



HGL

HydroGeoLogic, Inc

Exceeding Expectations

HAFB 06

Corporate Headquarters

Via Electronic Mail and Federal Express

14 November 2006

Mr. John E. Kieling
Manager, Permits Management Program
State of New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303



RE: Response to NMED Comments
Final 2005 Long-Term Groundwater Monitoring Report
Holloman Air Force Base, New Mexico, May 2006
EPA ID# NM6572124422

Dear Mr. Kieling:

Per the direction of and on behalf of Holloman Air Force Base, HGL is pleased to provide you with this response to the New Mexico Environment Department comments on the *Final 2005 Long-Term Groundwater Monitoring Report* dated 04 October 2006. A copy of the comment letter is included as Attachment A. NMED provided Solid Waste Management (SWMU)-specific comments for each of the SWMUs discussed in the LTM report. NMED concurred with the recommendations offered in the report for nine of the LTM sites, as reflected in NMED comments 1 (LF-01 - SWMU 106), 2 (SS-02 and SS-05 - AOC-T), 3 (SD-08 - SWMUs 4 and 82), 5 (SS-17 - AOC Q), 6 (LF-21 - SWMU 116), 7 (LF-29 - SWMU 104), 8 (DP-30 and SD-33 - SWMU 113B), 9 (SS-39 - SWMUs 165, 177, 179, and 181) and 10 (SS-46). NMED did not concur with the recommendations provided in the report for sites OT-16 (SWMUs 118 and 132 and AOC-A) and SS-48 (AOC N), and requested additional information for these sites in comments 4 and 11, respectively. These NMED comments and associated responses are provided below.

4.) OT-16 - Former Entomology Shop Area (SWMUs 118 and 132 and AOC-A)

The LTM Report recommended the following: *"The 2005 LTM Program concluded the fifth sampling event for site OT-16, satisfying the commitment to 10 years of LTM. It is therefore recommended that LTM cease. Although three VOCs and two pesticides were detected, all three were below the NMGWQ Standards. Furthermore, these compounds were present in the upgradient monitoring well. Therefore, OT-16 is also recommended for no further action. A report summarizing the RFIs and LTM program for this site will be submitted to NMED to further support the NFA recommendation."*

The NMED does not concur with this recommendation. Gamma-BHC (Lindane) was detected in monitoring well 118-MW1601 at a concentration of 0.2 µg/L. This concentration equals the US Environmental Protection Agency's maximum contaminant level (EPA MCL) as per the National Primary Drinking Water Standards and, therefore, equals the standard set by the facility's permit. It should be noted that Lindane has not been detected in this well since LTM sampling began in September 1997. NMED acknowledges that this well is presently hydrologically upgradient of the source area. However, due to the close well spacing and the very low flow gradient, seasonal groundwater fluctuations could account for this well's groundwater being impacted by the source area. It should also be noted that total dissolved solids (TDS) concentrations in all wells at this site are below 10,000 mg/L.

Therefore, the Permittee is required to sample groundwater from all wells at this site for pesticides and TDS on a quarterly basis for eight consecutive quarters. The Permittee is required to submit a letter work plan confirming the scheduling of this sampling activity, including the methodologies to be used. This work plan shall be submitted within 30 days of the date of this letter. A decision on whether NFA status for this site is warranted will be made after the required quarterly sampling.

Response: The OT-16 Long-Term Monitoring Work Plan addressing field activities associated with two additional years of quarterly groundwater monitoring is provided as Attachment B.

11.) SS-48 – Military Gas Station (AOC-N)

The LTM Report recommended the following: *"The 2005 LTM Program concluded the sixth sampling event for site SS-48 and over 10 years of LTM. Therefore, it is recommended that LTM cease. Although benzene was detected above NMGWQ Standards in one monitoring well (S55-MW05), SS-48 is recommended for NFA. The TDS concentrations in four of the six wells were above 10,000 mg/L. It is hypothesized that the two wells with TDS concentrations below 10,000 mg/L are artificially low due to the dilution of natural groundwater from leaking water lines and surface irrigation from the domestic water supply. In conclusion, the NMGWQ Standard for TDS does not apply because SS-48 groundwater in its natural state would have TDS concentrations greater than 10,000 mg/L. Therefore, the groundwater is not a potential domestic or agricultural water supply."*

The NMED does not concur with the recommendation that LTM cease and the site be considered for NFA status. Nor does the NMED agree with the conclusion that TDS concentrations in groundwater above 10,000 mg/L necessarily negate application of NM Water Quality Control Commission (NMWQCC) groundwater standards. Evaluation of potential risks from exposure pathways (e.g., vapor inhalation or construction worker exposure) will be deemed necessary for contaminants above NMWQCC Standards, regardless of TDS concentrations. The NMED also does not agree that the NMWQCC Standards do not apply to groundwater with TDS concentrations below 10,000 mg/L where this condition appears *"artificially low due to dilution of natural groundwater"*. If TDS concentrations are below 10,000 mg/L, the NMWQCC Standards will apply, regardless of hypothetical reasons for the lower concentrations.

The Benzene concentration in well S55-MW5 during this LTM event was 83 $\mu\text{g/L}$. The NMWQCC Standard is 10 $\mu\text{g/L}$. Benzene concentrations in this well have been above the NMWQCC Standard since September 1999. The TDS concentrations in this well during the 2005 LTM event were above 10,000 mg/L. In addition, the concentration of Methyl tertbutyl ether (MTBE) in well S55-MW5 was 419 $\mu\text{g/L}$ and the MTBE concentration in well S55-MW7 was 161 $\mu\text{g/L}$. Although there are no NMGWQCC Standards or EPA MCLs for MTBE in groundwater, the calculated standard as specified in the facility permit is 131 $\mu\text{g/L}$ and the NM Environmental Improvement Board Standard for groundwater remediation is 100 $\mu\text{g/L}$ (reference 20.5.12.1233 (a)(2) NMAC). These concentrations are exceeded in both wells. The TDS concentrations in these wells during the 2005 LTM event were above 10,000 mg/L. Therefore, the Permittee is required to conduct a risk assessment for volatile organic compounds, particularly Benzene and MTBE, evaluating the vapor inhalation and construction worker exposure pathways in the vicinity of this site. The Permittee is required to submit a letter work plan confirming the scheduling of this evaluation, including methodologies to be used. This work plan shall be submitted within 30 days of the date of this letter. A decision on whether NFA status or further LTM for this site is warranted will be made after the required risk assessment.

Response: NMED has requested that a work plan to perform a risk assessment be conducted evaluating the vapor inhalation and construction worker exposure pathways for volatile organic compounds (particularly benzene and MTBE) at the site. New Mexico has established Tier 1 risk-based screening levels for these receptors and pathways in the New Mexico Risk Based Decision Making (NMRBDM) process set forth in the *New Mexico Underground Storage Tank Bureau Guidelines for Corrective Action, March 13, 2000*. The Guidelines in Section 4.1 state that the NMED has determined that a risk-based decision making (RBDM) program is appropriate for managing petroleum releases at underground storage tank (UST) sites, which is also consistent with the NMED's overall objective of protecting public health, safety and welfare, and the environment. The process was developed and is administered by the department's Underground Storage Tank Bureau (the bureau), but conceptually, could apply to all contaminated sites.

