

NAFB 2003



DEPARTMENT OF THE AIR FORCE

HEADQUARTERS 49TH FIGHTER WING (ACC)  
HOLLOMAN AIR FORCE BASE, NEW MEXICO

14 MAY 2003

MEMORANDUM FOR NEW MEXICO ENVIRONMENT DEPARTMENT

Attn: James P. Bearzi  
Hazardous Waste Bureau  
2905 Rodeo Park Drive East, Bldg 1  
Santa Fe, NM 87505-6303



FROM: 49 CES/CC  
550 Tabosa Ave  
Holloman AFB NM 88330-8458

SUBJECT: Final Long-Term Groundwater Monitoring Report

1. This letter, with attachment, serves as our formal submittal of the 2001 Final Long-Term Groundwater Monitoring Report.
2. If you have any questions, please contact Mr. Dan Holmquist at (505) 572-5395.

*J J R J.*  
JUAN IBANEZ, JR., Lt Col, USAF  
Commander, 49th Civil Engineer Squadron

Attachment:  
*Final 2001 Long-Term Groundwater Monitoring Report*

cc (w/Atch):		
Cornelius Amindyas NMED-HWD	Steve Jetter NMED-HWD	Allen Chang
Hazardous Waste Bureau	Hazardous Waste Bureau	USEPA, Region 6 (6 PD-N)
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Langley Air Force Base,  
Virginia*

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*Revised Final  
2001 Long-Term Groundwater Monitoring Report*

*Holloman Air Force Base,  
New Mexico*

*May 2003*

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

*Project Number: KWRD20017009*

**RESPONSES TO COMMENTS FROM THE NEW MEXICO ENVIRONMENT DEPARTMENT  
FINAL 2001 LONG-TERM GROUNDWATER MONITORING REPORT  
HOLLOMAN AIR FORCE BASE, NEW MEXICO  
JULY 2002**

The information provided below are responses to the comments submitted by the New Mexico Environment Department (NMED) Hazardous Waste Bureau to Holloman Air Force Base (AFB) for the 2001 Final Long-Term Groundwater Monitoring (LTM) Report on February 24, 2003.

1. The contract-required detection limits (CRDLs) were provided in Appendix B of the Final Work Plan for the 2001 event. *A list of the CRDLs will be provided to for inclusion within Appendix B of the report.*
2. The groundwater quality standards are presented in micrograms per liter but have been changed to milligrams per liter as indicated in the attached revised version of Table 2-1. *A replacement for Table 2-1 will be provided.*
3. Lead has been included in the revised version of Table 2-1. *A replacement for Table 2-1 will be provided.*
4. The standard for 1,2-dichloroethane has been revised as requested in Table 2-1. *A replacement for Table 2-1 will be provided.*
5. Holloman AFB will be providing recommendations for the 11 sites that will no longer require monitoring after 2003 under the LTM in the report for the 2003 event.
6. The SVE system at SS-02 and SS-05 was in operation during the 2001 sampling program. *A replacement for page 4-1 will be provided.*
7. The detection limit values presented for nondetect results represent method reporting limits (MRLs) by individual analysis of methylene chloride. The MRL is not always the same value and the CRDL based on sample dilution or matrix interference. Sample dilution (10x) took place for the MW-02&05-05 because there were elevated levels of VOCs in the sample. The MRL for methylene chloride in MW-02&05-03 should have been shown as <5 micrograms per milliliter (ug/L). The CRDL for methylene chloride is 5 ug/L and 10 ug/L for each o-xylene and m-,p-xylenes.
8. Further clarification is needed for this comment. Based on the results of the 1999 and 2001 events, only well MW-02&05-05 has shown any signs of contamination. Prior to 1999, the four wells included in the LTM showed only minor contamination; and where there was contamination, the levels have decreased.
9. There is no discrepancy between MRLs reported for iron, but the data for metals was reported in ug/L not milligrams per liter (mg/L) as the table indicates. A values of 1000 ug/L is equivalent to 1 mg/L which is the CRDL for iron. *A replacement for Table 5-2 will be provided.*
10. The correct groundwater elevation for well MW-08-03/S10-MW7 is 4074.85 ft msl. *Figure 6-2 will be corrected and provided as a replacement page.*
11. The SVE system at SS-17 was in operation during the 2001 sampling program. *A replacement for page 4-1 will be provided.*
12. The discrepancy between MRLs reported for iron are due to the dilution that was required for analyzing the sample from well MW-19-03 within the calibration range of the instrument. The

