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# Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area H, Solid Waste Management Unit 54-004, at Technical Area 54, Second Quarter Fiscal Year 2009

Los Alamos
NATIONAL LABORATORY
EST. 1943

Prepared by the Environmental Programs Directorate

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# Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area H, Solid Waste Management Unit 54-004, at Technical Area 54, Second Quarter Fiscal Year 2009

July 2009

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## EXECUTIVE SUMMARY

This periodic monitoring report summarizes vapor-monitoring activities conducted during the second quarter of fiscal year (FY) 2009 at Material Disposal Area (MDA) H, Solid Waste Management Unit 54-004, at Technical Area 54 at Los Alamos National Laboratory. The objective of the monitoring is to evaluate trends in volatile organic compound (VOC) concentrations and tritium activity levels over time in subsurface vapor at MDA H.

Monitoring conducted during the second quarter of FY2009 included field screening and collecting vapor samples from 15 sampling ports within 3 vapor-monitoring boreholes at MDA H. Vapor samples were submitted for laboratory analyses of VOCs and tritium. Tritium concentrations have been corrected to account for the effects of silica gel–bound water.

The analytical results continue to confirm the presence of VOCs and tritium in pore-vapor samples collected at MDA H. These results for detected VOCs and tritium are consistent with previous sampling results. Vapor-monitoring results indicate that concentrations of VOCs in pore gas are not high enough to cause groundwater screening levels to be exceeded. Tritium values decrease with depth and distance from MDA H.

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## 1.0 INTRODUCTION

This periodic monitoring report presents the results of vapor-monitoring activities conducted during the second quarter of fiscal year (FY) 2009 at Material Disposal Area (MDA) H, Solid Waste Management Unit 54-004, at Technical Area 54 (TA-54) at Los Alamos National Laboratory (LANL or the Laboratory).

MDA H is located in the east-central portion of the Laboratory at TA-54 (Figure 1.0-1) on Mesita del Buey. MDA H is a 70-ft by 200-ft (0.3-acre) fenced area consisting of nine inactive vertical disposal shafts arranged in a line approximately 15 ft within, and parallel to, its southern fence line (Figure 1.0-2). Each shaft is cylindrical, 6 ft in diameter, and 60 ft deep. The shafts are filled with solid-form waste to a depth of 6 ft below ground surface (bgs). The waste in Shafts 1 to 8 is covered by a 3-ft layer of concrete placed over 3 ft of crushed tuff; the waste in Shaft 9 is covered by 6 ft of concrete. The regional aquifer beneath MDA H is estimated to be at an average depth of approximately 1040 ft bgs, based on data from nearby wells and the predictions of the hydrogeologic conceptual model for the Pajarito Plateau (LANL 1998, 059599).

From May 1960 to August 1986, MDA H functioned as the Laboratory's primary disposal area for classified solid-form waste. Between periods of waste disposal, each shaft was covered with a padlocked steel plate to prevent unauthorized access to classified materials. Much of the classified waste was nonhazardous; however, various hazardous chemicals, radionuclide-contaminated materials, and materials contaminated by high explosives were also disposed of at MDA H. These materials included scraps and shapes contaminated with depleted uranium, drummed radioactive waste, fuel elements, a tritium-contaminated unit, plutonium-contaminated shapes, and decontamination and decommissioning scrap.

Vapor monitoring at MDA H consists of screening 15 sampling ports in 3 vapor-monitoring boreholes (Figure 1.0-2). Volatile organic compound (VOC) and tritium samples are collected from each of the 15 sampling ports completed within each stratigraphic unit. Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to the New Mexico Environment Department (NMED) in accordance with U.S. Department of Energy policy.

Vapor monitoring at MDA H has been conducted since the second quarter of FY2005. The NMED-approved vapor-monitoring boreholes and the corresponding sampling intervals field screened and sampled are presented in Table 1.0-1. A summary of vapor-monitoring activities follows.

- On April 11, 2003, NMED sent a letter (NMED 2003, 075939) approving the Resource Conservation and Recovery Act facility investigation report for MDA H (LANL 2001, 070158) and subsequent addendum to the report (LANL 2002, 073270).
- In May 2003, the Laboratory submitted the corrective measures study for MDA H (LANL 2003, 076039) identifying a preferred remedy. Comments were received from NMED, and the report was reissued in June 2005 (LANL 2005, 089332).
- In December 2004, NMED sent a letter (NMED 2004, 092217) requesting that the Laboratory collect quarterly subsurface vapor-monitoring samples from borehole locations 54-15461, 54-15462, and 54-01023 to provide data to facilitate NMED's selection of an appropriate remedy for MDA H.

- In May 2005, NMED sent a letter (NMED 2005, 092219) requesting that the Laboratory continue to collect quarterly subsurface vapor-monitoring samples from borehole locations 54-15461, 54-15462, and 54-01023.
- In February 2005, the Laboratory began quarterly pore-gas monitoring using an inflatable packer sampling system. In March 2006, the Laboratory installed dedicated Flexible Liner Underground Technology (FLUTe) sampling membranes into each MDA H pore-gas monitoring location.
- NMED reviewed the 2007 pore-gas monitoring report and, based on packer sampling results for trichloroethene (TCE) in pore-gas samples collected before installing dedicated sampling equipment (FLUTe), suggested that the FLUTe membrane was adsorbing VOCs (NMED 2007, 099277; NMED 2008, 100480). A comparison of VOCs in subsurface vapor samples was conducted during the second and third quarters of FY2008. The purpose of the test was to compare VOC concentrations using the FLUTe system versus the packer system to collect subsurface vapor samples. This test compared vapor-sampling results between the FLUTe systems currently used at MDA H with the packer sampling system used at MDA H from 2001 to 2006. The results of this test are discussed in “Pilot Test Report for Comparing Packer and FLUTe Vapor-Sampling Systems at Material Disposal Area H” (LANL 2008, 103889). Pore gas was sampled using the FLUTe membrane system during the second quarter sampling event; however, the FLUTe membrane was damaged during the removal process to accommodate packer sampling for the comparison study. The FLUTe was sent to the manufacturer for repair before it was reinstalled for third quarter sampling activities, which were conducted as planned. During the membrane removal, the tubing was disconnected from the manifold and subsequently misaligned when it was reinstalled before third quarter FY2008 sampling activities.
- During the first quarter FY2009 (December 2008) sampling event, the field crew observed that one tube connecting the FLUTe membrane’s subsurface sampling port to the surface manifold in borehole location 54-15462 did not correspond to the correct fitting for that depth interval on the manifold. The borehole was sampled in the observed tubing configuration (with the exception of the 60-ft port depth, which was not sampled), and the membrane was removed following sampling. After the membrane was removed, it was determined that five of the six tubes were not connected to the correct fittings for the depth intervals on the manifold. In addition, one sampling port (60-ft depth) was not reconnected to any sample tubing at that time.
- As a result of the tubing misalignment, the samples collected from the borehole during the third and fourth quarter FY2008 sampling events and the first quarter FY2009 sampling event were aligned with the wrong depth intervals. Although the misalignment of the tubing in borehole location 54-15462 was not discovered until the first quarter FY2009 sampling event, the ambient air values measured in the port indicated the tubing may have been disconnected in the 60-ft port depth during the fourth quarter FY2008 sampling event. Therefore, the 60-ft port depth was not sampled during the fourth quarter FY2008 and first quarter FY2009 sampling events. The 60-ft port depth was sampled during the third quarter FY2008 sampling event; however, the results are not representative of formation air at this port depth.
- Because of the problems with the tubing configuration in borehole location 54-15462, the Laboratory corrected the field documentation (sample collection logs and field notebooks) for the third and fourth quarter FY2008 sampling events and for the first quarter FY2009 sampling event.
- The Sample Management Database records were updated to correlate the results to the correct port depths sampled in borehole location 54-15462 during the third and fourth quarters of FY2008 and the first quarter of FY2009.

