey (5Y 6/1)					
	26						
	27						
	28	silty clayey fine sand (SM), ~~w/ gypsum crystals~~ grey (5Y6/1), w gypsum xtals	1.0ppm			10 19	
	29	fine sand (SP), wet, grey (5Y5/1)		5557SP01-29-29.5		31 50	
	30						
	31						
	32	fine sand (SP), dry to moist, grey (5Y 6/1)					
	33		7.9ppm			~~47~~ 50+/2"	
	34	fine sand (SP), dry, orange (10 YR 7/6), very dense.			5557 SP01 34-34.5	42 50+/2"	12" recovery.
	35						
	36	fine sand (SP), moist, grey (5Y 5/1)					
	37						
	38		8.6ppm				
	39	clay (CL), dry red/white (5YR 5/4) very dense, w/ gypsum crystals		5557 SP01 39-39.5	5557 SP01 38.5-39	17 36 61	overdrilled to 41' for sponge point installation
	40						

PROJECT: ~~DO8~~ DACW-45-94-D0003 : DO8 WAD 35 : 5557 - REMED. @ O'CLUB

HOLE NO. SP-01

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

DISTRICT	OMAHA.
HOLE NUMBER	SMP-01
1. COMPANY NAME	GROUNDWATER TECHNOLOGY GOV. SVC
2. DRILL SUBCONTRACTOR	LAYNE ENVIRONMENTAL
SHEET / SHEETS	1 OF 3
3. PROJECT	DO 8 WAD 35 contract DACW-45-94-D0003-5557
4. LOCATION	OFFICER'S CLUB - HOLLOMAN AFB, N.M.
5. NAME OF DRILLER	DON KIRSNIS
6. MANUFACTURER'S DESIGNATION OF DRILL	FAILING F-10
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	8" HSA w/ 24" Calif. Style Split Spoons - overdrilled w/ 1'5" HSA for sparge monitoring point installation.
8. HOLE LOCATION	SEE MAP
9. SURFACE ELEVATION	4069' AMSL
10. DATE STARTED	28 MAR 1996
11. DATE COMPLETED	28 MAR 1996
12. OVERBURDEN THICKNESS	
13. DEPTH DRILLED INTO ROCK	NONE
14. TOTAL DEPTH OF HOLE	41'
15. DEPTH GROUNDWATER ENCOUNTERED	~~11.49' on 1 Apr~~
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	11.49' on 1 Apr 1996
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NONE			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
(2) 39' 39'						

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			X	L.S. STEVENSON

LOCATION SKETCH/COMMENTS SCALE:

Sparge monitoring point - cluster installation.

PROJECT: DACW-45-94-D0003: DO 8 WAD 35-5557-REMED. @ O'CLUB

HOLE NO.

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: SMP-01

PROJECT: 5557-REMEDIATION AT O CLUB
DACW-45-94-D0003 D08 WAD 35

INSPECTOR: L.S. STEVENSON

SHEET 2 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)
	1						
	2	Silty sands (SM), tan (10YR 8/2)	---				
	3						
	4		0.2ppm				
	5						
	6						
	7						
	8	Silty fine sands (SM), tan (10YR 8/3), w/ few gypsum nodules				10	
	9		1.8ppm			12	
						14	
	10					14	
	11						▽
	12						
	13	clayey fine sands (SC), moist, grey (5Y 7/1)					
	14		11.1ppm			11	
						15	
	15					21	
						27	
	16						
	17						
	18	clayey fine sand (SC), grey (5Y 6/1).	26.4ppm			7	
	19				5557 SMP01 19-20	11	
	20	fine clayey sand (SC), dry, grey (5Y 6/1), very hard				26	
						50	

PROJECT: ~~D08~~ DACW-45-94-D0003 : D08 WAD 35 : 5557-REMED. @ O'CLUB

HOLE NO.

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: SMP-01

PROJECT: 5557-REMEDIATION AT O CLUB
DACW-45-94-D0003 DO8 WAD 35

INSPECTOR: L.S. STEVENSON

SHEET 3 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)
	21						very hard drilling
	22						
	23						
	24	~~very~~ gypsum crystals, mottled, grey + white, very hard.	0.5ppm.			45 60/4"	9" recovery
	25	clayey sand (SC), orange + green (10YR 8/3)					lifting rig on auger pull-down.
	26						
	27						
	28	fine sand (SP), grey (5Y 6/1)					out of hard zone
	29	medium to fine sand (SW), orange (10YR 7/3)	2.0			22 39 50	18" recovery
	30						
	31						
	32						
	33	silty fine sand (SM), orange (7.5YR 6/6)	5.0			10 17 24 32	
	34	bands of grey, orange, white fine sands					
	35						
	36						
	37						
	38	sandy clay (CL), orange, thin band (3"), soft, plastic					
	39	fine sand (SM) w/ silt, grey 5Y 6/1			5557 SMP01 37-39.5	12 16 25 30	
	40						

PROJECT: ~~DOO~~ DACW-45-94-D0003 : DO8 WAD 35 ; 5557-REMED. @ O'CLUB

HOLE NO.

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

DISTRICT: OMAHA		HOLE NUMBER: SMP-02
1. COMPANY NAME: GROUNDWATER TECHNOLOGY GOV. SVC	2. DRILL SUBCONTRACTOR: LAYNE ENVIRONMENTAL	SHEET 1 OF 3 SHEETS
3. PROJECT: DO8WAD35 Contract DACW-45-94-D0003-5557	4. LOCATION: OFFICER'S CLUB - HOLLOMAN AFB, N.M.	
5. NAME OF DRILLER: DON KIRSNIS	6. MANUFACTURER'S DESIGNATION OF DRILL: FAILING F-10	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8" HSA w/ 24" Calif Style Split Spoons - overdrilled w/ 15" HSA for monitoring point installation	8. HOLE LOCATION: SEE MAP.	
	9. SURFACE ELEVATION: 4069' AMSL	
	10. DATE STARTED: 29 MAR 1996	11. DATE COMPLETED: 30 MAR 1996
12. OVERBURDEN THICKNESS:	15. DEPTH GROUNDWATER ENCOUNTERED:	
13. DEPTH DRILLED INTO ROCK: NONE	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 10.86' on 1 Apr 1996	
14. TOTAL DEPTH OF HOLE: 40.5'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NONE			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
(2) 19-20 + 39-40						

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			X	L. S. STEVENSON

LOCATION SKETCH/COMMENTS — SCALE:

Sponge monitoring point installation

PROJECT: DACW-45-94-D0003; DO8WAD35-5557-REMED. @ O'CLUB — HOLE NO. SMP-02

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: SMP-02

PROJECT: 5557-REMEDIATION AT O CLUB DACW-45-94-D0003 DO8 WAD 35

INSPECTOR: L.S. STEVENSON

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)
		SOD					
	1	gravel					
		red clay fill					
	2	silty fine sands (SM), brown + tan 10 YR 7/2					
	3						
	4		0.1ppm				
	5						
	6						
	7						
	8	fine silty sand (SM), dry, tan (10 YR 7/4)	0.0ppm			8	
	9	fine silty sand (SM), grey (5 Y 6/1)				11 14 17	
	10						∇
	11						
	12						
	13	fine silty sand (SM), moist to wet, grey (5 Y 7/1)	28.5ppm			6	
	14					11	
	15					21 34	
	16						
	17						
	18	silty fine sand (SM), moist, grey (5 Y 6/1)					
	19	clayey fine sand (SC) ~~Dry brown~~ gypsum cemented	93.1ppm		5557 SMP02 19.5-20	8 16 39 50/3"	21" recovery.
	20						

PROJECT: ~~DO8~~ DACW-45-94-D0003 : DO8 WAD 35 : 5557 - REMED. @ O'Club

HOLE NO.

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: SMP-02

PROJECT: 5557-REMEDIATION AT O CLUB DACW-45-94-D0003 DO8 WAD 35

INSPECTOR: L.S. STEVENSON

SHEET 3 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)
	21						interbedded hard & soft clays, silty sands.
	22						
	23	silty fine sand w clay (SM) moist, orange (5YR 7/6)					
	24	~~clayed~~ clays & gypsum nodules (CL), dry, orange (5YR 7/6)	0.7.			17 29 50	18" recovery
	25						
	26						
	27						
	28	sandy clay (CL), orange - yellow (10YR 8/4) w/ thin sand lamina.	1.5				
	29					12 16 24 31	
	30						
	31						
	32						
	33	med sand w/ clay & gyp. nodules (SC), moist, tan & orange 10YR 7/2					
	34					10 17 27 35	
	35						
	36						
	37	fine sand (SM) w/ silt, moist, tan (10YR 7/2), soft.					
	38						
	39	clayey fine sand (SC), dry, red (5YR 6/4), very hard, w/ gypsum crystals.			5557 SMP02 38-39	14 19 34 50+/4"	18" recovery
	40						

PROJECT: ~~DOO~~ DACW-45-94-D0003 : DO8 WAD 35 ; 5557 - REMED. @ O'Club

HOLE NO. SMP-02

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

DISTRICT: OMAHA	HOLE NUMBER: SMP-03	
1. COMPANY NAME: GROUNDWATER TECHNOLOGY GOT. SVC	2. DRILL SUBCONTRACTOR: LAYNE ENVIRONMENTAL	SHEET 1 OF 3 SHEETS
3. PROJECT: DO8WAD35 contract DACW-45-94-D0003-5557	4. LOCATION: OFFICER'S CLUB - HOLLOMAN AFB, N.M.	
5. NAME OF DRILLER: DON KIRSNIS	6. MANUFACTURER'S DESIGNATION OF DRILL: FAILING F-10	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8" HSA w/ 24" Calif. split spoons - overdrilled w/ 15" HSA	8. HOLE LOCATION: SEE MAP	
	9. SURFACE ELEVATION: 4070' AMSL	
	10. DATE STARTED: 26 MAR 1996	11. DATE COMPLETED: 26 MAR 1996
12. OVERBURDEN THICKNESS:	15. DEPTH GROUNDWATER ENCOUNTERED:	
13. DEPTH DRILLED INTO ROCK: NONE	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 12.44' on 1 Apr 1996	
14. TOTAL DEPTH OF HOLE: 41'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NONE			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
						%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			X	L.S. STEVENSON

LOCATION SKETCH/COMMENTS SCALE:

Sparge Monitoring Point Installation.

PROJECT: DACW-45-94-D0003: DO8WAD35-5557-REMED. @ O'CLUB

HOLE NO. SMP-03

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: SMP-03

PROJECT: 5557-REMEDIATION AT O CLUB
DACW-45-94-D0003 DO8 WAD 35

INSPECTOR: L.S. STEVENSON

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)
	1	silty fine sands (SM), tan (10 YR 8/3)					
	2		---				
	3						
	4		0.0 ppm				
	5						
	6						
	7						
	8	silty fine sands (SM) tan (10 YR 7/3), mottled.				15	
	9		0.0 ppm			26	
	10					50	
	11					53	
	12						
	13						▽
	14	fine sand (SP), grey (2.5 Y 7/1)	87			missing data (SS)	very hard augering.
	15						
	16						
	17						
	18	clayey sand (SC), light grey (2.5 Y 6/1), cohesive				14	
	19				5557 SMP03 19.5-20	16	
			991			23	
	20					32	

PROJECT: ~~D08~~ DACW-45-94-D0003 : D08 WAD 35 ; 5557 - REMED. @ O'CLUB

HOLE NO.

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: SMP-03

PROJECT: 5557-REMEDIATION AT O CLUB
DACW-45-94-D0003 ; D08 WAD 35

INSPECTOR: L.S. STEVENSON

SHEET 3 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)
	21						
	22		...				
	23						
	24	clayey silt (ML), grey (2.5 Y 5/1)	202ppm			16 29 40	
	25					50/4"	
	26						
	27						
	28						
	29	clayey fine sand (SC), grey (2.5 Y 6/1), cohesive, w/ traces of orange + black fine sand grains.	183ppm			11 19 27	moist bands of sandy materials.
	30					40	
	31						
	32						
	33	silty sand (SM), orange 10 YR 7/8, mottled w/ tan + dark orange	0.7ppm			8	
	34	clay (CL), tan				14	
	35	fine sand (SP), tan 10 YR 8/1				19 29	
	36						
	37						
	38	clay (CL), banded red + grey (10 YR 6/3), w/ some 1/2" thick sand stringers.	0.4.			7	hard + stiff
	39				5557 SMP03 39.5-40	17 17	
	40					24	

PROJECT: ~~D08~~ DACW-45-94-D0003 ; D08 WAD 35 ; 5557-REMED. @ O'Club

HOLE NO.

ENG FORM 5056A-R, AUG 94.