need for the 10x dilution was probably due to matrix interference caused by the elevated mineral content of high total dissolved solids groundwater in the vicinity of LF-19. The data for metals was reported in ug/L not milligrams per liter (mg/L) as the table indicates. A value of 1000 ug/L is equivalent to 1 mg/L which is the CRDL for iron. *A replacement for Table 9-2 will be provided.*

13. According to Carol Bieniulis' notes and the response to NMED's comments on the 1999 report, selenium was requested by the state, but discussions between Court Fesmire, Jose Gallegos, Cornelius Amindyas, and Rob Warder indicated that selenium was not to be included. The recommendation for LF-21 for 2001 included only analyzing for TCE, barium, iron and manganese because these analytes had been detected above CRDLs; and Ms. Bieniulis' notes indicate the state wanted arsenic added. In 1999 and 2001, no analytes exceeded New Mexico WQCC standards for groundwater. Selenium will be analyzed for in future LTM events at LF-21.
14. The discrepancy between MRLs reported for chromium are due to the dilution that was required for analyzing the sample from well MW-21-04 within the calibration range of the instrument. The need for the 10x dilution was probably due to matrix interference caused by the elevated mineral content of high total dissolved solids groundwater in the vicinity of LF-21. The data for metals was reported in ug/L not milligrams per liter (mg/L) as the table indicates. A value of 20 ug/L is equivalent to 0.02 mg/L which is the CRDL for chromium. *A replacement for Table 10-2 will be provided.*
15. The discrepancy between MRLs reported for iron are due to the dilution that was required for analyzing the sample from well MW-22-03 within the calibration range of the instrument. The need for the 10x dilution was probably due to matrix interference caused by the elevated mineral content of high total dissolved solids groundwater in the vicinity of LF-22. The data for metals was reported in ug/L not milligrams per liter (mg/L) as the table indicates. A value of 1000 ug/L is equivalent to 1 mg/L which is the CRDL for iron. *A replacement for Table 11-2 will be provided.*
16. All samples collected at LF-23 required a 10x dilution due to matrix interference caused by the elevated mineral content of high total dissolved solids groundwater in the vicinity of LF-23. The data for metals was reported in ug/L not milligrams per liter (mg/L) as the table indicates. *A replacement for Table 12-2 will be provided.*
17. Currently, no one on the project team knows of any documentation which describes the rationale used in the selection of wells to be included in the LTM.

Based on the comments received from NMED, the following pages were revised and provided as replacement pages for the May 2003 update of the Final 2001 LTM Report (July 2002):

- Title Page
- Table 2-1
- Page 4-1
- Figure 6-2
- Page 8-1
- Analytical data tables--Section 3 through 19 (units for metals were revised in all tables)
- Analytical Method Reporting Limits (Appendix B)
- Monitoring Well Gauging Information, September 2001 (Appendix C)
- Report cover and document spine



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**RON CURRY**  
SECRETARY

**DERRITH WATCHMAN-MOORE**  
DEPUTY SECRETARY

**CERTIFIED MAIL**  
**RETURN RECEIPT REQUESTED**

February 24, 2003

Mr. Howard Moffitt  
Deputy Base Civil Engineer  
49 CES/CIV  
550 Tabosa Avenue  
Holloman Air Force Base, NM 88330-8458

**RE: REVIEW OF THE FINAL LONG-TERM GROUNDWATER  
MONITORING REPORT, JULY 2002.  
HOLLOMAN AIR FORCE BASE, EPA ID # NM6572124422-2  
HWB-HAFB 02-007**

Dear Mr. Moffitt:

The Hazardous Waste Bureau (HWB) of the New Mexico Environment Department (NMED) has reviewed the 2001 Final Long-Term Groundwater Monitoring (LTM) Report that Holloman Air Force Base (HAFB) submitted to the HWB. NMED has determined that additional information is required prior to approving the 2001 LTM.