- Analytical results and their associated port depths were reported correctly in "Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area H, Solid Waste Management Unit 54-004, at Technical Area 54, Fiscal Year 2008" (LANL 2009, 105191).
- The third quarter FY2008 pore-gas results presented in "Pilot Test Report for Comparing Packer and FLUTe Vapor-Sampling Systems at Materials Disposal Area H" were incorrect (LANL 2008, 103889). The information presented in this report was revised and the report was resubmitted to NMED in February 2009 as "Pilot Test Report for Comparing Packer and FLUTe Vapor-Sampling Systems at Materials Disposal Area H, Revision 1" (LANL 2009, 105076).
- Although pore-gas screening and analytical data for borehole location 54-15462 reported for the third and fourth quarters of FY2008 and the first quarter of FY2009 were corrected in all field and laboratory documentation to correlate the results to the actual depths monitored, NMED rejected all data for this borehole collected during these three events. The data were rejected on the basis that misalignment of the sampling ports to the manifold may have resulted in inadequate purge volumes (NMED 2009, 105599).

Subsurface vapor-field screening and sampling are being performed to characterize VOC concentration and tritium activity level trends in subsurface vapor over time. Field-screening data and analytical laboratory results for the second quarter of FY2009 and the previous three quarters are presented in this report.

## 2.0 SCOPE OF ACTIVITIES

The following sampling activities were completed at MDA H during the second quarter of FY2009, as directed by NMED in a December 21, 2004, letter to the Laboratory (NMED 2004, 092217) and in a May 17, 2005, letter to the Laboratory (NMED 2005, 092219). Second quarter vapor-monitoring activities were conducted from March 9, 2009, to April 6, 2009. Vapor-monitoring boreholes and the corresponding sampling intervals field screened and sampled are presented in Table 1.0-1. Vapor-monitoring borehole locations are shown in Figure 1.0-2.

- Each sampling interval was purged to ensure that formation air was sampled in accordance with Standard Operating Procedure EP-ERSS-SOP-5074.
- Pore gas from each sampling interval was field screened for carbon dioxide ($CO_2$) and oxygen ($O_2$) using a Landtec GEM-500 and for selected VOCs, $CO_2$, and water vapor using a Brüel and Kjær (B&K) Type 1302 multigas photoacoustic analyzer. The pressure differential was also measured at each sampling interval.
- Vapor samples were collected from each sampling interval in SUMMA canisters for laboratory analyses of VOCs using U.S. Environmental Protection Agency (EPA) Method TO-15.
- Tritium samples were collected from each sampling interval with silica gel columns for laboratory analysis using EPA Method 906.0.
- A total of 15 VOC samples were collected from 15 ports in three boreholes.
- A total of 15 tritium samples were collected from 15 ports in three boreholes.

No investigation-derived waste was generated during quarterly monitoring.

## 2.1 Second Quarter FY2009 Deviations

Required vapor-monitoring locations and sampling intervals for MDA H are shown in Table 1.0-1. There were two deviations during the second quarter FY2009 sampling event: VOC sampling was completed on April 2, 2009, and tritium sampling was completed on April 6, 2009.

# 3.0 REGULATORY CRITERIA

The March 1, 2005, Compliance Order on Consent (the Consent Order) does not identify any cleanup standards, risk-based screening levels (SLs), risk-based cleanup goals, or other regulatory criteria for pore gas at MDA H. Therefore, an analysis was conducted to evaluate the potential for contamination of groundwater by VOCs in pore gas using SLs based on groundwater cleanup levels in the Consent Order. The analysis evaluated the groundwater concentration that will be in equilibrium with the maximum concentrations of VOCs detected at MDA H during the most recent monitoring event. The equilibrium relationship between air and water concentrations is described by the following equation.

$$C_{water} = C_{air}/H' \qquad \textbf{Equation 3.0-1}$$

Where $C_{water}$ = the volumetric concentration of contaminant in water,

$C_{air}$ = the volumetric concentration of contaminant in air, and

$H'$ = dimensionless form of Henry's law constant.

If the predicted concentration of a particular VOC in groundwater is less than the SL, then no potential exists for exceedances of groundwater cleanup levels. The analysis of the second quarter MDA H VOC pore gas data is presented in section 5.0.

Because there are no SLs for pore gas that address the potential for groundwater contamination, the screening evaluation was based on groundwater standards or tap water SLs and Henry's law constants that describe the equilibrium relationship between vapor and water concentrations. The source of the Henry's law constants is the NMED technical background document (NMED 2006, 092513) or the EPA regional screening tables (http://www.epa.gov/region06/6pd/rcra_c/pd-n/screen.htm). The following dimensionless form of Henry's law constant was used:

$$H' = \frac{C_{air}}{C_{water}} \qquad \textbf{Equation 3.0-2}$$

Equation 3.0-2 can be used to calculate the following screening value (SV):

$$SV = \frac{C_{air}}{1000 \times H' \times SL} \qquad \textbf{Equation 3.0-3}$$

where $C_{air}$ is the concentration of a particular VOC in the pore-gas sample (μg/m$^3$), H' is the dimensionless Henry's law constant, SL is the screening level (μg/L), and 1000 is a conversion factor from L to m$^3$. The SLs are the groundwater standards or tap water SLs. The groundwater standards are the EPA maximum contaminant level (MCL) or New Mexico Water Quality Control Commission (NMWQCC) groundwater standard, whichever is lower. If there is no MCL or NMWQCC standard, the EPA regional tap water SL (http://www.epa.gov/region06/6pd/rcra_c/pd-n/screen.htm) is used and adjusted to $10^{-5}$ risk for carcinogens. The numerator in Equation 3.0-3 is the actual concentration of the VOC in pore gas, and the denominator represents the pore-gas concentration needed to exceed the SL.

Therefore, if the SV is less than 1, the concentration of the VOC in pore gas does not exceed the SL, even if the VOC plume were in contact with groundwater. Table 3.0-1 presents the calculated concentrations of contaminants in pore gas corresponding to groundwater SLs.