(Proponent: CECW-EG)

HTW DRILLING LOG

HOLE NO. SB-1

1. COMPANY NAME: Blue Environmental	2. DRILLING CONTRACTOR: Blue Environmental
SHEET 1 OF 2 SHEETS	
3. PROJECT: Holloman Airforce Base	4. LOCATION: officers Club SS-57
5. NAME OF DRILLER: Robert Currence	6. MANUFACTURER'S DESIGNATION OF DRILL: DT-66
7. SIZES & TYPES OF DRILLING & SAMPLING EQUIPMENT	8. HOLE LOCATION: North East
	9. SURFACE ELEVATION (ft. NGVD)
	10. DATE STARTED / 11. DATE COMPLETED
12. OVERBURDEN THICKNESS	15. DEPTH GROUNDWATER ENCOUNTERED
13. DEPTH DRILLED INTO ROCK	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED
14. TOTAL DEPTH OF HOLE	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE REC %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	Field Screening Results d	Geotech Sample or Core Box No. e	Analytical Sample No. f	Blow Counts g	REMARKS h
	0	Silty Sand SM: Soft to med stiff, slightly moist to moist, dark reddish Brn (5YR 3/2) to white (5YR 8/1) mostly fine sand w/ some silt Gravel @ ≈10" BGS up to 1" in Dia, massive.					3 ft Rec
	1						
	2						
	3						
	4	Silty Sand As above: from 7 to 8 ft BGS Gravelly Silty Sand SM: Soft, silty wet,					2 ft Recov
	5						

PROJECT | HOLE NO.

HTW DRILLING LOG

HOLE NO. SB-1

PROJECT

INSPECTOR

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 Counts g	REMARKS h
	5	Reddish Brn (5YR 4/3) Some Gravel (Fine to Coarse), mostly Silty Sand (Mostly Fine Sand, w/Some Silt), non plastic, massive.					
	6						
	7						
	8	Silty Sand SM: Soft, slightly moist to Saturated, Brn (7.5YR 4/3) mostly fine sand, Some Silt, little Gravel, not plas massive, @ 10.5 ft area of Black staining ≈ 2" thick					3 ft Rec
	9						
	10						
	11						
	12						
	13						
	14						

PROJECT

HOLE NO.

HTW DRILLING LOG

HOLE NO. SB-02

SHEET 1 OF SHEETS

1. COMPANY NAME: Blute Environmental	2. DRILLING CONTRACTOR: Blute Environmental
3. PROJECT: Holloman Airforce Base	4. LOCATION: officers Club SS-57
5. NAME OF DRILLER: Robert Currence	6. MANUFACTURER'S DESIGNATION OF DRILL: DT-66
7. SIZES & TYPES OF DRILLING & SAMPLING EQUIPMENT	8. HOLE LOCATION: North East
	9. SURFACE ELEVATION (ft. NGVD)
	10. DATE STARTED / 11. DATE COMPLETED
12. OVERBURDEN THICKNESS	15. DEPTH GROUNDWATER ENCOUNTERED
13. DEPTH DRILLED INTO ROCK	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED
14. TOTAL DEPTH OF HOLE	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE REC %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	Field Screening Results d	Geotech Sample or Core Box No. e	Analytical Sample No. f	Blow Counts g	REMARKS h
	0	0-1 Gravel fill					5 ft Recovery
		1-4 Silty Sandy SM: Soft to med Stiff, Slightly moist, light Reddish Brn (5YR 6/4), Mostly fine sand, some silt, not plastic, mottled mostly massive, Gravel @ 2.5 ft BGS.					
	1						
	2						
	3						
	4	Silty Sand SM: Soft to med Stiff, Dry to slightly moist, white (5YR 8/1) to dark bluish gray (GLEY 4/1) mostly fine sand					4 ft Recovery over @ 8 ft
	5						

PROJECT

HOLE NO

HTW DRILLING LOG

HOLE NO. SB-2

PROJECT O-Club SS-57

INSPECTOR

SHEET 2 OF 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 Counts g	REMARKS h
	5	Some Silt, not plastic, not cohesive, odor @ 8 ft					
	6						
	7						
	8	Silty Sand Sm: As above @ 8.5 ft BGS Gravel layer ~4" thick, Saturated @ 9.5 ft BGS - Strong odor					4 ft Recovery.
	9						
	10						
	11						
	12						
	13						
	14						

PROJECT

HOLE NO.

HTW DRILLING LOG

HOLE NO. SB-3

SHEET 1 OF 2 SHEETS

1. COMPANY NAME: Blade Environmental	2. DRILLING CONTRACTOR: Blade Environmental
3. PROJECT: Holloman Airforce Base	4. LOCATION: officers Club SS-57
5. NAME OF DRILLER: Robert Currence	6. MANUFACTURER'S DESIGNATION OF DRILL: DT-66
7. SIZES & TYPES OF DRILLING & SAMPLING EQUIPMENT	8. HOLE LOCATION North East
	9. SURFACE ELEVATION (ft. NGVD)
	10. DATE STARTED / 11. DATE COMPLETED
12. OVERBURDEN THICKNESS	15. DEPTH GROUNDWATER ENCOUNTERED
13. DEPTH DRILLED INTO ROCK	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED
14. TOTAL DEPTH OF HOLE	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE REC %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	Field Screening Results d	Geotech Sample or Core Box No. e	Analytical Sample No. f	Blow Counts g	REMARKS h
	0	Silty Sand SM: Soft to med stiff slightly moist, white (5 YR 8/1), mostly fine sand w/ some silt, a few coarse sand grains throughout sample, moist, not coh.					4ft PID
	1						
	2						
	3						
	4	Silty sand As above @ 7ft DGS turns to a reddish yellow (5 YR 6/8)					4ft PID negativ
	5						

PROJECT | HOLE NO.

HTW DRILLING LOG

HOLE NO. SB-3

PROJECT

INSPECTOR

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 Counts g	REMARKS h
	5						
	6						
	7						
	8	Silty Sand Sm: As above					4 ft Rec.
		Sat @ 9 ft BGS					
	9						
	10						
	11						
	12						
	13						
	14						

PROJECT

HOLE NO.