Please provide the following information to NMED within thirty (30) days of receipt of this letter.

- 1) Please provide the Contract Required Detection Limits (CRDLs) for the LTM.
- 2) Table 2-1 – The groundwater standard lists analytes in mg/L whereas it appears that the values reported are in ug/L. Please correct the table.
- 3) Table 2-1 – Please include Lead in the table.
- 4) Table 2-1 – The applicable Water Quality Control Commission standard for 1,2-Dichloroethane is 10 ug/L not 25 mg/L as listed in the table.
- 5) Since the 2003 LTM report will conclude the 10-year LTM program for 11 of the 17 sites in the LTM program, will HAFB be providing recommendations for these sites in the 2003 LTM?

Mr. Howard Moffitt  
February 24, 2003  
Page 2

- 6) Page 4-1, Section 4.1 – Please state when operations of the SVE system at SS-02 & SS-05 was discontinued or that it was in operation during the reporting period. The text only indicates results as of December 1999.
- 7) Please explain the apparent reporting detection limit discrepancy for methylene chloride and m,p-Xylenes. Example: MW-02 & 05-05 and MW-02 & 05-03 have methylene chloride detection limits of <50 ppb whereas MW-02 & 05-06 and MW-02 & 05-08 have methylene chloride detection limits of <5 ppb.
- 8) Figures 4-2 and 4-3 – Please provide an explanation as to why the reported VOC contamination appears at the upgradient well, MW-02&05-08, and not at the downgradient well. HAFB may want to sample S1-MW3 to facilitate the site investigation. Please provide information if the area of this spill site been delineated previously.
- 9) Table 5-2 – Please explain why there is a <1000 ppm detection limit for iron.
- 10) Figures 5-2 and 6-2 – MW-08-03/S10-MW7 was sampled for water level with a water level of 4074.85 msl and 4071.64 msl at sites SD-08 and LF-10 respectively. Please provide an explanation as to the difference in elevation.
- 11) Page 8-1, Section 8.1 – Please state when operations of the SVE system at SS-17 was discontinued or that it was in operation during the reporting period (2001). The text indicates results as of January 2000.
- 12) Table 9-2 – Please explain the apparent reporting detection limit discrepancy for iron. Example: MW-19-03 has an iron detection limit of <10,000 ppm whereas MW-19-02 has a iron detection limit of <1000 ppm.
- 13) Page 10-1 – In the “Review of the Final Long-Term Groundwater Monitoring Report, June 2000” letter dated May, 2001, NMED recommended continuing the LF-21 sampling program for TCE, Arsenic, Barium, Iron, Manganese, and Selenium (See Comment #6). On Page 10-1, HAFB erroneously states that the analyte list was revised to include only TCE, arsenic, chromium, iron, and manganese as approved by NMED. Please explain why the recommendations in the May 2001 letter were not followed.
- 14) Table 10-2 - Please explain the apparent reporting detection limit discrepancy for chromium. Example: MW-21-04 has a chromium detection limit of <200 ppm whereas the other three monitoring wells have chromium detection limits of <20 ppm.
- 15) Table 11-2 – Please explain the apparent reporting detection limit discrepancy for iron. Example: MW-22-03 has a iron detection limit of <10,000 ppm whereas the other three monitoring wells have iron detection limits of <1000 ppm.
- 16) Table 12-2 – Please explain why there is a <10,000 ppm detection limit for iron.
- 17) Figure 18-3 – Please provide an explanation as to why the well closest to the presumed origination point, S55-MW3, was not included in the long-term sampling program.

The following recommendations to the sampling program or NMED concurrence with HAFB recommendations may be provided in the 2003 Final Long-Term Groundwater Monitoring Report.