## 4.0 FIELD-SCREENING RESULTS

Second quarter FY2009 vapor-monitoring field-screening activities were conducted at MDA H from March 9 to April 6, 2009. Before sampling, each sample interval was purged to ensure formation air was collected. The vapor from each port was field screened using a Landtec GEM-500 photoionization detector equipped with an 11.7-eV lamp to measure percent $CO_2$ and $O_2$. Each interval was monitored with the Landtec until $CO_2$ and $O_2$ readings stabilized. The stabilized percent $CO_2$ and $O_2$ values measured at each sampling location during the second quarter of FY2009 and the previous three quarters are provided in Table 4.0-1. After purging and stabilization, VOC field-screening results were collected using a B&K Type 1302 multigas photoacoustic analyzer to estimate VOC concentrations. The B&K is calibrated for analysis of four VOCs including trichlorofluoromethane (Freon-11); tetrachloroethene (PCE); 1,1,1-trichloroethane (TCA); and TCE. It also measures $CO_2$ and water vapor. The stabilized B&K field-monitoring values measured at each sampling location for the second quarter of FY2009 and the previous three quarters at each sampling location are provided in Table 4.0-2. The field-screening quality assurance/quality control (QA/QC) program is summarized in Appendix B, section B-5.0.

## 5.0 ANALYTICAL DATA RESULTS

Second quarter FY2009 vapor-sampling activities were conducted at MDA H from March 9, 2009, to April 6, 2009. Sampling locations and depths are provided in Table 1.0-1. Analytical vapor samples were collected in SUMMA canisters and submitted for laboratory analyses of VOCs according to EPA Method TO-15. Analytical vapor samples were collected in silica gel columns and submitted for laboratory analyses of tritium according to EPA Method 906.0. Table 5.0-1 presents analytical results for detected VOCs in samples collected during the second quarter of FY2009 and the three previous quarters. Detected VOC concentrations for the second quarter FY2009 are shown in Figure 5.0-1. Table 5.0-2 presents analytical results for detected activity levels of tritium in samples collected during the second quarter of FY2009 and the three previous quarters. Detected tritium activity levels for the second quarter FY2009 are shown in Figure 5.0-2. Analytical data and reports for the second quarter FY2009 and the three previous quarters are included in Appendix C (on CD included with this report). Tritium and VOC analytical data were reviewed in accordance with the QA/QC program presented in Appendix B.

A systematic low bias in previously reported tritium pore-vapor measurements has been identified (Whicker et al. 2009, 106429); tritium data presented in Table 5.0-2 have been corrected for this bias (Marczak 2009, 106500). The bias resulted from the properties of silica gel, the medium used to collect water vapor from pore-gas samples. Silica gel contains water bound to the silica gel molecules that cannot be completely removed by drying, before it is used in sampling, without degrading the silica gel properties. Thus, when water vapor is collected from the pore gas, the tritiated water vapor is diluted into the water bound to the silica gel molecules. The tritium results were corrected using the percent moisture value determined by the analytical laboratory. The corrected tritium results are reported in Table 5.0-2 and in Appendix C.

### 5.1 Data Summary

During the second quarter of FY2009, 24 VOCs were detected in the 15 vapor samples collected from MDA H. Dichlorodifluoromethane and Freon-11 were detected in 14 samples and TCA was detected in

13 samples. Eleven samples had detected concentrations of acetone and nine samples had detected concentrations of 1-butanol. Toluene; 2-butanone; chlorobenzene; and 1,1,2-trichloro-1,2,2-trifluoroethane were detected in eight samples each. PCE was detected in only two samples. The two highest concentrations of VOCs were 1000 $\mu g/m^3$ (280 ppbv) and 750 $\mu g/m^3$ (200 ppbv) of toluene in borehole location 54-15462 at port depths 10 ft bgs and 254 ft bgs, respectively. Second quarter FY2009 toluene concentrations were 1 to 2 orders of magnitude higher than the concentrations reported in third quarter FY2008. Chlorobenzene, detected in five port depths in second quarter FY2009, was not detected in third quarter FY2008 samples at this location. Second quarter FY2009 VOC concentrations were generally consistent with VOC concentrations observed in boreholes 54-01023 and 54-15461 during the three previous sampling events (Table 5.0-1).

Tritium was detected in 10 of the 15 vapor samples collected at activity levels ranging from 370 pCi/L to 4,635,189 pCi/L. The highest tritium activity levels were detected in vapor samples collected from borehole location 54-01023, the monitoring borehole nearest MDA H, indicating a tritium source in the shafts. During the second quarter of FY2009, tritium activity levels in this borehole location decreased with depth from 4,635,189 pCi/L at the top port depth (10 ft bgs) to 746,273 pCi/L at the lowest port depth (247 ft bgs). The highest activity level (4,635,189 pCi/L) is within the same order of magnitude as the highest activity levels from the previous three quarters. Tritium activity levels in borehole locations 54-15461 and 54-15462 in the second quarter of FY2009 ranged from 370 pCi/L to 21,855 pCi/L. The highest activity level in these outer locations is more than an order of magnitude lower than the lowest tritium activity level at borehole location 54-01023, indicating that tritium activity levels decrease with distance from MDA H.

## 5.2 Data Evaluation

The VOC results from the second quarter of FY2009 were screened to evaluate whether the concentrations of VOCs are a potential source of groundwater contamination. Because there are no SLs for pore gas that address the potential for groundwater contamination, the screening evaluation was based on groundwater standards or tap water SLs and Henry's law constants that describe the equilibrium relationship between vapor and water concentrations (see section 3.0).

SVs were calculated for the maximum concentrations of VOCs detected at MDA H using Equation 3.0-3 during the second quarter of FY2009. The evaluation included the 19 detected VOCs in MDA H samples for which there are MCLs, NMWQCC standards, or EPA regional tap water SLs. Table 5.2-1 presents the results of the pore-gas screening. SVs were less than 1.0 for all detected VOCs. Based on this evaluation, the concentrations of VOCs in the pore gas beneath MDA H do not pose an immediate potential source of groundwater contamination.

# 6.0 SUMMARY

The purpose of the quarterly pore-gas monitoring activities at MDA H is to evaluate trends in VOC concentrations and tritium activities in subsurface vapor at MDA H over time. The results from the second quarter FY2009 monitoring event are summarized as follows.

- VOC concentrations are present at low concentrations (≤1000 $\mu g/m^3$ or ≤430 ppbv) in subsurface vapor and are generally consistent with concentrations observed during the three previous quarterly sampling events.
- Maximum detected concentrations of VOCs are present in borehole location 54-15462. VOC values do not decrease with depth and are fairly consistent throughout the borehole location.