The Tier 1 screening levels are criteria developed using default exposure assumptions presented in the Guidelines. The NMRBDM process directs that contaminant concentrations in applicable media for appropriate receptors be compared to these screening levels. If these levels are exceeded, remediation or proceeding to a site-specific Tier 2 risk evaluation would be the next course of action. NMED may approve NFA status if the site satisfies the requirements of 20 NMAC 5.12.1227. These requirements include but are not limited to:

- Representative concentrations for each medium meet the criteria established in accordance with 20 NMAC 5.12 and the maximum concentration in each medium does not exceed the representative concentration by a factor of 10,
- No nuisance conditions exist at the site,
- NAPL and contaminant saturated soil have been removed or remediated,

- The bureau agrees with the overall tier 1 evaluation, and
- The overall size of the plume is shrinking as determined based on concentration trends observed in the monitoring wells.

In light of this, we compared contaminant concentrations in the groundwater to the Tier 1 RBSLs to determine whether further evaluation using a Tier 2 risk assessment is warranted. In accordance with the Guidelines, the groundwater data were initially screened against U.S. Environmental Protection Agency (USEPA) Maximum Contaminant Levels (MCLs) and New Mexico Groundwater Quality (NMGWQ) standards. With respect to methyl tertiary butyl ether (MTBE), the New Mexico Environmental Improvement Board Standard of 100 $\mu\text{g/L}$ was utilized for screening purposes. The only compounds detected at concentrations exceeding the initial screening criteria include benzene, ethylbenzene, MTBE, and trichloroethene (TCE). As presented in the Final 2005 Long-Term Groundwater Monitoring Report (Bhate, 2006), TCE was detected at the highest concentrations up and cross-gradient of the site and is not site-related. Thus, benzene, ethylbenzene, and MTBE concentrations were evaluated with respect to the RBSLs.

Although the site and surrounding area are defined as commercial in accordance with Section 4.3.1 of the corrective action guidance document, benzene, ethylbenzene, and MTBE were compared to both residential and commercial groundwater indoor inhalation RBSLs, provided in Tables 4-17 and 4-18 of the guidance document, respectively. In addition, the concentrations of the three VOCs was also compared to the construction worker groundwater outdoor inhalation RBSLs located in Table 4-19 of the corrective action guidance document (NM USTB, 2000). This comparison is provided on Table 1, included as Attachment C to this Comment Response Letter. Table 1 summarizes the groundwater analytical data obtained from 10 years of biennial groundwater sampling at site SS-48 for these three compounds, as presented in the Final 2005 Long-Term Groundwater Monitoring Report (Bhate, 2006). Based on direct comparison, none of the three contaminants have historically or currently been detected at concentrations exceeding these RBSLs, as described in the following paragraphs.

Benzene. The historic maximum concentration of benzene (560 $\mu\text{g/L}$ at S55-MW5 in 2001) is nearly half of the residential groundwater inhalation RBSL (957 $\mu\text{g/L}$), over 10 times lower than the commercial groundwater inhalation RBSL (5,920 $\mu\text{g/L}$), and over 50 times lower than the construction worker outdoor groundwater inhalation value (33,300 $\mu\text{g/L}$). Benzene concentrations have declined, currently ranging from non-detect to 83 $\mu\text{g/L}$.

Ethylbenzene. Ethylbenzene has historically been detected only once above the MCL, in monitoring well S55-MW5 in September 1999. This historic maximum concentration (870 $\mu\text{g/L}$) is orders of magnitude lower than the residential groundwater indoor inhalation RBSL (200,000 $\mu\text{g/L}$), commercial groundwater indoor inhalation RBSL (1,500,000 $\mu\text{g/L}$), and construction worker groundwater outdoor inhalation RBSL (4,770,000 $\mu\text{g/L}$). Since that time, ethylbenzene concentrations have declined, and range from non-detect to 6.8 $\mu\text{g/L}$.

MTBE. The highest MTBE concentration detected during the December 2005 sampling event, 419 $\mu\text{g/L}$ in S55-MW5, is several thousand times lower than the residential groundwater indoor inhalation RBSL (2,340,000 $\mu\text{g/L}$), the commercial groundwater indoor inhalation RBSL (25,400,000 $\mu\text{g/L}$), and construction worker groundwater outdoor inhalation RBSL (81,100,000 $\mu\text{g/L}$). MTBE has been detected at concentrations of 419 $\mu\text{g/L}$ or lower throughout the monitoring program.

In summary, all concentrations are several orders of magnitude below Tier 1 RBSLs. The site also satisfies the other criteria described above, namely no nuisance conditions exist at the site, there are no NAPL and contaminant saturated soils present (based on the RFI soil data - provided on Table 2 in Attachment C -, and low groundwater contaminant levels), and BTEX concentrations have decreased. The TDS of groundwater containing contaminants above standards is greater than 10,000 mg/L. It is important to note that the facility is active, and that sporadic MTBE detections may be associated with current operations, and not any former release, since MTBE addition at high concentrations only began in 1992 to fulfill the oxygenate requirements set by Congress in the 1990 Clean Air Act Amendments.

Based on this evaluation and the satisfaction of these criteria, we request that NMED consider cessation of LTM and NFA for the site under NMED Criterion 5.



Kenneth J. Cottrell, C.P.G., P.G.
Senior Project Manager

Attachments

CC: George Fish, Holloman AFB
Lora Fly, ACC
Dave Griffin, Holloman AFB
Debbie Hartell, Holloman AFB
Rene Hefner, AFCEE
Stan Scott, ACC
Dave Strasser, NMED

ATTACHMENT A

**NMED 04 OCTOBER 2006 COMMENT LETTER
ON
FINAL 2005 LONG-TERM GROUNDWATER MONITORING REPORT**



BILL RICHARDSON
GOVERNOR

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RON CURRY
SECRETARY

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

October 4, 2006

Ms. Debbie Hartell
Chief
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Holloman AFB, NM 88330-8458

**SUBJECT: FINAL 2005 LONG-TERM GROUNDWATER MONITORING REPORT
HOLLOMAN AIR FORCE BASE, NEW MEXICO, MAY 2006
EPA ID# NM6572124422
HWB-HAFB-06-003**

Dear Ms. Hartell:

The New Mexico Environment Department (NMED) has reviewed Holloman Air Force Base's (the Permittee's) "Final 2005 Long-Term Groundwater Monitoring Report" (LTM Report) and has the following Solid Waste Management Unit (SWMU)-specific comments.

1. **LF-01 – Main Base Landfill (SWMU 106)**

The LTM Report recommended the following: *"The presence of benzene and manganese above the NM Groundwater Quality (NMGWQ) Standards in one monitoring well (S1-MW3) has triggered additional characterization associated with Site SS-02 and SS-05 to delineate the nature and extent. In accordance with the Class III Permit Modification for No Further Action (NFA) Status for seven Solid Waste Management Units at HAFB granted by the NMED on November 29, 2005, no additional characterization or monitoring is required at LF-01."*

The NMED concurs with this recommendation. Therefore no long term monitoring (LTM) is required at this site at this time. Contamination in monitoring well S1-MW3 shall subsequently

be addressed by further investigation activities proposed by the Permittee at the adjoining site SS-02/SS-05.