- 1) Page ES-1 – Recommendations were made to remove root growth from wells at seven landfills prior to sampling. Page 20-1 recommends removing root growth from three landfills. NMED concurs with recommendations to remove root growth wherever necessary prior to sampling.
- 2) Page 3-3 – NMED concurs with continuing the LF-01 sampling program for Arsenic, Barium, Manganese, and Selenium.
- 3) Table 4-2 – NMED recommends that sampling continue for VOCs at SS-02 & SS-05.
- 4) Page 5-3 – NMED concurs with continuing the SD-08 sampling program for 1,2-Dichloroethane, Arsenic, Barium, Iron, and Manganese.
- 5) Page 6-2 – NMED recommends continuing the LF-10 sampling program for Arsenic, Barium, Manganese, and Selenium.
- 6) Page 7-3 – NMED recommends continuing the OT-16 sampling program for VOCs and Lindane in 118-MW1602.
- 7) Page 8-3 – NMED concurs with no changes to the LTM Program for SS-17.
- 8) Figure 8-1 – A building is shown in Figure 8-1 to the northeast of Building 18, which doesn't appear to exist.
- 9) Page 9-3 – NMED concurs with continuing the LF-19 sampling program for Barium, Iron, and Manganese.
- 10) Page 10-3 – NMED recommends that HAFB continue with the LF-21 sampling program for TCE, Arsenic, Barium, Iron, Manganese, and Selenium.
- 11) NMED recommends HAFB continue investigating the LF-21 site in an attempt to determine the cause of the TCE contamination detected in upgradient monitoring well MW-21-01.
- 12) Page 11-2 – NMED recommends continuing the LF-22 sampling program for Arsenic, Barium, Iron, Manganese, and Selenium.
- 13) Page 12-2 – NMED recommends continuing the LF-23 sampling program for Barium, Iron, Manganese, and Selenium.
- 14) Consideration should be given into investigating the LF-23 site in an attempt to determine the cause of the Iron, Manganese, and Barium detected in upgradient monitoring well MW-23-01.
- 15) Page 13-3 – NMED concurs with the recommendation to monitor for chloroform and 1,2-dichloroethane at LF-29.
- 16) Page 14-2 – NMED recommends continuing the DP-30 and SD-33 sampling program for chloroform, 1,1-dichloroethane, TCE, Arsenic, Barium, Iron, and Selenium.
- 17) Page 15-2 – NMED concurs with no changes to the LTM Program for SS-39.
- 18) Page 16-2 – NMED concurs with the recommendation to discontinue long-term monitoring at OT-44 due to no VOCs detected during the last sampling event.
- 19) Page 17-2 – NMED concurs with the recommendation that monitoring for bromodichloromethane, chloroform, and methylene chloride continue at SS-46.

Mr. Howard Moffitt

February 24, 2003

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- 20) Page 18-2 – NMED concurs with the recommendation that monitoring for VOCs continue at SS-48.
- 21) Page 19-2 – NMED concurs with the recommendation to discontinue long-term monitoring at SS-56 due to no VOCs and Lead detected during the past three sampling events.

If you have any questions or need any further information please contact me, or Robert Warde the address above or by phone at 505-841-9040.

Sincerely,



Cornelius Amindyas  
Project Leader  
Holloman Air Force Base

CAA/rw

cc: John Kieling, NMED HWB  
Will Moats, NMED HWB  
Robert Warder, PE, NMED HWB  
Steve Jetter, NMED HWB  
Allen Chang, EPA Region 6 (6PD-N)  
Debbie Hartell, HAFB  
Dan Holmquist, HAFB

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**FINAL  
2001 LONG-TERM GROUNDWATER MONITORING REPORT  
HOLLOMAN AIR FORCE BASE, NEW MEXICO**

*Prepared for:*

49 CES/CEV  
Holloman Air Force Base, NM  
and  
HQ ACC/CEVC  
Langley Air Force Base, VA

*Prepared by:*

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Under Contract No. DACW45-94-D-0003  
Delivery Order No. 32, Work Authorization Directive 9  
U.S. Army Corps of Engineers  
Omaha District  
Omaha, Nebraska

July 2002  
(May 2003 update)