- The maximum detected concentrations of all VOCs in pore gas were less than the concentrations needed to exceed groundwater SLs.
- Analytical laboratory results for tritium have been corrected to account for the impact of silica gel–bound water. All values presented in this report (including those provided in Appendix C) have been corrected. All discussions of data values, detections, and trends present the corrected tritium concentrations.
- Tritium in pore vapor was detected in 10 samples analyzed during the second quarter of FY2009; the activity levels are generally consistent with those detected during the three previous quarterly sampling events.
- Tritium activity levels in pore vapor at borehole location 54-01023 were more than an order of magnitude greater than activities from borehole locations 54-15461 and 54-15462 at similar depths. Tritium activities decreased laterally within a short distance from MDA H. Tritium activity levels in borehole location 54-01023 decreased with depth.

## 7.0 REFERENCES AND MAP DATA SOURCES

### 7.1 References

*The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.*

*Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.*

LANL (Los Alamos National Laboratory), May 22, 1998. "Hydrogeologic Workplan," Los Alamos National Laboratory document LA-UR-01-6511, Los Alamos, New Mexico. (LANL 1998, 059599)

LANL (Los Alamos National Laboratory), May 2001. "RFI Report for Material Disposal Area H at Technical Area 54," Los Alamos National Laboratory document LA-UR-01-1208, Los Alamos, New Mexico. (LANL 2001, 070158)

LANL (Los Alamos National Laboratory), October 2002. "Addendum to the RFI Report for Material Disposal Area H (Solid Waste Management Unit 54-004) at Technical Area 54," Los Alamos National Laboratory document LA-UR-02-3397, Los Alamos, New Mexico. (LANL 2002, 073270)

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LANL (Los Alamos National Laboratory), September 2008. "Pilot Test Report for Comparing Packer and FLUTe Vapor-Sampling Systems at Material Disposal Area H," Los Alamos National Laboratory document LA-UR-08-5872, Los Alamos, New Mexico. (LANL 2008, 103889)

LANL (Los Alamos National Laboratory), January 2009. "Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area H, Solid Waste Management Unit 54-004, at Technical Area 54, Fiscal Year 2008," Los Alamos National Laboratory document LA-UR-09-0473, Los Alamos, New Mexico. (LANL 2009, 105191)

LANL (Los Alamos National Laboratory), February 2009. "Pilot Test Report for Comparing Packer and FLUTe Vapor-Sampling Systems at Material Disposal Area H, Revision 1," Los Alamos National Laboratory document LA-UR-09-0924, Los Alamos, New Mexico. (LANL 2009, 105076)

Marczak, S., July 2009. "Technical Implementation of the Correction Factor Calculation for Tritium in Pore-Gas Data," Los Alamos National Laboratory document LA-UR-09-4629, Los Alamos, New Mexico. (Marczak 2009, 106500)

NMED (New Mexico Environment Department), April 11, 2003. "Approval of RCRA Facility Investigation Report for Material Disposal Area H," New Mexico Environment Department letter to P. Nanos (LANL Interim Director), and D. Gregory (DOE-OLASO) from J. Young (NMED), Santa Fe, New Mexico. (NMED 2003, 075939)

NMED (New Mexico Environment Department), December 21, 2004. "Notification to Collect Additional Vapor Monitoring Data at MDA H, SWMU 54-004, at TA-54," New Mexico Environment Department letter to D. Gregory (DOE LASO) and G.P. Nanos (LANL Director) from N. Dhawan (NMED-HWB), Santa Fe, New Mexico. (NMED 2004, 092217)

NMED (New Mexico Environment Department), May 17, 2005. "Notification for Additional Information for MDA H, SWMU 54-004, at TA-54," New Mexico Environment Department letter to D. Gregory (DOE LASO) and G.P. Nanos (LANL Director) from N. Dhawan (NMED-HWB), Santa Fe, New Mexico. (NMED 2005, 092219)

NMED (New Mexico Environment Department), June 2006. "Technical Background Document for Development of Soil Screening Levels, Revision 4.0, Volume 1, Tier 1: Soil Screening Guidance Technical Background Document," New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, Santa Fe, New Mexico. (NMED 2006, 092513)

NMED (New Mexico Environment Department), December 21, 2007. "Review of Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area H, Solid Waste Management Unit 54-004, at Technical Area 54, Fiscal Year 2007," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2007, 099277)

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NMED (New Mexico Environment Department), April 7, 2009. "Review of the Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area H, Solid Waste Management Unit 54-004, at Technical Area 54, Fiscal Year 2008, Revision 1 and the Pilot Test Report for Comparing Packer and FLUTe Vapor-Monitoring Systems at Material Disposal Area H, Revision 1," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2009, 105599)

Whicker, J.J., J.M. Dewart, S.P. Allen, W.F. Eisele, M.C. McNaughton, and A.A. Green, June 17, 2009. "Corrections for Measurement of Tritium in Subterranean Vapor Using Silica Gel," Los Alamos National Laboratory document LA-UR-09-03837, Los Alamos, New Mexico. (Whicker et al. 2009, 106429)

## 7.2 Map Data Sources

Data sources used in original figures created for this report are described below and identified by legend title.

| Legend Item | Data Source |
|---|---|
| Disposal pit | Waste Storage Features; LANL, Environment and Remediation Support Services Division, GIS/Geotechnical Services Group, EP2007-0032; 1:2,500 Scale Data; 13 April 2007. |
| Disposal shaft | Waste Storage Features; LANL, Environment and Remediation Support Services Division, GIS/Geotechnical Services Group, EP2007-0032; 1:2,500 Scale Data; 13 April 2007. |
| Elevation contour | Hypsography, 10, 20, & 100 Foot Contour Intervals; LANL, ENV Environmental Remediation and Surveillance Program; 1991. |
| Fence | Security and Industrial Fences and Gates; LANL, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 10 September 2007. |
| LANL boundary | LANL Areas Used and Occupied; LANL, Site Planning & Project Initiation Group, Infrastructure Planning Division; 19 October 2008. |
| MDA | Materials Disposal Areas; LANL, ENV Environmental Remediation and Surveillance Program; ER2004-0221; 1:2,500 Scale Data; 23 April 2004. |
| Paved road | Paved Road Arcs; LANL, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 10 September 2007. |
| Structure | Structures; LANL, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 10 September 2007. |
| TA boundary | Technical Area Boundaries; LANL, Site Planning & Project Initiation Group, Infrastructure Planning Division; 19 September 2007. |
| Unpaved road | Dirt Road Arcs; LANL, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 10 September 2007. |
| Vapor-monitoring well | Point Feature Locations of the Environmental Restoration Project Database; LANL, Environment and Remediation Support Services Division, EP2007-0754; 30 November 2007. |