2. **SS-02 and SS-05 – POL Spill Sites 1 and 2 (AOC-T)**

The LTM Report recommended the following: *“A Voluntary Corrective Measures (VCM) Report summarizing soil remediation, additional groundwater characterization, and risk evaluation will be submitted to NMED in support of a NFA recommendation.”*

The NMED concurs with this recommendation.

3. **SD-08 – Refuse Collection Truck Washrack (SWMUs 4 and 82)**

The LTM Report recommended the following: *“Manganese in wells MW-08-04 and MW-08-05 was the only contaminant detected above the NMGWQ Standard at SD-08 during the 2005 event. 1,2-Dichloroethane was detected in groundwater at MW-08-01 (73 µg/L) during the 2003 LTM event at a concentration greater than the NMGWQ Standard. This result was not confirmed during the 2005 event as the well was dry. SD-08 is recommended for closeout pending results of additional characterization to be performed in 2006.”*

The NMED concurs with this recommendation.

4. **OT-16 – Former Entomology Shop Area (SWMUs 118 and 132 and AOC-A)**

The LTM Report recommended the following: *“The 2005 LTM Program concluded the fifth sampling event for site OT-16, satisfying the commitment to 10 years of LTM. It is therefore recommended that LTM cease. Although three VOCs and two pesticides were detected, all three were below the NMGWQ Standards. Furthermore, these compounds were present in the upgradient monitoring well. Therefore, OT-16 is also recommended for no further action. A report summarizing the RFIs and LTM program for this site will be submitted to NMED to further support the NFA recommendation.”*

The NMED does not concur with this recommendation. Gamma-BHC (Lindane) was detected in monitoring well 118-MW1601 at a concentration of 0.2 µg/L. This concentration equals the US Environmental Protection Agency's maximum contaminant level (EPA MCL) as per the National Primary Drinking Water Standards and, therefore, equals the standard set by the facility's permit. It should be noted that Lindane has not been detected in this well since LTM sampling began in September 1997. NMED acknowledges that this well is presently hydrologically upgradient of the source area. However, due to the close well spacing and the very low flow gradient, seasonal groundwater fluctuations could account for this well's groundwater being impacted by the source area. It should also be noted that total dissolved solids (TDS) concentrations in all wells at this site are below 10,000 mg/L.

Therefore, the Permittee is required to sample groundwater from all wells at this site for pesticides and TDS on a quarterly basis for eight consecutive quarters. The Permittee is required to submit a letter work plan confirming the scheduling of this sampling activity, including the methodologies to be used. This work plan shall be submitted within 30 days of the date of this letter. A decision on whether NFA status for this site is warranted will be made after the required quarterly sampling.

5. SS-17 – BX Service Station (AOC-Q)

The LTM Report recommended the following: *“Contaminated soil removal is underway and will be completed in 2008. Upon conclusion of this removal, a Voluntary Corrective Measures Report summarizing soil remediation, nature and extent of groundwater conditions, and risk evaluation will be submitted to NMED to support further decisions with regard to this site.”*

The NMED concurs with this recommendation.

6. LF-21 – West Area Landfill No. 2 (SWMU 116)

The LTM Report recommended the following: *“The 2005 LTM Program concluded its sixth sampling event for LF-21, representing over 10 years of LTM, satisfying the Decision Document commitment. Manganese detected in well MW-21-02 was the only contaminant detected above the NMGWQ Standards at LF-21 during the 2005 event. It is recommended that LTM cease. Supplemental characterization work is being performed this year in accordance with the July 2005 HydroGeoLogic RFI work plan, as amended in response to NMED comments, to support future decisions with regard to LF-21.”*

The NMED concurs with this recommendation.

7. LF-29 – Former Army Landfill (SWMU 104)

The LTM Report recommended the following: *“This round completes 10 years of LTM at LF-29 and it is recommended that LTM cease. Additional characterization work to support future decisions with regard to LF-29 is being performed this year in accordance with the July 2005 HydroGeoLogic RFI work plan, as amended in response to NMED comments.”*

The NMED concurs with this recommendation.

8. DP-30 and SD-33 – Grease Trap Disposal Pits (SWMU 113B)

The LTM Report recommended the following: *“Supplemental characterization work is being performed this year in accordance with the July 2005 HydroGeoLogic RFI work plan, as amended in response to NMED comments. This characterization includes continued groundwater sampling on a semi-annual basis for VOCs, metals and TDS.”*

The NMED concurs with this recommendation.

9. **SS-39 – Missile Fuel Spill Area (SWMUs 165, 177, 179 and 181)**

The LTM Report recommended the following: *“Supplemental characterization work is being performed this year in accordance with the July 2005 HydroGeoLogic RFI work plan, as amended in response to NMED comments. This characterization includes continued groundwater sampling on a semi-annual basis for VOCs, RCRA metals, perchlorate and TDS.”*

The NMED concurs with this recommendation.

10. **SS-46 – JP-4 Spill Site (SWMU 130)**

The LTM Report recommended the following: *“The 2005 LTM Program concluded the fifth sampling event for site SS-46 and 10 years of monitoring. It is recommended that LTM cease. Furthermore, VOCs were not detected above the CRDLs and SS-46 is recommended for No Further Action under NMED Criterion 5.”*

The NMED concurs with this recommendation.

11. **SS-48 – Military Gas Station (AOC-N)**

The LTM Report recommended the following: *“The 2005 LTM Program concluded the sixth sampling event for site SS-48 and over 10 years of LTM. Therefore, it is recommended that LTM cease. Although benzene was detected above the NMGWQ Standards in one monitoring well (S55-MW5), SS-48 is recommended for NFA. The TDS concentrations in four of the six wells were above 10,000 mg/L. It is hypothesized that the two wells with TDS concentrations below 10,000 mg/L are artificially low due to the dilution of natural groundwater from leaking water lines and surface irrigation from the domestic water supply. In conclusion, the NMGWQ Standard for TDS does not apply because SS-48 groundwater in its natural state would have TDS concentrations greater than 10,000 mg/L. Therefore, the groundwater is not a potential domestic or agricultural water supply.”*

The NMED does not concur with the recommendation that LTM cease and the site be considered for NFA status. Nor does the NMED agree with the conclusion that TDS concentrations in groundwater above 10,000 mg/L necessarily negate application of NM Water Quality Control Commission (NMWQCC) groundwater standards. Evaluation of potential risks from exposure pathways (e.g. vapor inhalation or construction worker exposure) will be deemed necessary for contaminants above NMWQCC Standards, regardless of TDS concentrations. The NMED also does not agree that the NMWQCC Standards do not apply to groundwater with TDS concentrations below 10,000 mg/L where this condition appears *“artificially low due to dilution*

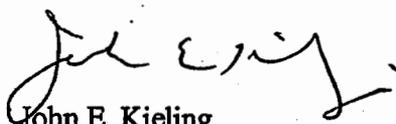
Ms. Debbie Hartell
October 4, 2006
Page 5

of natural groundwater". If TDS concentrations are below 10,000 mg/L, the NMWQCC Standards will apply, regardless of hypothetical reasons for the lower concentrations.