Project Number: KWRD20017009

**FINAL**  
**2001 LONG-TERM GROUNDWATER MONITORING REPORT**  
**HOLLOMAN AIR FORCE BASE, NEW MEXICO**

*Prepared for:*

49 CES/CEV  
Holloman Air Force Base, NM  
and  
HQ ACC/CEVC  
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Under Contract No. DACW45-94-D-0003  
Delivery Order No. 32, Work Authorization Directive 9  
U.S. Army Corps of Engineers  
Omaha District  
Omaha, Nebraska

July 2002

Project Number: KWRD20017009

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## ACRONYMS

AFB	Air Force Base
AOC	Area of Concern
BRA	baseline risk assessment
BTEX	benzene, toluene, ethylbenzene, and xylenes
BX	Base Exchange
CDAP	Chemical Data Acquisition Plan
CRDL	contract-required detection limit
DDD	1,1-bis(chlorophenyl)-2,2-dichloroethane
DDE	1,1-bis(chlorophenyl)-2,2-dichloroethene
DDT	1,1-bis(chlorophenyl)-2,2,2-trichloroethane
EPA	U.S. Environmental Protection Agency
FEC	Foothills Engineering Consultants, Inc.
Foster Wheeler Environmental	Foster Wheeler Environmental Corporation
FS	Feasibility Study
ft	feet
ft/ft	Feet per foot
GTI	Groundwater Technology, Incorporated
IDL	instrument detection limit
LTM	Long-Term Groundwater Monitoring
mg/kg	milligrams per kilogram
MOBBS	Mobile Bare Base Squadron
msl	mean sea level
MTBE	tert-butylmethyl ether
NMED	New Mexico Environment Department
OCP	organochlorine pesticide
PCB	polychlorinated biphenyl
POL	petroleum, oils, and lubricants
ppm	parts per million
QA	quality assurance

### ACRONYMS (Concluded)

RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI	Remedial Investigation
SOP	standard operating procedure
SVE	soil vapor extraction
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TCE	trichloroethylene
TCLP	Toxicity Characteristic Leaching Procedure
TOC	top of casing
TOX	total organic halogens
TPH	total petroleum hydrocarbons
TRPH	total recoverable petroleum hydrocarbons
USACE	United States Army Corps of Engineers
UST	underground storage tank
VOC	volatile organic compound
µg/L	micrograms per liter

## EXECUTIVE SUMMARY

This report presents the results of the 2001 Long-Term Groundwater Monitoring (LTM) Program for selected Resource Conservation and Recovery Act and Installation Restoration Program sites at Holloman Air Force Base, New Mexico. The 2001 LTM Program represents the fourth of five sampling events scheduled as part of a 10-year voluntary program in which monitoring is performed once every 2 years. The LTM Program began in August 1995. The objective this program is to meet U.S. Environmental Protection Agency Region 6 and New Mexico Environment Department (NMED) closure requirement for sites included in this program. Although active remediation in the form of free-phase product removal is ongoing at a few of the sites, this program supports conditional closure of all LTM sites as presented in the appropriate decision documents.

In this report, analytical results obtained during the 2001 LTM Program activities were evaluated and compared with results generated in 1995, 1997, and 1999. The 1995 analytical results served as baseline concentrations from which to compare all subsequent results. For the six sites introduced in 1997, analytical results obtained during the 1997 LTM Program served as baseline concentrations from which to compare all subsequent results.

In general, groundwater sample results from 2001 were consistent with sample results from previous LTM Programs (e.g., did not change by one order of magnitude). Nine wells at seven sites had analyte detections that exceeded New Mexico Groundwater Quality Standards. Arsenic and Barium were reported as detections at more sites than in previous years due to improved analytical technologies resulting in analytical methods with lower detection limits than previously available. Overall, metals were detected at lower concentrations in 2001 than in previous years. Fewer volatile organic compounds (VOCs) were detected in 2001 than in 1999.

Recommendations for revising the 2003 LTM Program were made for 15 of the 17 sites addressed in this report. These recommendations primarily focus on decreasing the number of constituents in the analytical requirements for each site. Recommendations were made for OT-44 and SS-56 to discontinue monitoring since analytes were not detected in 2001 or during previous sampling events. Additional recommendations have been made pertaining to removing root growth from wells at seven landfills prior to sampling.

Table ES-1 summarizes the 2001 LTM Program and the recommendations for the 2003 LTM Program.