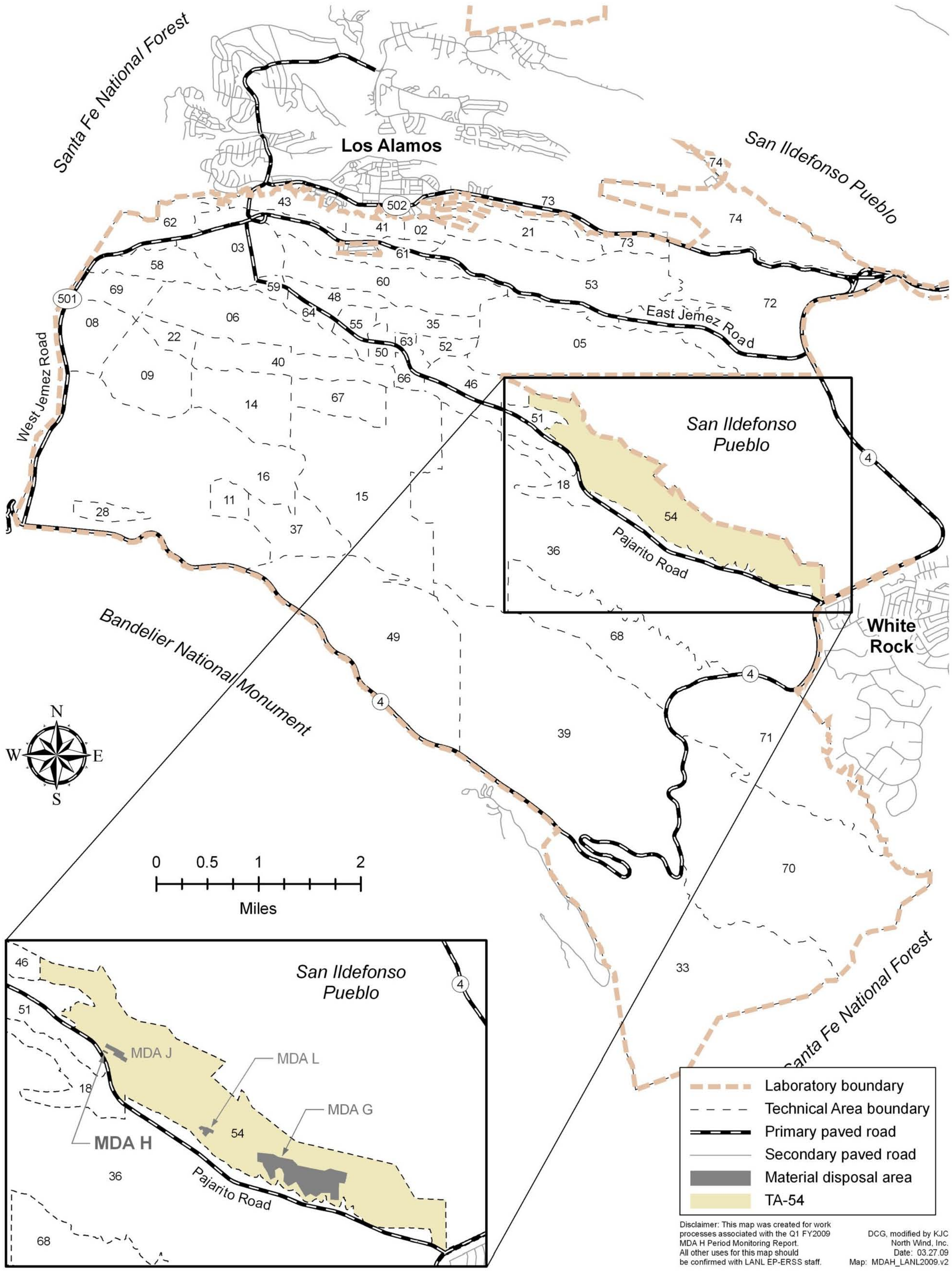


**Figure 1.0-1 Location of MDA H in TA-54 with respect to Laboratory TAs and surrounding land holdings**

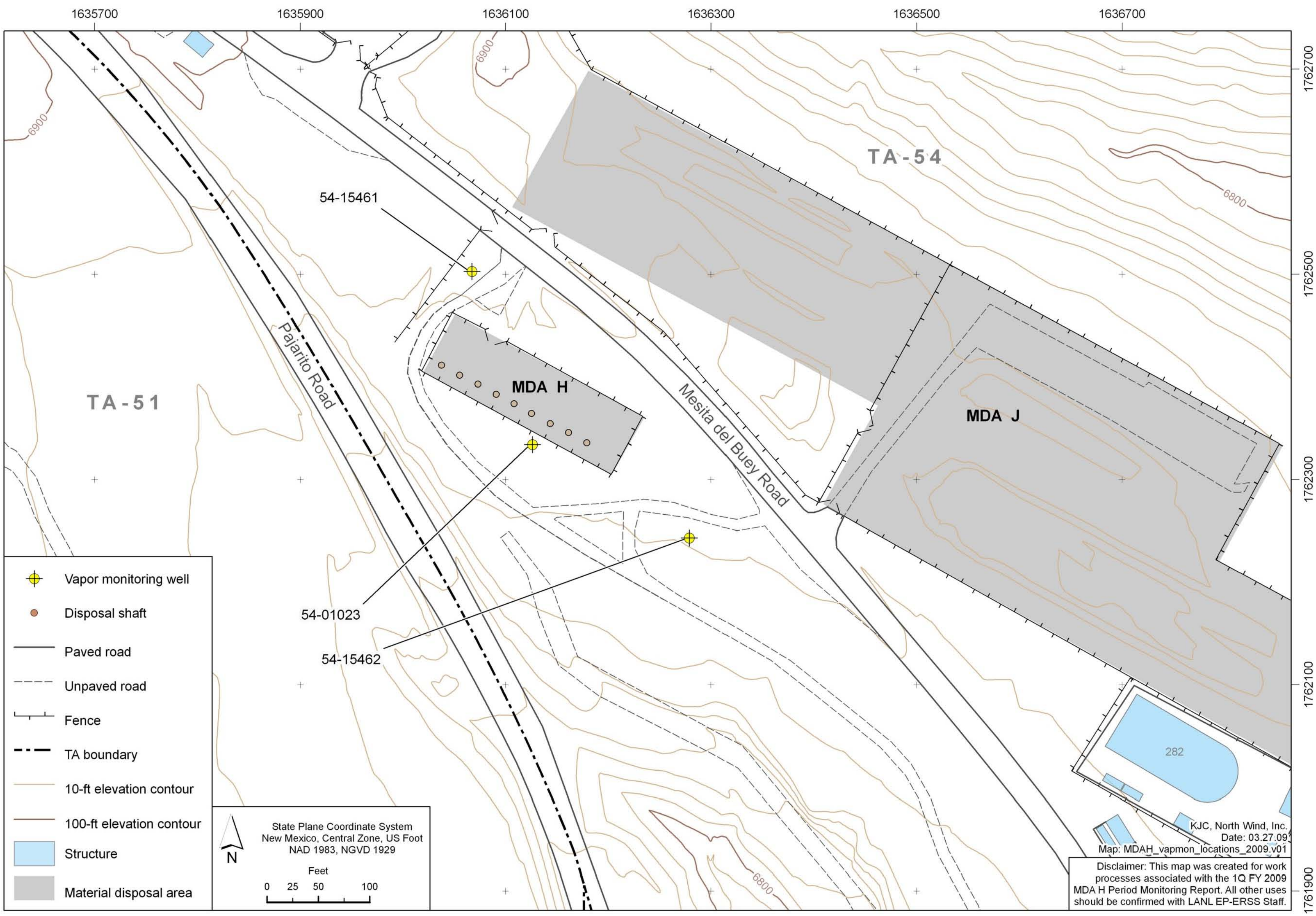


**Figure 1.0-2 Locations of MDA H pore-gas monitoring boreholes**

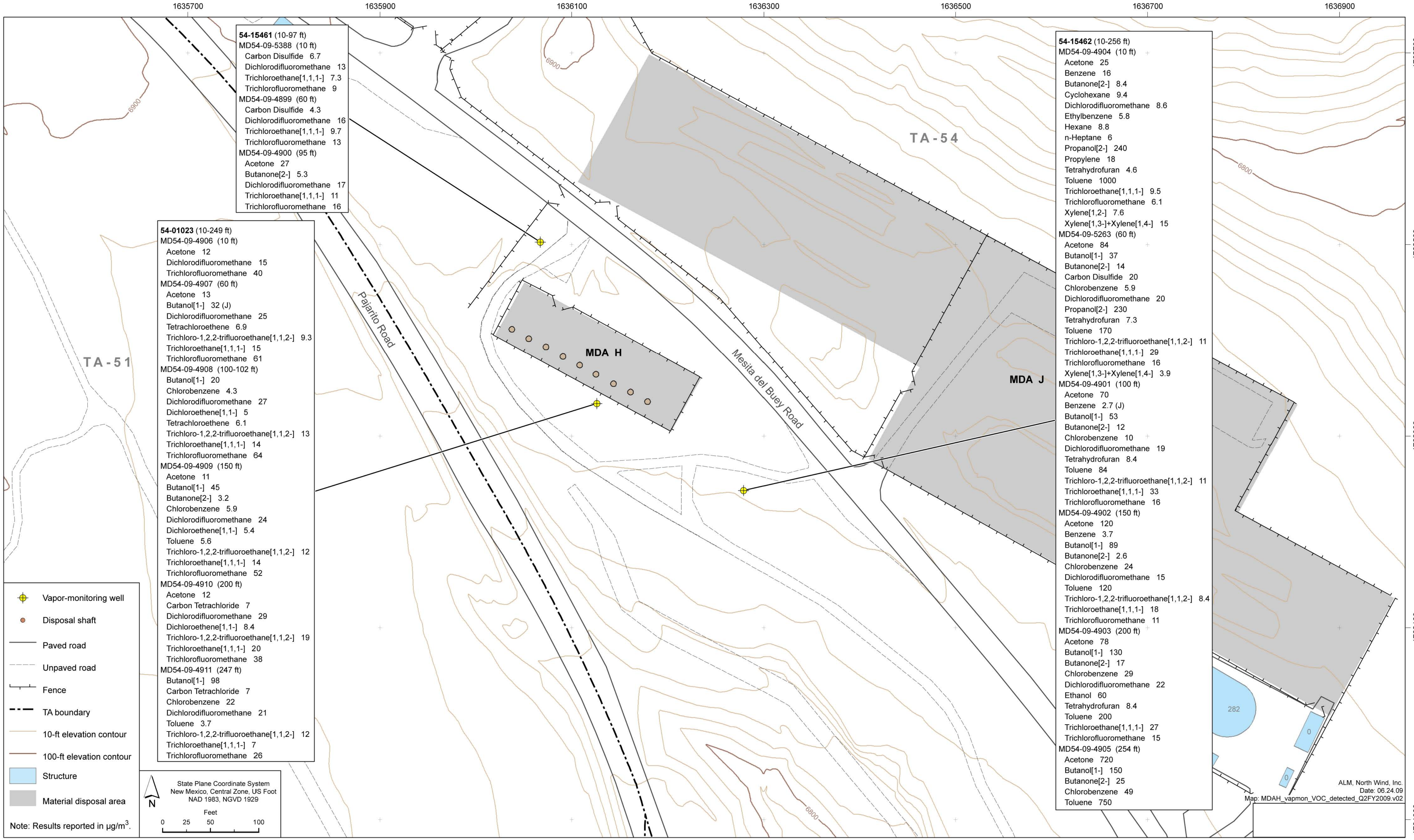


**Figure 5.0-1 VOCs detected in vapor samples at MDA H**

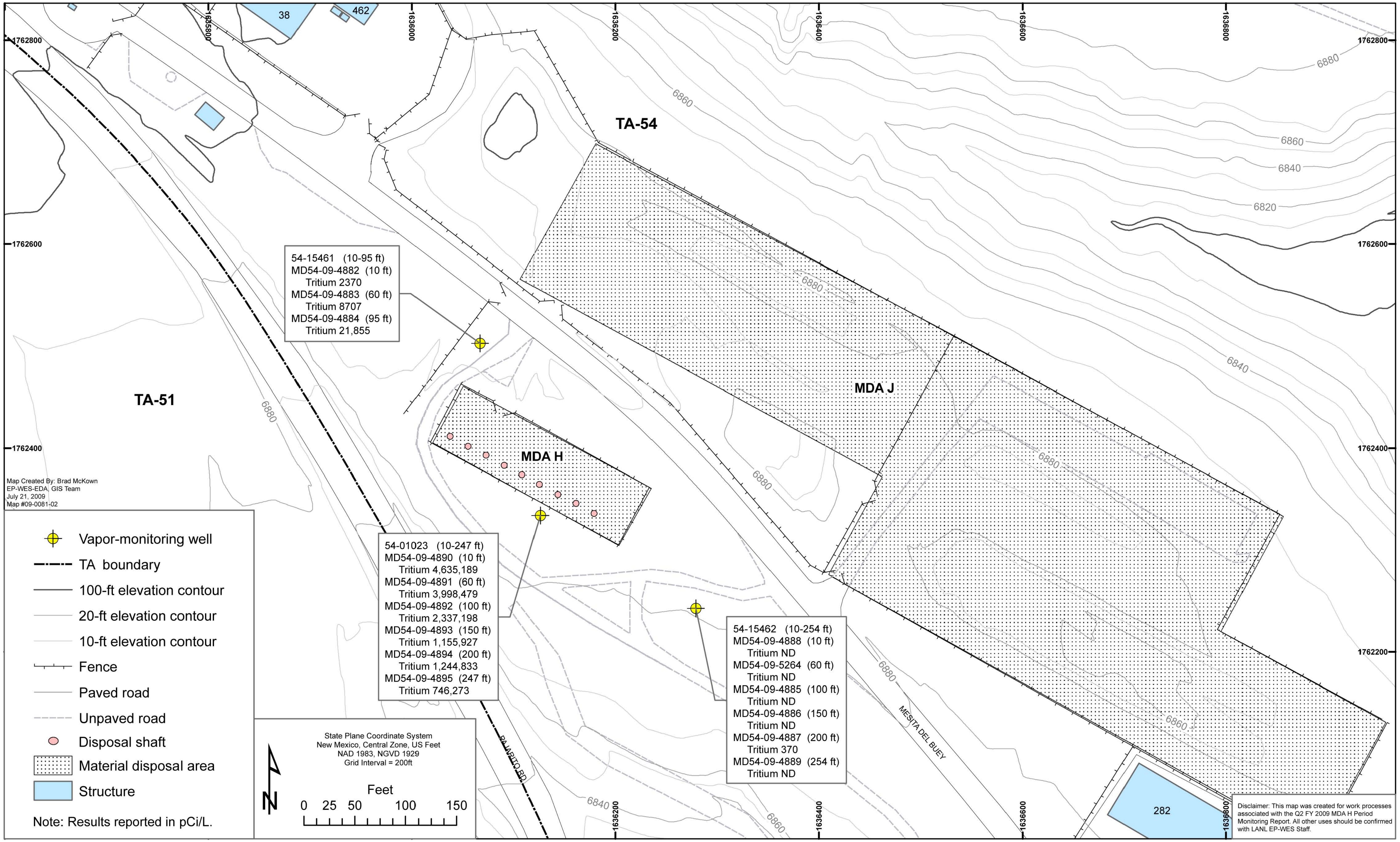


**Figure 5.0-2 Tritium detected in vapor samples at MDA H**

**Table 1.0-1**
**MDA H Subsurface Vapor-Monitoring Locations**

| Borehole ID | VOC and Tritium Sampling Port Depth Interval (ft) | | | | | |
|---|---|---|---|---|---|---|
| 54–01023 | 10 (10–12) | 60 (60–62) | 100 (100–102) | 150 (150–152) | 200 (200–202) | 247 (247–249) |
| 54–15461 | 10 (10–12) | 60 (60–62) | 95 (95–97) | —* | — | — |
| 54–15462 | 10 (10–12) | 60 (60–62) | 100 (100–102) | 150 (150–152) | 200 (200–202) | 254 (254–256) |

Note: Depths in parentheses denote sample intervals where VOC and tritium samples were collected.