The Benzene concentration in well S55-MW5 during this LTM event was 83 µg/L. The NMWQCC Standard is 10 µg/L. Benzene concentrations in this well have been above the NMWQCC Standard since September 1999. The TDS concentrations in this well during the 2005 LTM event were above 10,000 mg/L. In addition, the concentration of Methyl tertbutyl ether (MTBE) in well S55-MW5 was 419 µg/L and the MTBE concentration in well S55-MW7 was 161 µg/L. Although there are no NMWQCC Standards or EPA MCLs for MTBE in groundwater, the calculated standard as specified in the facility permit is 131 µg/L and the NM Environmental Improvement Board Standard for groundwater remediation is 100 µg/L (reference 20.5.12.1233 (a)(2) NMAC). These concentrations are exceeded in both wells. The TDS concentrations in these wells during the 2005 LTM event were above 10,000 mg/L. Therefore, the Permittee is required to conduct a risk assessment for volatile organic compounds, particularly Benzene and MTBE, evaluating the vapor inhalation and construction worker exposure pathways in the vicinity of this site. The Permittee is required to submit a letter work plan confirming the scheduling of this evaluation, including methodologies to be used. This work plan shall be submitted within 30 days of the date of this letter. A decision on whether NFA status or further LTM for this site is warranted will be made after the required risk assessment.

If you have any questions regarding this matter, please contact David Strasser of my staff at (505) 222-9526 or at the above address.

Sincerely,



John E. Kieling
Manager
Permits Management Program

JEK:dcs

Ms. Debbie Hartell

October 4, 2006

Page 6

cc: J. Bearzi, NMED, HWB
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C. Amindyas, NMED, HWB
D. Strasser, NMED, HWB
D. Tellez, EPA, Region 6 (6PD-F)
D. Griffin, HAFB

File: HAFB, 2006 and Reading
HWB-HAFB-06-003 (2005 LTM Report)
HWB-HAFB-05-003 (SD-08 RFI WP)
HWB-HAFB-05-004 (SS-02/SS-05 RFI WP)
HWB-HAFB-05-006 (LF-21, LF-29, DP-30/SD-33 and SS-39 RFI WP)

ATTACHMENT B

**OT-16 (SWMU 118 AND 132 AND AOC-A)
LONG TERM MONITORING WORK PLAN**

**OT-16 (SWMUS 118 AND 132 AND AOC 32)
LONG TERM MONITORING
WORK PLAN**

**HOLLOMAN AIR FORCE BASE
ALAMOGORDO, NEW MEXICO**



**Air Force Center for Environmental Excellence
Brooks City-Base, Texas**

November 2006

**OT-16 (SWMUS 118 AND 132 AND AOC 32)
LONG TERM MONITORING
WORK PLAN**

**HOLLOMAN AIR FORCE BASE
ALAMOGORDO, NEW MEXICO**

Prepared for

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Contract No. F41624-03-D-8602
Task Order No. 037

November 2006

REPORT DOCUMENTATION PAGE			Form Approved
Public reporting for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1024, Arlington, VA 22202 1302, and to the Office of Management and Budget, Paperwork Reduction Project (0704 0188), Washington, DC 20503.			
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6. AUTHOR(S) HydroGeoLogic, Inc.			
7. PERFORMANCE ORGANIZATION NAME(S) AND ADDRESS(S) HydroGeoLogic, Inc. 1155 Herndon Parkway, Suite 900 Herndon, Virginia 20170-5545		8. PERFORMANCE ORGANIZATION REPORT NUMBER	
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OT-16 (SWMUS 118 AND 132 AND AOC 32) LONG TERM MONITORING WORK PLAN

1.0 INTRODUCTION

Based upon a review of historic groundwater data, the New Mexico Environment Department (NMED) requires two years of quarterly groundwater long term monitoring (LTM) to be conducted at the Holloman Air Force Base (AFB) Environmental Restoration Program (ERP) site OT-16 (SWMUs 118 and 132 and AOC 32) prior to considering cessation of LTM and potential no further action (NFA) status under NMED Criterion 5. The two year quarterly groundwater LTM requirement was based on the gamma-BHC (lindane) concentration in well 118-MW1601 equaling the U.S. Environmental Protection Agency (USEPA) Maximum Contaminant Level (MCL) of 0.2 micrograms per liter during the 2005 LTM event.

This work plan (WP) describes the quarterly LTM field activities and field methodologies that will be employed at ERP site OT-16 to satisfy NMED requirements. The WP was generated at the request of the Air Force Center of Environmental Excellence (AFCEE) under Contract Number F41624-03-D-8602, Task Order 037 to support the Holloman Air Force Base (AFB) ERP.

2.0 SITE BACKGROUND

2.1 LOCATION

Building 21 (OT-16) was located in the Civil Engineering Complex located in the southwestern portion of Holloman AFB and was approximately one-half acre in size. OT-16 encompasses former Building 21, a former transformer pad (Area of Concern [AOC] A), a former truck washrack (solid waste management unit [SWMU] 79), a former pesticide plastic holding tank (SWMU 118) located within a flush-to grade concrete secondary containment structure, and a former disposal pit (SWMU 132). All onsite structures and features were demolished and removed in the mid-1990s. The site is currently used as a vacant lot. Four monitoring wells (118-MW01 through 118-MW04) are currently present onsite.

The locations of Holloman AFB in relation to Alamogordo and OT-16 in relation to Holloman AFB are presented in the *Final Work Plan for the 2003 Long-Term Groundwater Monitoring Program, Holloman Air Force Base, New Mexico 2003* (Bhate Environmental Associates, Inc. [Bhate], 2003) as Figures 1-1 and 1-2, respectively. A site layout map of OT-16 identifying the former location of Building 21 and the four

onsite monitoring wells (118-MW1601 through 118-MW1604) is included in the Bhat 2003 Work Plan as Figure 3-5.

2.2 WASTE HISTORY

Prior to its conversion into an entomology shop in 1977, Building 21 was a power plant that contained six diesel generators and several transformers for power generation. No information regarding the startup of the former power plant, power plant waste handling practices, and equipment maintenance requirements were obtained during the various record searches conducted at OT-16.

After its conversion into an entomology shop, Building 21 was utilized as the Base herbicide and pesticide bulk storage facility. The weighing and mixing of the chemicals prior to application was also accomplished within this shop. Entomology operations varied seasonally. During the summertime there was a significant increase in the quantities of herbicides and other pesticides utilized to combat the increased growth rate of weeds and to reduce mosquito populations.

From 1977 to 1980, rinse water produced from washing pesticide mixing equipment was discharged to a septic tank drain field (i.e., SWMU 132) located on the northwest side of the building (CH2M Hill, 1983). After 1980, the rinse water along with unused pesticide quantities from small quantity containers was collected within a 120-gallon plastic above-ground holding tank. The holding tank was located on the southwestern exterior wall of Building 21 within a secondary concrete containment structure (i.e., SWMU 118). The contained fluids were either used on base or discharge via a tanker truck to the base sanitary lagoons (CH2M Hill 1983). In 1991, the tank was discovered to be leaking and was removed. A new tank was installed and subsequently removed in August 1992 (Radian, 1993). Entomology shop activities ceased in 1992 and the site is currently being used as a gravel and concrete-paved vehicle parking lot.