Table ES-1. Summary of 2001 Long-Term Groundwater Monitoring Findings and Recommendations for Future Monitoring

Site	2001 Analyses (EPA Methods)	2001 Results Above CRDL	2001 Results Above NMGWQ Standards	2003 LTM Program Recommendations
LF-01	Metals ( <i>arsenic, barium, manganese, selenium</i> ) (6010B Trace, 7470A)	Arsenic, Barium, Selenium	None	No changes to 2003 LTM Program. Continue to analyze for arsenic, barium, manganese, and selenium. Additionally, resurvey well 1W3 to determine if survey errors account for groundwater elevation differences in the southern portion of the site. Remove roots from all wells 2 weeks prior to sampling to ensure that representative water level measurements and groundwater samples are obtained.
SS-02 & SS-05	VOCs (8260B)	Benzene, Ethylbenzene, Toluene, o-Xylene	Benzene, Ethylbenzene	Reduce VOC analytical scope to only include benzene, toluene, ethylbenzene, and xylenes.
SD-08	VOCs ( <i>1,2-dichloroethane</i> [8260B]), Metals ( <i>arsenic, barium, iron, lead, manganese</i> [6010B Trace, 7470A])	Arsenic, Barium, Iron	Iron, Manganese	Continue sampling for arsenic, barium, iron, and manganese. Sample well MW-08-01 for 1,2-dichloroethane. Discontinue sampling for lead since it has not been detected since 1995.
LF-10	Metals ( <i>arsenic, barium, chromium, lead, manganese, selenium</i> [6010B Trace, 7470A])	Arsenic, Barium	None	Continue sampling for arsenic, barium, and manganese. Discontinue sampling for chromium, lead, and selenium. Remove roots from all wells 2 weeks prior to sampling to ensure that representative water level measurements and groundwater samples are obtained.
OT-16	VOCs ( <i>trichloroethylene, chloroform, chlorobenzene, methylene chloride</i> [8260B]), Organochlorine Pesticides ( <i>Gamma-BHC [Lindane]</i> in 118-MW1602 only [8081A])	Chloroform	None	Continue sampling for chlorobenzene, chloroform, and trichloroethylene. Sample 118MW1602 for gamma-BHC. Discontinue sampling for methylene chloride since it has not been detected since 1997.
SS-17	VOCs (8260B)	1,2-Dichloroethane; Ethylbenzene; tert-butylmethyl ether (MTBE)	1,2-Dichloroethane	No changes to the 2003 LTM Program. Continue sampling for VOCs.
LF-19	Metals ( <i>barium, iron, lead, manganese</i> [6010B Trace, 7470A]; <i>total mercury</i> [7470A])	Barium	Manganese	Continue sampling for barium, iron, and manganese. Discontinue sampling for lead and mercury. Remove roots from all wells 2 weeks prior to sampling to ensure that representative water level measurements and groundwater samples are obtained.
LF-21	VOCs ( <i>trichloroethylene</i> [8260B]), Metals ( <i>arsenic, chromium, iron, manganese</i> [6010B Trace, 7470A])	Trichloroethylene	None	Continue sampling for arsenic, iron, manganese, and trichloroethylene. Discontinue sampling for chromium. Remove roots from all wells 2 weeks prior to sampling to ensure that representative water level measurements and groundwater samples are obtained.

Table ES-1. Summary of 2001 Long-Term Groundwater Monitoring Findings and Recommendations for Future Monitoring