*— = Borehole location only has three ports.

**Table 3.0-1**
**Henry's Law Constants, Groundwater SLs, and Calculated Concentrations Corresponding to Groundwater SLs for Detected VOCs in Pore Gas**

| VOC | Henry's Law Constant[a] (dimensionless) | Groundwater SL (µg/L) | Calculated Concentrations in Pore Gas Corresponding to Groundwater Standard (µg/m³) |
|---|---|---|---|
| Acetone | 0.0016 | 22,000[b] | 35,200 |
| Benzene | 0.228 | 5[c] | 1140 |
| Butanol[1-] | 0.00036[b] | 3700[b] | 1332 |
| Butanone[2-] | 0.0011 | 7100[b] | 7810 |
| Carbon Disulfide | 1.2 | 1000[b] | 1,200,000 |
| Carbon Tetrachloride | 1.25 | 5[c] | 6250 |
| Chlorobenzene | 0.15 | 100[c] | 15,000 |
| Cyclohexane | 6.1[b] | 13,000[b] | 79,300,000 |
| Dichlorodifluoromethane | 4.1 | 390[b] | 1,600,000 |
| Dichloroethene[1,1-] | 1.1 | 5[d] | 5500 |
| Ethanol | na[e] | na | na |
| Ethylbenzene | 0.323 | 700[c] | 226,000 |
| Hexane | 5 | 880[b] | 4,400,000 |