HTW DRILLING LOG

HOLE NO. SB-4

1. COMPANY NAME: Blue Environmental	2. DRILLING CONTRACTOR: Blue Environmental
SHEET 1 OF 1 SHEETS	
3. PROJECT: Holloman Airforce Base	4. LOCATION: officers Club SS-57
5. NAME OF DRILLER: Robert Cuffance	6. MANUFACTURER'S DESIGNATION OF DRILL: DT-66
7. SIZES & TYPES OF DRILLING & SAMPLING EQUIPMENT: Macro Core 4'	8. HOLE LOCATION: North East
	9. SURFACE ELEVATION (ft. NGVD)
	10. DATE STARTED / 11. DATE COMPLETED
12. OVERBURDEN THICKNESS	15. DEPTH GROUNDWATER ENCOUNTERED
13. DEPTH DRILLED INTO ROCK	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED
14. TOTAL DEPTH OF HOLE	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE REC %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	Field Screening Results d	Geotech Sample or Core Box No. e	Analytical Sample No. f	Blow Counts g	REMARKS h
	0	0-1 ft Gravel					3 ft Recovery
	1	1-4 Silty Sand SM - med Stiff - Soft, Silty, moist, Pink (5YR 8/3) 60% fine sand 40% silt, nonplastic, non coh, massive					
	2						
	3						
	4	Silty Sand As above Selected from 5-6 ft Bgs Soft, Pink (5YR 8/3)					3.5 ft Recovery
	5						

PROJECT | HOLE NO.

HTW DRILLING LOG

HOLE NO. SB-001

PROJECT SS-57

INSPECTOR

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 Counts g	REMARKS h
	5	Mostly fine sand & silt, non plastic, cohesive, massive					
	6						
	7	@ 7 ft BGS Silty Sand as before Soft, silty mst, reddish yellow (5YR 6/6), mostly fine sand & silt, nonplastic, not cohesive, massive					
	8	Silty Sand as above; Saturated @ 9.5 ft BGS					
		Δ loc Collect SS57-SB04-01-10					
	9						
	10						
	11						
	12						
	13						
	14						

PROJECT

HOLE NO.

HTW DRILLING LOG

HOLE NO. SB-5

SHEET 1 OF SHEETS

1. COMPANY NAME: Blue Environmental	2. DRILLING CONTRACTOR: Blue Environmental
3. PROJECT: Holloman Airforce Base	4. LOCATION: officers Club SS-57
5. NAME OF DRILLER: Robert Currence	6. MANUFACTURER'S DESIGNATION OF DRILL: DT-66
7. SIZES & TYPES OF DRILLING & SAMPLING EQUIPMENT: 4Ft Macro Core	8. HOLE LOCATION: North East
	9. SURFACE ELEVATION (ft. NGVD)
	10. DATE STARTED: 2/10/04 — 11. DATE COMPLETED: 2/10/04
12. OVERBURDEN THICKNESS	15. DEPTH GROUNDWATER ENCOUNTERED
13. DEPTH DRILLED INTO ROCK	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED
14. TOTAL DEPTH OF HOLE	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE REC %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	Field Screening Results d	Geotech Sample or Core Box No. e	Analytical Sample No. f	Blow Counts g	REMARKS h
	0	0-1.5ft Gravel					4ft Heavy
		1.5-4					
		Silty Sand SM - Soft to hard stiff,					
	1	Slightly moist to moist, white					
		(5YR 8/1) mostly fine sand w/					
		Some silt, not plastic, non coh,					
		massive @ 3ft silty sand layer					
	2	4" thick dark reddish Brn (5YR 3/3)					
	3						
	4	Silty Sand SM - Soft to hard stiff					4ft Heavy
		Slightly moist to saturated from 2.5-					
		3ft 4in, white (5YR 8/1) to red to					
		(2.5YR 6/6) mostly fine sand some silt					
	5						

PROJECT | HOLE NO.

HTW DRILLING LOG

HOLE NO. SB-5

PROJECT O-Club

INSPECTOR

SHEET 2 OF 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 Counts g	REMARKS h
	5	non plastic, non cohesive, some laminations					
	6						
	7						
	8	As above Saturated @ 10ft [redacted] SS57-SB05-01-10					4ft Recovery.
	9						
	10						
	11						
	12						
	13						
	14						

PROJECT HOLE NO.

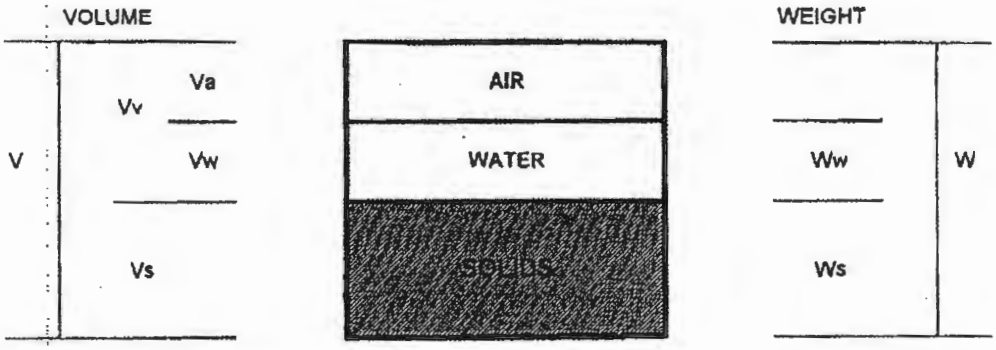
APPENDIX C

GEOTECHNICAL PARAMETERS LABORATORY SHEETS

Geotechnical.pdf

BEAVER ENGINEERING, INC.
7378 COCKRILL BEND BLVD
NASHVILLE, TN 37209
615-350-8124
e-mail: DATA@BEAVERENGINEERING.COM

DETERMINATION OF PHYSICAL PROPERTIES OF SOILS



Va = VOLUMETRIC AIR, Volume of Air
Vw =VOLUMETRIC WATER , Volume of Water
Vs = Volume of Solids
Vv = Volume of voids

W = TOTAL SAMPLE WEIGHT
Ww = Weight of Water
Ws = Weight of Solids

POROSITY = Ratio of volume of voids to the total volume (V) of a given mass, Vv / V

SAMPLE IDENTIFICATION AND TEST RESULTS

DATE	FEBRUARY 25, 2004
PROJECT NUMBER	04-4653
PROJECT	ELAB OF TENNESSEE
LOCATION OF SAMPLE	SS57-GB-0106-4-6
TYPE SAMPLE	SHELBY TUBE
SOIL TYPE AND COLOR DESCRIPTION	SAND, VERY PALE BROWN
LENGTH	12.816 cm
WEIGHT	958.5 grams
MOISTURE	5.3%
SPECIFIC GRAVITY	2.61
VOLUMETRIC AIR	**0.244** cm3 air/cm3 soil
VOLUMETRIC WATER CONTENT	**0.092** cm3 H2o/cm3 soil
TOTAL SOIL POROSITY	**0.336** cm3/cm3 soil
SOIL BULK DRY DENSITY	**108.3** pcf.
	1.73 g soil/cm3 soil