2.3 ENVIRONMENTAL SETTING

2.3.1 Topography and Surface Water

The topography of the OT-16 area is flat. No surface water drainages cross or bound the site. Dillard Draw is the closest surface water drainage feature and is located approximately 2,250 feet east of OT-16.

2.3.2 Geology

The lithology beneath OT-16 consists primarily of silty to clayey sand. The stratigraphy is typical of the alluvial, eolian, and playa deposits of the Tularosa Basin (Radian 1992). No evidence of fill material was encountered within the footprint of the former drainage pit/boring located along the northwest wall of Building 21 (Radian, 1993).

2.3.3 Hydrogeology

Groundwater occurs in a shallow unconfined aquifer beneath Building 21 approximately 4 to 5 feet bgs. Based on groundwater level measurements, groundwater beneath OT-16 generally flows to the south-southeast at a rate of 6 to 57 feet per year (Radian 1992). A groundwater potentiometric surface map of the 2005 groundwater data is included as Figure 6-2 in the 2005 LTM report (Bhate, 2006). Based on the 1992 groundwater data a hydraulic gradient of approximately 3.62×10^{-3} was calculated. Total Dissolved Solids (TDS) concentrations at this site are typically below 10,000 mg/L.

3.0 SAMPLING PROTOCOL FOR GROUNDWATER LONG TERM MONITORING

This section describes the protocol that will be followed to sample groundwater at OT-16 for the following eight LTM quarters. All sampling activities will be conducted in the same manner as previously presented in Bhate's 2003 Final Work Plan to promote consistency of results.

3.1 EQUIPMENT CALIBRATION

All field equipment requiring calibration will be calibrated in accordance with an equipment calibration program and in accordance with recognized procedures provided by the manufactures, the American Society for Testing and Materials, the United States Environmental Protection Agency, and/or the National Institute of Standards and Technology. The calibration program elements and calibration procedures are presented within the 2003 Work Plan (Bhate, 2003) as well as within the NMED-approved standard operating procedure (SOP) A-4 (Calibration Procedures for Field Equipment) included in Appendix A of the Work Plan.

3.2 WATER LEVEL MEASUREMENTS

Water level will be measured in all four site monitoring wells (118-MW1601 through 118-MW1604) prior to pre-sample purging activities. Water level measurements will be collected using an electronic water level indicator and will be measured to the nearest 0.01 foot from the top of casing (TOC) of each well. Light non-aqueous phase liquids have never been detected beneath the site and are not expected. In the event LNAPL is suspected, the presence of LNAPL will be confirmed with an interface probe and documented. If LNAPL is confirmed in a well, a groundwater sample will not be collected from that well. A detailed procedure for performing water level measurements is included is SOP A-3 (Groundwater Sampling from Monitoring Wells for Chemical Analysis), located in Appendix A of the 2003 Work Plan (Bhate, 2003).

3.3 WELL PURGING (PRE-SAMPLE WELL PURGING)

Each onsite monitoring well, excluding any well with confirmed LNAPL, will be purged prior to sampling using a polyvinyl chloride (PVC) bailer. All purging activities will be conducted in accordance with the procedures presented within the 2003 LTM Work Plan (Bhate, 2003) and as described within SOP A-3 (Groundwater Sampling from Monitoring Wells for Chemical Analysis), located in Appendix A of the 2003 Work Plan (Bhate, 2003).

3.4 GROUNDWATER SAMPLE COLLECTION

Groundwater samples will be collected from each well after purging using a dedicated disposable Teflon[®] bailer. The sampling methodology is described within SOP A-3 (Groundwater Sampling from Monitoring Wells for Chemical Analysis), located in Appendix A of the 2003 Work Plan (Bhate, 2003).

Based on groundwater analytical results obtained from the various biennial groundwater monitoring events, the 2005 NMED approved pesticide target analyte list included only alpha-BHC, gamma-BHC, and dieldrin. Of the three compounds, only gamma-BHC (lindane) has been detected above screening criteria in any of the site monitoring wells. Consequently, groundwater samples collected during the eight quarterly monitoring events for all onsite monitoring wells will be sampled and analyzed for gamma-BHC (lindane). In addition, the collected groundwater samples will also be analyzed for TDS. During sample collection, the gamma-BHC (lindane) sample will be collected before the TDS sample.

3.5 SAMPLE HANDLING, SAMPLE NUMBERING SYSTEM, AND DOCUMENTATION

Proper sample handling and documentation is necessary to ensure the quality of analytical data collected during this program. Documentation includes the use of field logbooks, instrument calibration logs, sample collection forms, chain-of-custody forms, sample labels, well gauging forms, and well purging records. Sample documentation and handling procedures are described in detail in Section 2.5 and 2.8 of the Work Plan (Bhate, 2003) and SOP A-1 (Documentation, Sample Handling, Chain-of-Custody (C-O-C), and Shipping) and SOP A-3 (Groundwater Sampling from monitoring Wells for Chemical analysis) located in Appendix A of the 2003 Work Plan (Bhate, 2003).

All samples and associated quality control (QC)/quality assurance (QA) samples will be numbered in accordance with the procedures outlined in the 2003 Work Plan (Bhate, 2003).

3.6 QUALITY ASSURANCE/QUALITY CONTROL SAMPLING

All QA/QC sampling activities will be conducted in accordance with the 2003 Work Plan (Bhate, 2003) and the project Quality Assurance Project Plan, included as Appendix B of the 2003 Work Plan (Bhate, 2003).

3.7 WASTE MANAGEMENT

Investigation derived waste expected to be generated during the eight quarters of groundwater LTM includes water (purge and decontamination water) and disposable sampling and personnel protective equipment (e.g., bailers, gloves, tape, etc.). IDW generated during the project will be handled in accordance with all applicable Federal, state, local, and Base regulations. The procedures to characterize, manage, and dispose of investigation derived waste (IDW) is presented in Section 2.11 of the 2003 Work Plan. These procedures have been obtained from the Holloman AFB Basewide Waste Management Plan (Radian, 1993).

4.0 DATA EVALUATION AND REPORTING PROTOCOL

All data evaluation and project reporting activities will be conducted as presented in Sections 4.1 and 4.2 of the 2003 Work Plan (Bhate, 2003) but on a quarterly rather than a biennial basis. The analytical data obtained from the eight quarterly groundwater LTM events will be evaluated by comparing the current data to site-specific historical data, USEPA MCLs, and New Mexico Groundwater Quality (NMGWQ) standards presented in New Mexico Administrative Code 20.6.2 issued by the New Mexico Water Quality Control Commission. The results of the quarterly groundwater LTM events will be presented in a report with a format similar to the 2005 groundwater LTM report (Bhate, 2006). The quarterly reports will evaluate groundwater flow direction by including a groundwater potentiometric surface map, summarize the field activities conducted, and present the results of the analyses and data evaluation. A table summarizing the historic data and current analytical results will also be included within the quarterly reports.

5.0 PROJECT RESPONSIBILITIES AND SCHEDULE

Key project personnel positions and responsibilities are presented in Section 5.0 of the 2003 Work Plan (Bhate, 2003). Groundwater LTM sampling events will be conducted quarterly for approximately two years (i.e., 8 quarterly events). It is anticipated, the quarterly LTM program will be initiated in spring 2008, and coincide seasonally with former sampling events (i.e., March, June September, and December) to provide consistency with historic events.