| n-Heptane | na | na | na |
| Propanol[2-] | na | na | na |
| Propylene | na | na | na |
| Tetrachloroethene | 0.754 | 5[c] | 3770 |
| Tetrahydrofuran | na | na | na |
| Toluene | 0.272 | 750[d] | 204,000 |
| Trichloro-1,2,2-trifluoroethane[1,1,2-] | 21.4 | 59,000[b] | 1,260,000,000 |
| Trichloroethane[1,1,1-] | 0.705 | 60[d] | 42,300 |
| Trichlorofluoromethane | 4 | 1300[b] | 5,200,000 |
| Xylene[1,2-] | 0.213 | 1400[b] | 298,000 |
| Xylene[1,3-]+Xylene[1,4-] | 0.27[b] | 200[b,f] | 54,000 |

Note: Calculated concentrations in pore gas corresponding to groundwater standard derived from denominator of Equation 3.0-3.

[a] NMED (2006, 092513, Appendix B).

[b] EPA regional screening level table from http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm.

[c] EPA MCL (40 Code of Federal Regulations 141.61).

[d] NMWQCC groundwater standard (20.6.2.3103 New Mexico Administrative Code).

[e] na = Not available.

[f] SL for Xylene[1,3-]+Xylene[1,4-] is for xylene mixture.