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615-350-8124

CLIENT ELAB OF TENNESSEE

PROJECT ELAB OF TENNESEE PROJ. NO. 04-4653

TEST DESCRIPTION:
MOISTURE, ASH & Organic Matter
ASTM D 2974

LOCATION	SS57-GB-0106-4-0	
DESCRIPTION	SAND, VERY PALE BROWN	
TYPE SAMPLE	SHELBY TUBE	
MOISTURE, AS PERCENT OF AS RECEIVED		5.0%
MOISTURE AS PERCENT OF OVEN DRIED MASS		5.3%
ORGANIC MATTER, ASTM D2974		2.2%
FRACTIONAL ORGANIC CARBON,(ORGANIC MATTER/1.72)		1.3%

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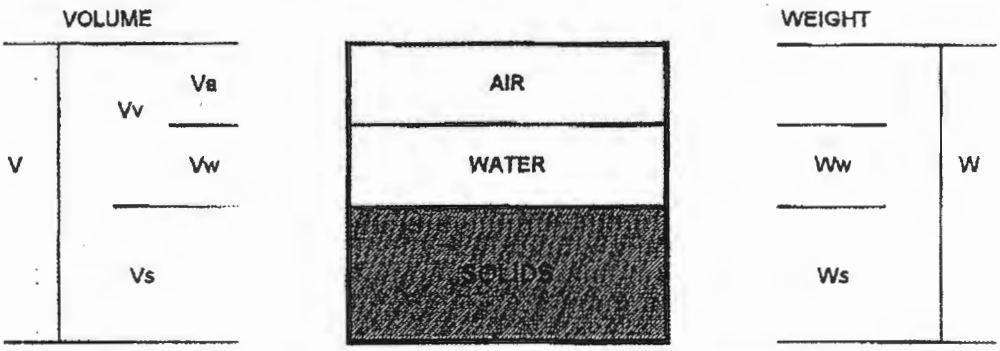
DETERMINATION OF PHYSICAL PROPERTIES OF SOILS



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W = TOTAL SAMPLE WEIGHT
Ww = Weight of Water
Ws = Weight of Soilds

POROSITY = Ratio of volume of voids to the total volume (V) of a given mass, Vv / V

SAMPLE IDENTIFICATION AND TEST RESULTS

DATE	FEBRUARY 25, 2004
PROJECT NUMBER	04-4053
PROJECT	ELAB OF TENNESSEE
LOCATION OF SAMPLE	SS57-SVO1-ST-2-4
TYPE SAMPLE	SHELBY TUBE
SOIL TYPE AND COLOR DESCRIPTION	SAND, VERY PALE BROWN
LENGTH	12.825 cm
WEIGHT	958.9 grams
MOISTURE	18.8%
SPECIFIC GRAVITY	2.67
VOLUMETRIC AIR	**0.138** cm3 air/cm3 soil
VOLUMETRIC WATER CONTENT	**0.288** cm3 H2o/cm3 soil
TOTAL SOIL POROSITY	**0.426** cm3/cm3 soil
SOIL BULK DRY DENSITY	**96.6** pcf.
	1.53 g soil/cm3 soil

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CLIENT ELAB OF TENNESSEE

PROJECT ELAB OF TENNESEE PROJ. NO. 04-4653

TEST DESCRIPTION:
MOISTURE, ASH & Organic Matter
ASTM D 2974

LOCATION	SS57-SV01-ST-2-4	
DESCRIPTION	SAND, VERY PALE BROWN	
TYPE SAMPLE	SHELBY TUBE	
MOISTURE, AS PERCENT OF AS RECEIVED		15.8%
MOISTURE AS PERCENT OF OVEN DRIED MASS		18.8%
ORGANIC MATTER, ASTM D2974		2.7%
FRACTIONAL ORGANIC CARBON,(ORGANIC MATTER/1.72)		1.6%

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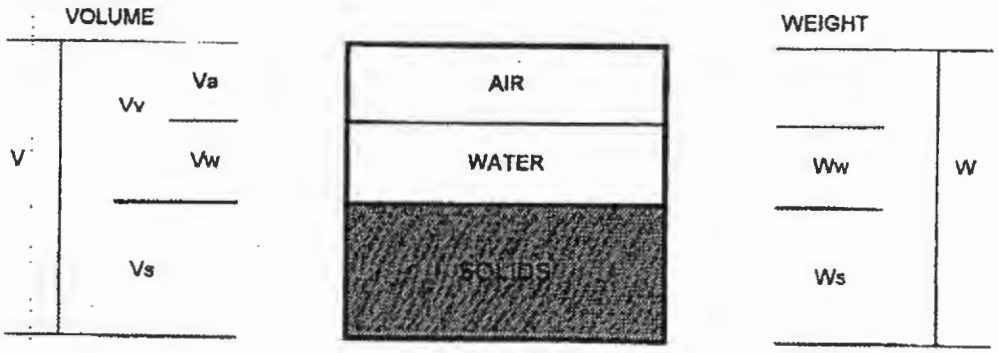
DETERMINATION OF PHYSICAL PROPERTIES OF SOILS



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W = TOTAL SAMPLE WEIGHT
Ww = Weight of Water
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POROSITY = Ratio of volume of voids to the total volume (V) of a given mass, Vv / V

SAMPLE IDENTIFICATION AND TEST RESULTS

DATE	FEBRUARY 25, 2004
PROJECT NUMBER	04-4653
PROJECT	ELAB OF TENNESSEE
LOCATION OF SAMPLE	SS57-SVO1-ST-7-9
TYPE SAMPLE	SHELBY TUBE
SOIL TYPE AND COLOR DESCRIPTION	SAND, LIGHT YELLOWISH BROWN
LENGTH	12.961 cm
WEIGHT	979.7 grams
MOISTURE	15.8%
SPECIFIC GRAVITY	2.63
VOLUMETRIC AIR	0.142 cm3 air/cm3 soil
VOLUMETRIC WATER CONTENT	0.252 cm3 H2o/cm3 soil
TOTAL SOIL POROSITY	0.394 cm3/cm3 soil
SOIL BULK DRY DENSITY	99.5 pcf.
	1.59 g soil/cm3 soil