6.0 REFERENCES

Bhate (Bhate Environmental Associates, Inc.), 2003. Final Work Plan for the 2003 Long-Term Groundwater Monitoring Program, Holloman Air Force Base, New Mexico. April.

Bhate (Bhate Environmental Associates, Inc.), 2006. Final 2005 Long-Term Groundwater Monitoring Report, Holloman Air Force Base, New Mexico. May.

CH2MHill, 1983. Installation Restoration Program Records Search for Holloman AFB. August

NMED (New Mexico Environment Department), 2006. Final 2005 Long-Term Groundwater Monitoring Report, Holloman Air Force Base, New Mexico, May 2006 (EPA ID#NM6572124422, HWB-HAFB-06-003). October 4.

Radian Corporation, October 1992. Investigation, Study and Recommendation for 29 Waste Sites, Holloman AFB.

Radian Corporation, November 1993. Preliminary Assessment and Site Investigation Report – Investigation of Four Waste Sites, Holloman AFB.

ATTACHMENT C

**TABLE 1
GROUNDWATER RISK BASED SCREENING EVALUATION
SS-48 (AOC-N) – MILITARY GAS STATION
HOLLOMAN AIR FORCE BASE, NEW MEXICO**

**TABLE 2
RFI SOIL DATA
SS-48 (AOC-N) – MILITARY GAS STATION
HOLLOMAN AIR FORCE BASE, NEW MEXICO**

TABLE 1

GROUNDWATER RISK BASED SCREENING EVALUATION
 SS-48 (AOC N) MILITARY GAS STATION
 HOLLOMAN AIR FORCE BASE, NEW MEXICO
 Page 2 of 6

Parameter	Well 1	Well 2	Well 3	Well 4	Well 5	Well 6	Well 7	Well 8	Well 9	Well 10	Well 11	Well 12	Well 13	Well 14	Well 15
VOCs (µg/L)															
Benzene	957	5,920	33,300	5	10	NA	NA	NA	NA	NA	0.38	(J)	--		
Methyl tertiary butyl ether	2,340,000	25,400,000	81,100,000	NA	100 ⁽⁸⁾	NA	NA	NA	NA	NA	7.7	--			
Ethylbenzene	200,000	1,500,000	4,770,000	700	750	NA	NA	NA	NA	NA	1.4	--			
Filterable Residue (mg/L)															
TDS	NA	NA	NA	NA	N	NA	NA	NA	NA	NA	NA	6,110			

- (1) Obtained from Table 4-17 of the Guidance on Corrective Action (NMED, 2000)
- (2) Obtained from Table 4-18 of the Guidance on Corrective Action (NMED, 2000)
- (3) Obtained from Table 4-19 of the Guidance on Corrective Action (NMED, 2000)
- (4) for mixed Xylenes
- (5) USEPA MCLs updated on October 19, 2008
- (6) Maximum allowable annual average level for Total Trihalomethanes
- (7) Values obtained from New Mexico Administrative Code 20.6.2.3103A, B, and C
- (8) Background (upgradient) well
- (9) New Mexico Administrative Code 20.5.12.1233

CRDL - contract-required detection limit
 IDL - instrument detection limit
 ND - not detected at or above method reporting limit
 NA - not analyzed/not applicable
 VOCs - volatile organic compounds
 µg/L - micrograms per liter
 mg/L - milligrams per liter
 USEPA - U. S. Environmental Protection Agency
 MCL - Maximum Contaminant Level
 NMGWQ - New Mexico Groundwater Quality
 -- - not detected
 NS - not sampled

Laboratory Qualifiers- assigned as a result of laboratory data assessment procedures
 J - Estimated value; less than CRDL but greater than or equal to IDL
 D - Value derived from analysis of diluted sample.
 UB - Qualifies as non-detect due to presence of analyte in associated laboratory blank

EPA Qualifiers- assigned as a result of independent data validation
 (J)-- Estimated value based on QC criteria
 (U)-- Estimated non-detect based on QC criteria

2003 Validation Qualifiers
 J - Estimated value detected less than the CRDL but greater than the reporting limit.
 U - The analyte was analyzed for, but not detected. The associated numerical value is at or below the method detection limit.
 UJ - Estimated as non-detect at the detection limit.

Results in **BOLD** and *italics* exceed NMGWQ Standards for Human Health and USEPA Primary Drinking Water MCLs
 Results in **BOLD** exceed NMGWQ Standards for Human Health
 Results in *italics* exceed USEPA Primary Drinking Water MCLs

TABLE 1

GROUNDWATER RISK BASED SCREENING EVALUATION
 SS-48 (AOC N) MILITARY GAS STATION
 HOLLOMAN AIR FORCE BASE, NEW MEXICO
 Page 1 of 6

Contaminant	Well ID	Well Type	Depth (ft)	Sample Date	Sample Type	Result (µg/L)	CRDL	IDL	ND	NA	NS	Remarks
VOCs (µg/L)												
Benzene	957		5,920	33,300	5	10	--	--	--	--	--	--
Methyl tertiary butyl ether	2,340,000		25,400,000	81,100,000	NA	100 ⁽⁶⁾	--	--	NA	--	--	--
Ethylbenzene	200,000		1,500,000	4,770,000	700	750	--	--	--	--	--	--
Filterable Residue (mg/L)												
TDS	NA		NA	NA	NA	N	NA	NA	NA	NA	NA	11,500

- (1) Obtained from Table 4-17 of the Guidance on Corrective Action (NMED, 2000)
- (2) Obtained from Table 4-18 of the Guidance on Corrective Action (NMED, 2000)
- (3) Obtained from Table 4-19 of the Guidance on Corrective Action (NMED, 2000)
- (4) for mixed Xylenes
- (5) USEPA MCLs updated on October 19, 2006
- (6) Maximum allowable annual average level for Total Trihalomethanes
- (7) Values obtained from New Mexico Administrative Code 20.6.2.3103A, B, and C
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- (9) New Mexico Administrative Code 20.5.12.1233

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 IDL - instrument detection limit
 ND - not detected at or above method reporting limit
 NA - not analyzed/not applicable
 VOCs - volatile organic compounds
 µg/L - micrograms per liter
 mg/L - milligrams per liter
 USEPA - U. S. Environmental Protection Agency
 MCL - Maximum Contaminant Level
 NMGWQ - New Mexico Groundwater Quality
 -- - not detected
 NS - not sampled

Results in **BOLD** and *italics* exceed NMGWQ Standards for Human Health and USEPA Primary Drinking Water MCLs
 Results in **BOLD** exceed NMGWQ Standards for Human Health
 Results in *italics* exceed USEPA Primary Drinking Water MCLs

Laboratory Qualifier- assigned as a result of laboratory data assessment procedures
 J - Estimated value; less than CRDL but greater than or equal to IDL
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 (J)- Estimated value based on QC criteria
 (UJ)- Estimated non-detect based on QC criteria

2003 Validation Qualifier
 J - Estimated value detected less than the CRDL but greater than the reporting limit
 U - The analyte was analyzed for, but not detected. The associated numerical value is at or below the method detection limit.
 UJ - Estimated as non-detect at the detection limit.