Site	2001 Analyses (EPA Methods)	2001 Results Above CRDL	2001 Results Above NMGWQ Standards	2003 LTM Program Recommendations
LF-22	Metals ( <i>arsenic, barium, iron, lead, manganese, selenium</i> [6010B Trace, 7470A]), Herbicides ( <i>picloram, MCP</i> P in MW-22-01 only [8151A])	Barium, Selenium	None	Continue sampling for arsenic, barium, manganese, and selenium. Discontinue sampling for iron and lead in all wells. Discontinue sampling for picloram and MCPP in well MW-22-01 since their presence in 1999 could not be confirmed in 2001. Remove roots from all wells 2 weeks prior to sampling to ensure that representative water level measurements and groundwater samples are obtained.
LF-23	Metals ( <i>barium, iron, manganese, selenium</i> [6010B Trace, 7470A]), Herbicides ( <i>4-nitrophenol</i> in MW-23-01 only [8151A])	None	Manganese	Continue sampling for barium, manganese, and selenium. Discontinue sampling for iron in all wells. Discontinue sampling for 4-nitrophenol in well MW-23-01 since its presence in 1999 could not be confirmed in 2001. Remove roots from all wells 2 weeks prior to sampling to ensure that representative water level measurements and groundwater samples are obtained.
LF-29	VOCs (8260B)	1,2-Dichloroethane	1,2-Dichloroethane	Continue sampling for chloroform and 1,2-dichloroethane only. Discontinue sampling for all other VOCs.
DP-30 & SD-33	VOCs (8260B), Metals ( <i>arsenic, barium, iron, selenium</i> [6010B Trace, 7470A])	Barium; Selenium; 1,1-Dichloroethane; Trichloroethylene	1,1-Dichloroethane; Trichloroethylene	Continue sampling for VOCs chloroform, 1,1-dichloroethane, and trichloroethylene only; arsenic; barium; and selenium. Discontinue sampling for all other VOCs and iron.
SS-39	VOCs (8260B)	Acetone, Trichloroethylene, Methylene ketone	None	No changes to 2003 LTM Program. Continue sampling for VOCs. Remove roots from all wells 2 weeks prior to sampling to ensure that representative water level measurements and groundwater samples are obtained.
OT-44	VOCs (8260B)	None	None	Discontinue sampling at OT-44. VOCs were not detected in groundwater in 2001. Prior to 2001, VOCs were not detected or detected at/below the CRDL.
SS-46	VOCs (8260B), Dissolved lead (6010B Trace)	Bromodichloromethane, Chloroform	None	Continue sampling for bromodichloromethane, chloroform, and methylene chloride only. Discontinue sampling for lead.
SS-48	VOCs (8260B)	Benzene, MTBE	Benzene	Continue to analyze for benzene and MTBE only. Discontinue analysis of all other VOCs.
SS-56	VOCs (8260B), Dissolved lead (6010B Trace)	None	None	Discontinue sampling at SS-56. VOCs were not detected above the CRDL in groundwater in 2001. Prior to 2001, VOCs were not detected or detected below the CRDL.

Notes:

CRDL - contract-required detection limit

EPA - United States Environmental Protection Agency

LTM - Long-Term Groundwater Monitoring

MTBE - tert-Butylmethyl ether

NMGWQ - New Mexico Groundwater Quality

Trace - inductively coupled plasma trace analysis

VOC - volatile organic compound

## 1. INTRODUCTION

This report presents the results of the 2001 Long-Term Groundwater Monitoring (LTM) Program for 17 Resource Conservation and Recovery Act (RCRA) and Installation Restoration Program sites at Holloman Air Force Base (AFB), New Mexico (Figure 1-1). Sites were included in the LTM Program based on investigations and risk assessments conducted for each site. The community participation, background information, quantitative risk assessments, and selected remedies are summarized in the Decision Document for each site or presented in the following documents: *Decision Documents for Installation Restoration Program Sites* (Walk, Haydel & Associates 1990), *Decision Documents for Installation Restoration Program* (EBASCO/Groundwater Technology Inc. 1995), and *Feasibility Study—Investigation, Study, and Recommendations for 29 Waste Sites* (Radian 1993). These documents establish the requirement for long-term groundwater monitoring as a condition of site closure. The objective of the LTM Program is twofold:

- Ensure that the selected remedy has effectively stopped the release of contamination to the groundwater for the two sites with ongoing remediation, and/or
- Ensure that further degradation to groundwater quality is not occurring for all 17 sites.

The LTM Program was designed as a 10-year program with monitoring performed once every 2 years. The 2001 program represents the fourth of five scheduled sampling events. The first three LTM Program sampling events were conducted in August 1995, September 1997, and September 1999.