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CLIENT ELAB OF TENNESSEE

PROJECT ELAB OF TENNESEE PROJ. NO. 04-4653

TEST DESCRIPTION:
MOISTURE, ASH & Organic Matter
ASTM D 2974

LOCATION	3357-SV01-ST-7-9	
DESCRIPTION	SAND, LIGHT YELLOWISH BROWN	
TYPE SAMPLE	SHELBY TUBE	
MOISTURE, AS PERCENT OF AS RECEIVED		13.7%
MOISTURE AS PERCENT OF OVEN DRIED MASS		15.8%
ORGANIC MATTER, ASTM D2974		2.1%
FRACTIONAL ORGANIC CARBON,(ORGANIC MATTER/1.72)		1.2%

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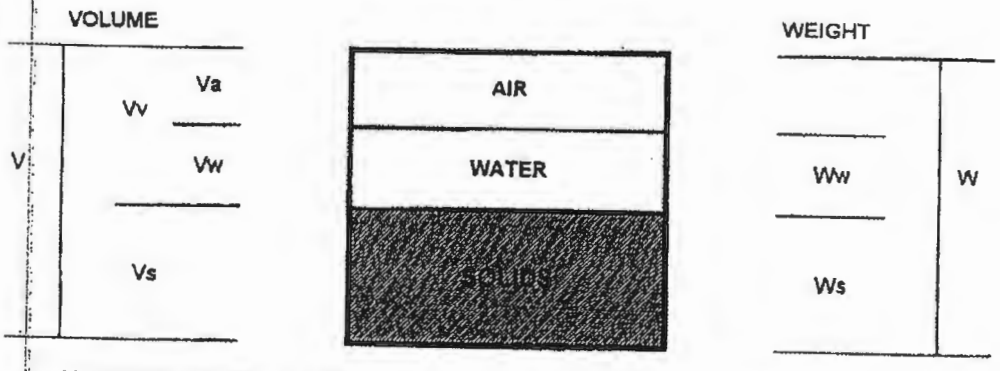
DETERMINATION OF PHYSICAL PROPERTIES OF SOILS



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Ww = Weight of Water
Ws = Weight of Soilds

POROSITY = Ratio of volume of voids to the total volume (V) of a given mass, Vv / V

SAMPLE IDENTIFICATION AND TEST RESULTS

DATE FEBRUARY 25, 2004

PROJECT NUMBER	04-4653
PROJECT	ELAB OF TENNESSEE
LOCATION OF SAMPLE	SS57-SV02-ST-2-4
TYPE SAMPLE	SHELBY TUBE
SOIL TYPE AND COLOR DESCRIPTION	SAND, LIGHT YELLOWISH BROWN
LENGTH	11.808 cm
WEIGHT	883.3 grams
MOISTURE	11.6%
SPECIFIC GRAVITY	2.68
VOLUMETRIC AIR	0.190 cm3 air/cm3 soil
VOLUMETRIC WATER CONTENT	0.192 cm3 H2o/cm3 soil
TOTAL SOIL POROSITY	0.382 cm3/cm3 soil
SOIL BULK DRY DENSITY	103.4 pcf.
	1.66 g soil/cm3 soil

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CLIENT ELAB OF TENNESSEE

PROJECT ELAB OF TENNESEE PROJ. NO. 04-4653

TEST DESCRIPTION:
MOISTURE, ASH & Organic Matter
ASTM D 2974

LOCATION	SS57-SV02-ST-2-4	
DESCRIPTION	SAND, LIGHT YELLOWISH BROWN	
TYPE SAMPLE	SHELBY TUBE	
MOISTURE, AS PERCENT OF AS RECEIVED		10.4%
MOISTURE AS PERCENT OF OVEN DRIED MASS		11.6%
ORGANIC MATTER, ASTM D2974		1.2%
FRACTIONAL ORGANIC CARBON,(ORGANIC MATTER/1.72)		0.7%

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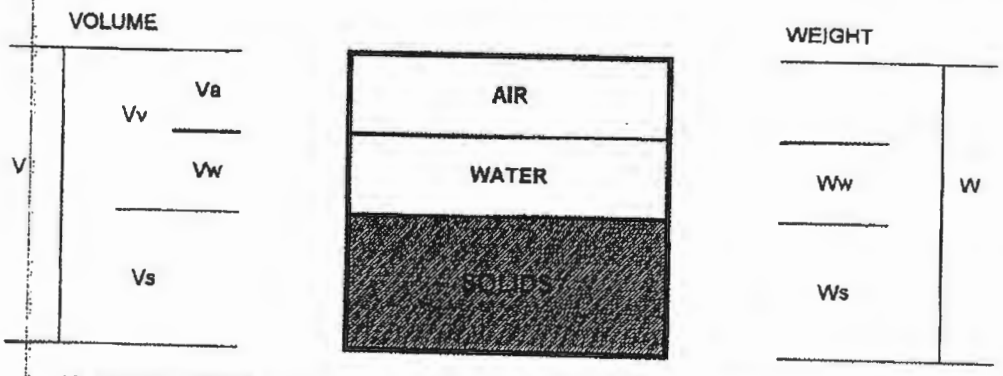
DETERMINATION OF PHYSICAL PROPERTIES OF SOILS



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POROSITY = Ratio of volume of voids to the total volume (V) of a given mass, Vv / V

SAMPLE IDENTIFICATION AND TEST RESULTS

DATE	FEBRUARY 25, 2004
PROJECT NUMBER	04-4653
PROJECT	ELAB OF TENNESSEE
LOCATION OF SAMPLE	SS57-SV02-ST-7-9
TYPE SAMPLE	SHELBY TUBE
SOIL TYPE AND COLOR DESCRIPTION	SAND, LIGHT YELLOWISH BROWN
LENGTH	12.838 cm
WEIGHT	966.9 grams
MOISTURE	16.1%
SPECIFIC GRAVITY	2.64
VOLUMETRIC AIR	0.152 cm3 air/cm3 soil
VOLUMETRIC WATER CONTENT	0.253 cm3 H2o/cm3 soil
TOTAL SOIL POROSITY	0.405 cm3/cm3 soil
SOIL BULK DRY DENSITY	98.1 pcf.
	1.57 g soil/cm3 soil