TABLE 1

GROUNDWATER RISK BASED SCREENING EVALUATION
 SS-48 (AOC N) MILITARY GAS STATION
 HOLLOMAN AIR FORCE BASE, NEW MEXICO
 Page 3 of 6

Parameter	Well ID	Well ID	Well ID	Well ID	Well ID	Well ID	Well ID	Well ID	Well ID	Well ID	Well ID	Well ID	Well ID	Well ID	Well ID	Well ID	Well ID
VOCs (µg/L)																	
Benzene	957	5,920	33,300	5	10	--	--	--	--	--	--	--	--	--	--	--	--
Methyl tertiary butyl ether	2,340,000	25,400,000	81,100,000	NA	100 ⁽⁶⁾	--	--	NA	--	--	--	--	--	--	--	--	--
Ethylbenzene	200,000	1,500,000	4,770,000	700	750	--	0.81	J	--	--	--	--	--	--	--	--	--
Filterable Residue (mg/L)																	
TDS	NA	NA	NA	NA	N	NA	10,200										

- (1) Obtained from Table 4-17 of the Guidance on Corrective Action (NMED, 2000)
- (2) Obtained from Table 4-18 of the Guidance on Corrective Action (NMED, 2000)
- (3) Obtained from Table 4-19 of the Guidance on Corrective Action (NMED, 2000)
- (4) for mixed Xylenes
- (5) USEPA MCLs updated on October 19, 2008
- (6) Maximum allowable annual average level for Total Trihalomethanes
- (7) Values obtained from New Mexico Administrative Code 20.8.2.3103A, B, and C
- (8) Background (upgradient) well
- (9) New Mexico Administrative Code 20.5.12.1233

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 (J)- Estimated value based on QC criteria
 (UJ)- Estimated non-detect based on QC criteria

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NA - not analyzed/not applicable
VOCs - volatile organic compounds
µg/L - micrograms per liter
mg/L - milligrams per liter
USEPA - U. S. Environmental Protection Agency
MCL - Maximum Contaminant Level
NMGWQ - New Mexico Groundwater Quality
-- - not detected
NS - not sampled

2009 Validation Qualifiers
 J - Estimated value detected less than the CRDL but greater than the reporting limit.
 U - The analyte was analyzed for, but not detected. The associated numerical value is at or below the method detection limit.
 UJ - Estimated as non-detect at the detection limit.

Results in **BOLD** and **italics** exceed NMGWQ Standards for Human Health and USEPA Primary Drinking Water MCLs
 Results in **BOLD** exceed NMGWQ Standards for Human Health
 Results in **italics** exceed USEPA Primary Drinking Water MCLs

TABLE 1

**GROUNDWATER RISK BASED SCREENING EVALUATION
SS-48 (AOC N) MILITARY GAS STATION
HOLLOMAN AIR FORCE BASE, NEW MEXICO
Page 4 of 6**

Parameter	Well 1	Well 2	Well 3	Well 4	Well 5	Well 6	Well 7	Well 8	Well 9	Well 10	Well 11	Well 12	Well 13	Well 14	Well 15
VOCs (µg/L)															
Benzene	957	5,920	33,300	5	10	38	--	170	D	560		100		83	
Methyl tertiary butyl ether	2,340,000	25,400,000	81,100,000	NA	100 ⁽⁶⁾	--	350	NA		100		25		419	
Ethylbenzene	200,000	1,500,000	4,770,000	700	750	--	--	870	D	19	J	140		8.8	
Filterable Residue (mg/L)															
TDS	NA	NA	NA	NA	N	NA	NA	NA	NA	NA	NA	NA	NA	11,700	

- (1) Obtained from Table 4-17 of the Guidance on Corrective Action (NMED, 2000)
 (2) Obtained from Table 4-18 of the Guidance on Corrective Action (NMED, 2000)
 (3) Obtained from Table 4-19 of the Guidance on Corrective Action (NMED, 2000)
 (4) for mixed Xylenes
 (5) USEPA MCLs updated on October 19, 2008
 (6) Maximum allowable annual average level for Total Trihalomethanes
 (7) Values obtained from New Mexico Administrative Code 20.8.2.3103A, B, and C
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 ND - not detected at or above method reporting limit
 NA - not analyzed/not applicable
 VOCs - volatile organic compounds
 µg/L - micrograms per liter
 mg/L - milligrams per liter
 USEPA - U. S. Environmental Protection Agency
 MCL - Maximum Contaminant Level
 NMGWQ - New Mexico Groundwater Quality
 -- - not detected
 NS - not sampled

Results in **BOLD** and *italics* exceed NMGWQ Standards for Human Health and USEPA Primary Drinking Water MCLs
 Results in **BOLD** exceed NMGWQ Standards for Human Health
 Results in *italics* exceed USEPA Primary Drinking Water MCLs

Laboratory Qualifiers - assigned as a result of laboratory data assessment procedures
 J - Estimated value; less than CRDL but greater than or equal to IDL
 D - Value derived from analysis of diluted sample
 UB - Qualifies as non-detect due to presence of analyte in associated laboratory blank

EPA Qualifiers - assigned as a result of independent data validation
 (J) - Estimated value based on QC criteria
 (UJ) - Estimated non-detect based on QC criteria

2003 Validation Qualifiers
 J - Estimated value detected less than the CRDL but greater than the reporting limit
 U - The analyte was analyzed for, but not detected. The associated numerical value is at or below the method detection limit
 UJ - Estimated as non-detect at the detection limit

TABLE 1

**GROUNDWATER RISK BASED SCREENING EVALUATION
SS-48 (AOC N) MILITARY GAS STATION
HOLLOMAN AIR FORCE BASE, NEW MEXICO
Page 5 of 6**

VOCs (µg/L)											
Benzene	957	5,920	33,300	5	10	NS	NS	NS	NS	NS	--
Methyl tertiary butyl ether	2,340,000	25,400,000	81,100,000	NA	100 ⁽⁶⁾	NS	NS	NS	NS	NS	--
Ethylbenzene	200,000	1,500,000	4,770,000	700	750	NS	NS	NS	NS	NS	--
Filterable Residue (mg/L)											
TDS	NA	NA	NA	NA	N	NS	NS	NS	NS	NS	6,340

- (1) Obtained from Table 4-17 of the Guidance on Corrective Action (NMED, 2000)
 (2) Obtained from Table 4-18 of the Guidance on Corrective Action (NMED, 2000)
 (3) Obtained from Table 4-19 of the Guidance on Corrective Action (NMED, 2000)
 (4) for mixed Xylenes
 (5) USEPA MCLs updated on October 19, 2006
 (6) Maximum allowable annual average level for Total Trihalomethanes
 (7) Values obtained from New Mexico Administrative Code 20.6.2.3103A, B, and C
 (8) Background (upgradient) well
 (9) New Mexico Administrative Code 20.5.12.1233