During the 1995 LTM Program, monitoring was conducted at 12 different sites. Eleven of these sites (OT-45 was eliminated) were included in the 1997 and 1999 sampling events along with six additional sites. The 17 LTM sites were included in the 2001 sampling event and are listed in Table 1-1.

Remediation is on-going for the following sites:

- SS-02/SS-05, Petroleum, Oils, and Lubricants (POL) Spill Sites Nos. 1 and 2—Operation of soil-vapor extraction (SVE) system
- SS-17, BX (Base Exchange) Service Station—Operation of SVE system

The 2001 LTM Program activities included measuring static water levels and collecting groundwater samples at selected monitoring wells. Groundwater samples were collected from 65 monitoring wells located at the 17 LTM sites listed in Table 1-1. Site locations are shown on Figure 1-2. Groundwater samples were submitted for site-specific chemical analyses including volatile organic compounds



(VOCs), semivolatle organic compounds (SVOCs), organochlorine pesticides (OCPs), polychlorinated biphenyls (PCBs), chlorinated herbicides, total mercury, dissolved RCRA metals, iron, manganese, and dissolved lead. Analyses were performed in accordance with *SW-846 Test Methods for Evaluating Solid Waste*, third edition and updates (U.S. Environmental Protection Agency [EPA] 1986).

**Table 1-1. 2001 Long-Term Monitoring Program Sites**

Site	SWMU	Location
LF-01	106	Main Base Landfill
SS-02/SS-05 *	AOC-T	POL Spill Sites Nos. 1 and 2
SD-08	4, 82	Refuse Collection Truck Wash rack
LF-10	101, 109	Old Main Base Landfill
OT-16 *	118, 132, AOC-A	Former Entomology Shop Area
SS-17 *	None	BX Service Station
LF-19	105	Golf Course Landfill
LF-21	116	West Area Landfill No. 2
LF-22	115	West Area Landfill No.1
LF-23	108	MOBBS Landfill
LF-29 *	104	Former Army Landfill
DP-30/SD-33	113B	Grease Trap Disposal Pits
SS-39 *	165, 177, 179, 181	Missile Fuel Spill Area
OT-44	AOC-P	Building 301 Aircraft Maintenance Area
SS-46 *	130	JP-4 Spill Site
SS-48	None	Military Gas Station
SS-56	None	West Ramp Fuel Spill

\* These sites were added to the LTM Program during the 1997 sampling event. OT-45 was removed from the LTM Program after the 1995 baseline sampling event.

AOC	area of concern	POL	Petroleum, oils, and lubricants
BX	Base Exchange	SWMU	Solid Waste Management Unit
MOBBS	Mobile Bare Base Squadron		

## 1.1 PURPOSE

This report presents the background and site-specific information necessary to assess groundwater quality and provides recommendations for future long-term groundwater monitoring at Holloman AFB. The data evaluation will provide the basis for recommending future monitoring under the LTM Program.

Any recommendation made in this report to revise the analytical requirements at a site is supported by the data evaluation results.

## 1.2 DOCUMENT ORGANIZATION

This 2001 LTM report presents groundwater sampling procedures and site-specific background information and analytical results. The document contains the following 21 sections:

- Section 1.0 – Introduction
- Section 2.0 – Sampling Procedures
- Sections 3.0 through 19.0 – Site-Specific Long-Term Groundwater Monitoring Results
- Section 20.0 – Conclusions and Recommendations
- Section 21.0 – References

Pertinent site background information and specific agreements made between the U.S. Air Force and the New Mexico Environment Department (NMED) for each site are presented in the *Draft Final 1995 Long-Term Groundwater Monitoring Report* (Foster Wheeler Environmental Corporation [Foster Wheeler] and Groundwater Technology Government Services, Inc. [GTI] 1996). This information, which provides the basis for the site-specific 2001 LTM Program, has been updated and is summarized in each site-specific section (Sections 3.0 through 19.0).

This report also includes three appendices. Appendix A presents the Data Quality Control Summary Report for the analytical data collected during the September 2001 LTM Program sampling event. Appendix B provides the analytical results from the subcontractor laboratory for environmental samples and field duplicates. Field sampling and monitoring well gauging information is provided in Appendix C.