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PROJECT ELAB OF TENNESEE PROJ. NO. 04-4653

TEST DESCRIPTION:
MOISTURE, ASH & Organic Matter
ASTM D 2974

LOCATION	S357-SV02-ST-7-9	
DESCRIPTION	SAND, LIGHT YELLOWISH BROWN	
TYPE SAMPLE	SHELBY TUBE	
MOISTURE, AS PERCENT OF AS RECEIVED		13.9%
MOISTURE AS PERCENT OF OVEN DRIED MASS		16.1%
ORGANIC MATTER, ASTM D2974		1.1%
FRACTIONAL ORGANIC CARBON,(ORGANIC MATTER/1.72)		0.6%

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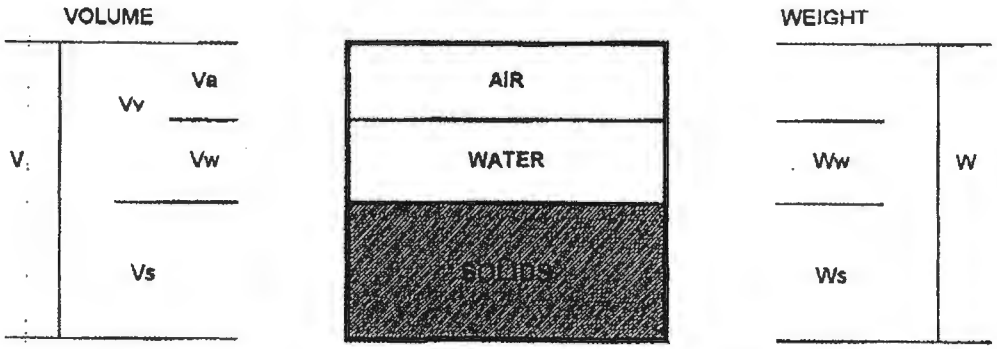

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SAMPLE IDENTIFICATION AND TEST RESULTS

DATE	FEBRUARY 25, 2004
PROJECT NUMBER	04-4653
PROJECT	ELAB OF TENNESSEE
LOCATION OF SAMPLE	SS57-SV03-ST-2-4
TYPE SAMPLE	SHELBY TUBE
SOIL TYPE AND COLOR DESCRIPTION	SAND, VERY PALE BROWN
LENGTH	12.575 cm
WEIGHT	887.4 grams
MOISTURE	17.3%
SPECIFIC GRAVITY	2.62
VOLUMETRIC AIR	**0.183** cm3 air/cm3 soil
VOLUMETRIC WATER CONTENT	**0.255** cm3 H2o/cm3 soil
TOTAL SOIL POROSITY	**0.438** cm3/cm3 soil
SOIL BULK DRY DENSITY	**92.0** pcf.
	1.47 g soil/cm3 soil

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PROJECT ELAB OF TENNESEE PROJ. NO. 04-4653

TEST DESCRIPTION:
MOISTURE, ASH & Organic Matter
ASTM D 2974

LOCATION	SS57-SV03-ST-2-4	
DESCRIPTION	SAND, VERY PALE BROWN	
TYPE SAMPLE	SHELBY TUBE	
MOISTURE, AS PERCENT OF AS RECEIVED		14.8%
MOISTURE AS PERCENT OF OVEN DRIED MASS		17.3%
ORGANIC MATTER, ASTM D2974		1.3%
FRACTIONAL ORGANIC CARBON,(ORGANIC MATTER/1.72)		0.8%

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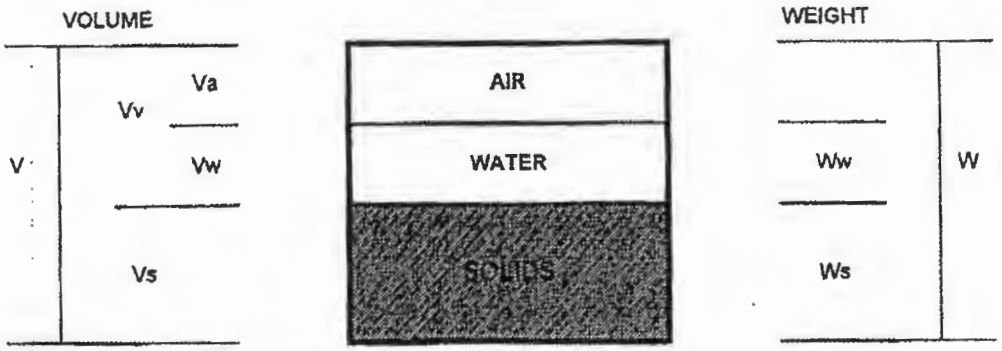

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SAMPLE IDENTIFICATION AND TEST RESULTS

DATE	FEBRUARY 25, 2004
PROJECT NUMBER	04-4653
PROJECT	ELAB OF TENNESSEE
LOCATION OF SAMPLE	SS57-SV03-ST-7-9
TYPE SAMPLE	SHELBY TUBE
SOIL TYPE AND COLOR DESCRIPTION	SAND, STRONG BROWN
LENGTH	16.491 cm
WEIGHT	1253.4 grams
MOISTURE	2.9%
SPECIFIC GRAVITY	2.61
VOLUMETRIC AIR	0.233 cm3 air/cm3 soil
VOLUMETRIC WATER CONTENT	0.054 cm3 H2o/cm3 soil
TOTAL SOIL POROSITY	0.287 cm3/cm3 soil
SOIL BULK DRY DENSITY	116.1 pcf.
	1.86 g soil/cm3 soil

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PROJECT ELAB OF TENNESEE PROJ. NO. 04-4653

TEST DESCRIPTION:
MOISTURE, ASH & Organic Matter
ASTM D 2974

LOCATION	SS57-SV03-ST-7-9	
DESCRIPTION	SAND, STRONG BROWN	
TYPE SAMPLE	SHELBY TUBE	
MOISTURE, AS PERCENT OF AS RECEIVED		2.7%
MOISTURE AS PERCENT OF OVEN DRIED MASS		2.9%
ORGANIC MATTER, ASTM D2974		1.8%
FRACTIONAL ORGANIC CARBON,(ORGANIC MATTER/1.72)		1.1%

APPENDIX D

JOHNSON AND ETTINGER OUTPUT

RESULTS SHEET

RISK-BASED SOIL CONCENTRATION CALCULATIONS:

Indoor exposure soil conc., carcinogen (µg/kg)	Indoor exposure soil conc., noncarcinogen (µg/kg)	Risk-based indoor exposure soil conc., (µg/kg)	Soil saturation conc., C_{sat} (µg/kg)	Final indoor exposure soil conc., (µg/kg)
NA	1.55E+08	1.55E+08	6.95E+05	NOC

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.
MESSAGE: Risk/HQ or risk-based soil concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

END

RESULTS SHEET

RISK-BASED SOIL CONCENTRATION CALCULATIONS:

Indoor exposure soil conc., carcinogen (µg/kg)	Indoor exposure soil conc., noncarcinogen (µg/kg)	Risk-based indoor exposure soil conc., (µg/kg)	Soil saturation conc., C_{sat} (µg/kg)	Final indoor exposure soil conc., (µg/kg)
NA	1.21E+07	1.21E+07	1.27E+08	1.21E+07

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.
MESSAGE: Risk/HQ or risk-based soil concentration is based on a route-to-route extrapolation.