CRDL - contract-required detection limit
 IDL - instrument detection limit
 ND - not detected at or above method reporting limit
 NA - not analyzed/not applicable
 VOCs - volatile organic compounds
 µg/L - micrograms per liter
 mg/L - milligrams per liter
 USEPA - U. S. Environmental Protection Agency
 MCL - Maximum Contaminant Level
 NMGWQ - New Mexico Groundwater Quality
 -- - not detected
 NS - not sampled

Results in **BOLD** and *italics* exceed NMGWQ Standards for Human Health and USEPA Primary Drinking Water MCLs
 Results in **BOLD** exceed NMGWQ Standards for Human Health
 Results in *italics* exceed USEPA Primary Drinking Water MCLs

Laboratory Qualifiers - assigned as a result of laboratory data assessment procedures
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TABLE 1

GROUNDWATER RISK BASED SCREENING EVALUATION
 SS-48 (AOC N) MILITARY GAS STATION
 HOLLOMAN AIR FORCE BASE, NEW MEXICO
 Page 6 of 6

VOCs (µg/L)						Filterable Residue (mg/L)								
Parameter	Well 1	Well 2	Well 3	Well 4	Well 5	Well 6	Well 7	Well 8	Well 9	Well 10	Well 11	Well 12	Well 13	Well 14
Benzene	957	5,920	33,300	5	10	--	--	--	--	--	0.5	(J)	--	--
Methyl tertiary butyl ether	2,340,000	25,400,000	81,100,000	NA	100 ⁽⁸⁾	--	--	NA	3	J	280	--	181	--
Ethylbenzene	200,000	1,500,000	4,770,000	700	750	--	--	--	--	--	--	--	--	--
Filterable Residue (mg/L)						NA	NA	NA	NA	NA	NA	12,100	NA	NA

- (1) Obtained from Table 4-17 of the Guidance on Corrective Action (NMED, 2000)
- (2) Obtained from Table 4-18 of the Guidance on Corrective Action (NMED, 2000)
- (3) Obtained from Table 4-19 of the Guidance on Corrective Action (NMED, 2000)
- (4) for mixed Xylene
- (5) USEPA MCLs updated on October 19, 2008
- (6) Maximum allowable annual average level for Total Trihalomethanes
- (7) Values obtained from New Mexico Administrative Code 20.8.2.3103A, B, and C
- (8) Background (upgradient) well
- (9) New Mexico Administrative Code 20.5.12.1233

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 ND - not detected at or above method reporting limit
 NA - not analyzed/not applicable
 VOCs - volatile organic compounds
 µg/L - micrograms per liter
 mg/L - milligrams per liter
 USEPA - U. S. Environmental Protection Agency
 MCL - Maximum Contaminant Level
 NMGWQ - New Mexico Groundwater Quality
 -- - not detected
 NS - not sampled

Results in **BOLD** and *italics* exceed NMGWQ Standards for Human Health and USEPA Primary Drinking Water MCLs
 Results in **BOLD** exceed NMGWQ Standards for Human Health
 Results in *italics* exceed USEPA Primary Drinking Water MCLs

Table 2
Analytical Soil Results from SS-48
Phase I RI 1989

Analyte				B1						B2					
	Residential	Industrial/Occupational	Construction Worker	Sample Depth						Sample Depth					
				2.5	5	7.5	10	12.5	20	2.5	5	7.5	10	12.5	20
Volatiles															
Benzene (µg/kg)	27000	73600	157000	--	--	NA	NA	--	NA	--	--	NA	NA	--	NA
Ehtylbenzene (µg/kg)	10600000	25400000	57100000	--	--	NA	NA	--	NA	--	--	NA	NA	--	NA
Toluene (µg/kg)	248000	248000	248000	NA	--	NA	NA	--	NA	NA	--	NA	NA	--	NA
Total Xylenes (µg/kg)	132000	132000	132000	NA	--	NA	NA	--	NA	NA	--	NA	NA	--	NA
BN/AE (µg/kg)	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRPH (mg/kg)	1000	--	--	307	--	NA	NA	--	NA	--	--	NA	NA	--	NA
Lead (µg/kg)	400000	750000	750000	5	5	NA	NA	3.2	NA	--	0.8	NA	NA	1.3	NA

µg/kg = micrograms per kilogram

RI = Remedial Investigation

NA = Not Analyzed

BN/AE = Base Neutrals/Acid Extractables

TRPH = Total Recoverable Petroleum Hydrocarbons

-- = Not Detected/Not Applicable

() = Stage II data

* = Acid extractables not valid due to out-of-r

** = Outside QC limits-one surrogate recover out-of-range

= Corps of Engineers lab data

**Table 2
Analytical Soil Results from SS-48
Phase I RI 1989**

Volatiles															
Benzene (µg/kg)	27000	73600	157000	74	85**	NA	NA	--	NA	NA	(-)	NA	(-)	NA	(-)
Ehtylbenzene (µg/kg)	10600000	25400000	57100000	31	134	NA	NA	--	NA	NA	NA	NA	(-)	NA	(-)
Toluene (µg/kg)	248000	248000	248000	8	41	NA	NA	--	NA	NA	NA	NA	(-)	NA	(-)
Total Xylenes (µg/kg)	132000	132000	132000	11	335	NA	NA	--	NA	NA	NA	NA	(-)	NA	(-)
BN/AE (µg/kg)	--	--	--	NA	NA	NA	NA	NA	NA	NA	(-)	NA	(-)	NA	(-)
TRPH (mg/kg)	1000	--	--	--	36	NA	NA	--	NA	NA	(-)	NA	(-)	NA	(12)
Lead (µg/kg)	400000	750000	750000	--	2	NA	NA	3.9	NA	NA	(-)	NA	(5)	NA	(3)

µg/kg = micrograms per kilogram
 RI = Remedial Investigation
 NA = Not Analyzed
 BN/AE = Base Neutrals/Acid Extractables
 TRPH = Total Recoverable Petroleum Hydrocarbons
 -- = Not Detected/Not Applicable
 (-) = Stage II data
 * = Acid extractables not valid due to out-of-r
 ** = Outside QC limits-one surrogate recover out-of-range
 # = Corps of Engineers lab data

Table 2
Analytical Soil Results from SS-48
Phase I RI 1989

Volatiles									
Benzene (µg/kg)	27000	73600	157000	NA	(-)	NA	NA	NA	(-)
Ehtylbenzene (µg/kg)	10600000	25400000	57100000	NA	NA	NA	NA	NA	(-)
Toluene (µg/kg)	248000	248000	248000	NA	NA	NA	NA	NA	(-)
Total Xylenes (µg/kg)	132000	132000	132000	NA	NA	NA	NA	NA	(-)
BN/AE (µg/kg)	-	-	-	(-)*	(-)*	NA	NA	NA	(-)*
TRPH (mg/kg)	1000	-	-	(-)	(-)	NA	NA	NA	(-)
Lead (µg/kg)	400000	750000	750000	(-)	(1)	NA	NA	NA	(9)

µg/kg = micrograms per kilogram

RI = Remedial Investigation

NA = Not Analyzed

BN/AE = Base Neutrals/Acid Extractables

TRPH = Total Recoverable Petroleum Hydrocarbons

- = Not Detected/Not Applicable

() = Stage II data

* = Acid extractables not valid due to out-of-n

** = Outside QC limits-one surrogate recover out-of-range

= Corps of Engineers lab data