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RESULTS SHEET

RISK-BASED SOIL CONCENTRATION CALCULATIONS:

Indoor exposure soil conc., carcinogen (µg/kg)	Indoor exposure soil conc., noncarcinogen (µg/kg)	Risk-based indoor exposure soil conc., (µg/kg)	Soil saturation conc., C_{sat} (µg/kg)	Final indoor exposure soil conc., (µg/kg)
1.79E+09	NA	1.79E+09	1.85E+04	NOC

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.
MESSAGE: Risk/HQ or risk-based soil concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

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RESULTS SHEET

RISK-BASED SOIL CONCENTRATION CALCULATIONS:

Indoor exposure soil conc., carcinogen (µg/kg)	Indoor exposure soil conc., noncarcinogen (µg/kg)	Risk-based indoor exposure soil conc., (µg/kg)	Soil saturation conc., C_{sat} (µg/kg)	Final indoor exposure soil conc., (µg/kg)
NA	2.11E+05	2.11E+05	8.10E+05	2.11E+05

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

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RESULTS SHEET

RISK-BASED SOIL CONCENTRATION CALCULATIONS:

Indoor exposure soil conc., carcinogen (µg/kg)	Indoor exposure soil conc., noncarcinogen (µg/kg)	Risk-based indoor exposure soil conc., (µg/kg)	Soil saturation conc., C_{sat} (µg/kg)	Final indoor exposure soil conc., (µg/kg)
5.74E+10	NA	5.74E+10	2.51E+04	NOC

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.
MESSAGE: Risk/HQ or risk-based soil concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

END

RESULTS SHEET

RISK-BASED SOIL CONCENTRATION CALCULATIONS:

Indoor exposure soil conc., carcinogen (µg/kg)	Indoor exposure soil conc., noncarcinogen (µg/kg)	Risk-based indoor exposure soil conc., (µg/kg)	Soil saturation conc., C_{sat} (µg/kg)	Final indoor exposure soil conc., (µg/kg)
2.65E+07	1.04E+07	1.04E+07	6.38E+05	6.38E+05

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

END

RESULTS SHEET

RISK-BASED SOIL CONCENTRATION CALCULATIONS:

Indoor exposure soil conc., carcinogen (µg/kg)	Indoor exposure soil conc., noncarcinogen (µg/kg)	Risk-based indoor exposure soil conc., (µg/kg)	Soil saturation conc., C_{sat} (µg/kg)	Final indoor exposure soil conc., (µg/kg)
NA	5.29E+03	5.29E+03	7.50E+04	5.29E+03

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

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RESULTS SHEET

RISK-BASED SOIL CONCENTRATION CALCULATIONS:

Indoor exposure soil conc., carcinogen (µg/kg)	Indoor exposure soil conc., noncarcinogen (µg/kg)	Risk-based indoor exposure soil conc., (µg/kg)	Soil saturation conc., C_{sat} (µg/kg)	Final indoor exposure soil conc., (µg/kg)
NA	7.82E+04	7.82E+04	4.94E+05	7.82E+04

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

END

RESULTS SHEET

RISK-BASED SOIL CONCENTRATION CALCULATIONS:

Indoor exposure soil conc., carcinogen (µg/kg)	Indoor exposure soil conc., noncarcinogen (µg/kg)	Risk-based indoor exposure soil conc., (µg/kg)	Soil saturation conc., C_{sat} (µg/kg)	Final indoor exposure soil conc., (µg/kg)
NA	3.32E+11	3.32E+11	1.42E+06	NOC

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.
MESSAGE: Risk/HQ or risk-based soil concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	2.82E+04	2.82E+04	5.70E+04	2.82E+04

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	2.97E+04	2.97E+04	2.00E+03	NOC

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.
NOC = NOT OF CONCERN. The groundwater conc. at or above the solubility limit is not of concern for this pathway.

SCROLL DOWN TO "END"

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	8.44E+05	8.44E+05	1.34E+05	NOC

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.
NOC = NOT OF CONCERN. The groundwater conc. at or above the solubility limit is not of concern for this pathway.
MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	8.35E+06	8.35E+06	7.90E+04	NOC

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.
NOC = NOT OF CONCERN. The groundwater conc. at or above the solubility limit is not of concern for this pathway.

SCROLL DOWN TO "END"

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	3.04E+08	3.04E+08	2.23E+08	NOC

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.
NOC = NOT OF CONCERN. The groundwater conc. at or above the solubility limit is not of concern for this pathway.

SCROLL DOWN TO "END"

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	9.57E+07	9.57E+07	1.00E+09	9.57E+07

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
1.10E+04	NA	1.10E+04	1.79E+06	1.10E+04

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	3.12E+05	3.12E+05	1.19E+06	3.12E+05

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
4.65E+03	NA	4.65E+03	7.92E+06	4.65E+03

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	1.32E+04	1.32E+04	2.80E+05	1.32E+04

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
7.09E+06	2.79E+06	2.79E+06	1.69E+05	NOC

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.
NOC = NOT OF CONCERN. The groundwater conc. at or above the solubility limit is not of concern for this pathway.

SCROLL DOWN TO "END"

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	9.81E+03	9.81E+03	6.13E+04	9.81E+03

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	6.09E+05	6.09E+05	1.40E+04	NOC

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.
NOC = NOT OF CONCERN. The groundwater conc. at or above the solubility limit is not of concern for this pathway.

SCROLL DOWN TO "END"

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RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	1.14E+05	1.14E+05	1.10E+06	1.14E+05

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

END