**Table 4.0-1**
**Field-Screening Results Using a Landtec GEM-500 at MDA H**

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte | 3rd Quarter FY08 | | | | 4th Quarter FY08 | | 1st Quarter FY09 | | 2nd Quarter FY09 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | Packer | | FLUTe | | FLUTe | | FLUTe | |
| | | | | Date | Result (%) | Date | Result (%) | Date | Result (%) | Date | Result (%) | Date | Result (%) |
| 54-01023 | Ambient | Ambient | $CO_2$ | 6/23/08 | 0 | 6/20/08 | 0 | 9/9/08 | 0 | 12/3/08 | 0 | 3/11/09 | 0.6 |
| | | | $O_2$ | 6/23/08 | 20.7 | 6/20/08 | 21.2 | 9/9/08 | 20.5 | 12/3/08 | 20.8 | 3/11/09 | 21.4 |
| | 10 | 10–12 | $CO_2$ | 6/23/08 | 0.6 | 6/20/08 | 0.5 | 9/9/08 | 0.7 | 12/3/08 | 0.1 | 3/11/09 | 0.8 |
| | | | $O_2$ | 6/23/08 | 20 | 6/20/08 | 21.3 | 9/9/08 | 19.7 | 12/3/08 | 20.2 | 3/11/09 | 21.1 |
| | 60 | 60–62 | $CO_2$ | 6/23/08 | 0.5 | 6/20/08 | 0.2 | 9/9/08 | 0.6 | 12/3/08 | 0.1 | 3/11/09 | 1 |
| | | | $O_2$ | 6/23/08 | 20 | 6/20/08 | 21.4 | 9/9/08 | 19.6 | 12/3/08 | 19.9 | 3/11/09 | 21 |
| | 100 | 100–102 | $CO_2$ | 6/23/08 | 0.4 | 6/20/08 | 0.1 | 9/9/08 | 0 | 12/3/08 | 0.1 | 3/11/09 | 1 |
| | | | $O_2$ | 6/23/08 | 20.3 | 6/20/08 | 21.1 | 9/9/08 | 20 | 12/3/08 | 19.9 | 3/11/09 | 20.8 |
| | 150 | 150–152 | $CO_2$ | 6/23/08 | 0.5 | 6/20/08 | 0.1 | 9/9/08 | 0.3 | 12/3/08 | 0 | 3/11/09 | 0.9 |
| | | | $O_2$ | 6/23/08 | 20.3 | 6/20/08 | 21.1 | 9/9/08 | 20 | 12/3/08 | 20 | 3/11/09 | 21 |
| | 200 | 200–202 | $CO_2$ | 6/23/08 | 0.5 | 6/20/08 | 0.2 | 9/9/08 | 0.2 | 12/3/08 | 0 | 3/11/09 | 0.8 |
| | | | $O_2$ | 6/23/08 | 20.4 | 6/20/08 | 21.1 | 9/9/08 | 20 | 12/3/08 | 20 | 3/11/09 | 20.9 |
| | 247 | 247–249 | $CO_2$ | 6/23/08 | 0.5 | 6/20/08 | 0.1 | 9/9/08 | 0.2 | 12/3/08 | 0 | 3/11/09 | 0.8 |
| | | | $O_2$ | 6/23/08 | 20.5 | 6/20/08 | 21.2 | 9/9/08 | 20 | 12/3/08 | 20.2 | 3/11/09 | 21.1 |
| 54-15461 | Ambient | Ambient | $CO_2$ | 6/26/08 | 0 | 6/25/08 | 0 | 9/9/08 | 0 | 12/3/08 | 0 | 3/9/09 | 0 |
| | | | $O_2$ | 6/26/08 | 21.7 | 6/25/08 | 21.3 | 9/9/08 | 20.2 | 12/3/08 | 20.7 | 3/9/09 | 20.9 |
| | 10 | 10–12 | $CO_2$ | 6/26/08 | 0.6 | 6/25/08 | 0 | 9/9/08 | 0.3 | 12/3/08 | 0 | 3/9/09 | 1 |
| | | | $O_2$ | 6/26/08 | 21.2 | 6/25/08 | 21.5 | 9/9/08 | 20 | 12/3/08 | 20.5 | 3/9/09 | 20.7 |
| | 60 | 60–62 | $CO_2$ | 6/26/08 | 0.3 | 6/25/08 | 0 | 9/9/08 | NS[a] | 12/3/08 | 0.1 | 3/9/09 | 1.2 |
| | | | $O_2$ | 6/26/08 | 21.2 | 6/25/08 | 21.2 | 9/9/08 | NS | 12/3/08 | 19.9 | 3/9/09 | 20.6 |
| | 95 | 95–97 | $CO_2$ | 6/26/08 | 0.4 | 6/25/08 | 0.1 | 9/9/08 | NS | 12/3/08 | 0.1 | 3/9/09 | 1 |
| | | | $O_2$ | 6/26/08 | 21.2 | 6/25/08 | 21.1 | 9/9/08 | NS | 12/3/08 | 19.7 | 3/9/09 | 20.7 |

**Table 4.0-1 (continued)**

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte | 3rd Quarter FY08 | | | | 4th Quarter FY08 | | 1st Quarter FY09 | | 2nd Quarter FY09 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | Packer | | FLUTe | | FLUTe | | FLUTe | |
| | | | | Date | Result (%) | Date | Result (%) | Date | Result (%) | Date | Result (%) | Date | Result (%) |
| 54-15462 | Ambient | Ambient | $CO_2$ | 6/26/08 | 0 | 6/23/08 | 0 | 9/11/08 | 0 | 12/5/08 | 0 | 4/2/09 | 0 |
| | | | $O_2$ | 6/26/08 | 21.2 | 6/23/08 | 21.2 | 9/11/08 | 20.3 | 12/5/08 | 20.7 | 4/2/09 | 21.8 |
| | 10 | 10–12 | $CO_2$ | 6/26/08 | 0.2 | 6/24/08 | 0.1 | 9/11/08 | 0 | 12/5/08 | NS | 4/2/09 | 0 |
| | | | $O_2$ | 6/26/08 | 21.4 | 6/24/08 | 21.6 | 9/11/08 | 16.7 | 12/5/08 | 20.4 | 4/2/09 | 21.9 |
| | 60 | 60–62 | $CO_2$ | 6/26/08 | 0.1[b] | 6/24/08 | 0 | NS | NS | NS | NS | 4/2/09 | 0 |
| | | | $O_2$ | 6/26/08 | 21.2[b] | 6/24/08 | 21.7 | NS | NS | NS | NS | 4/2/09 | 21.7 |
| | 100 | 100–102 | $CO_2$ | 6/26/08 | 0 | 6/24/08 | 0 | 9/11/08 | 0.1 | 12/5/08 | 0 | 4/2/09 | 0 |
| | | | $O_2$ | 6/26/08 | 21.2 | 6/24/08 | 21.3 | 9/11/08 | 19.2 | 12/5/08 | 20.6 | 4/2/09 | 21.7 |
| | 150 | 150–152 | $CO_2$ | 6/26/08 | 0.3 | 6/24/08 | 0.1 | 9/11/08 | 0 | 12/5/08 | 0 | 4/2/09 | 0 |
| | | | $O_2$ | 6/26/08 | 21.2 | 6/24/08 | 21.2 | 9/11/08 | 19.8 | 12/5/08 | 20.4 | 4/2/09 | 21.6 |
| | 200 | 200–202 | $CO_2$ | 6/26/08 | 0.3 | 6/23/08 | 0 | 9/11/08 | 0 | 12/5/08 | 0 | 4/2/09 | 0 |
| | | | $O_2$ | 6/26/08 | 21.2 | 6/23/08 | 21.2 | 9/11/08 | 19.9 | 12/5/08 | 20.4 | 4/2/09 | 22 |
| | 254 | 254–256 | $CO_2$ | 6/26/08 | 0 | 6/23/08 | 0.1 | 9/11/08 | 0 | 12/5/08 | 0 | 4/2/09 | 0 |
| | | | $O_2$ | 6/26/08 | 21.6 | 6/23/08 | 20.9 | 9/11/08 | 20.2 | 12/5/08 | 19.9 | 4/2/09 | 22.1 |

Note: Grey shading indicates data rejected by NMED (2009, 105599).

[a] NS = Not sampled.

[b] Results are not representative of formation air because tubing was disconnected from sampling port.

**Table 4.0-2**
**Field-Screening Results Using a B&K Multigas Analyzer at MDA H**

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte (Unit) | 3rd Quarter FY08 | | | | 4th Quarter FY08 | | 1st Quarter FY09 | | 2nd Quarter FY09 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | Packer | | FLUTe | | FLUTe | | FLUTe | |
| | | | | Date | Result | Date | Result | Date | Result | Date | Result | Date | Result |
| 54-01023 | Ambient | Ambient | $CO_2$ (µg/m$^3$) | 6/23/08 | 826,000 | 6/20/08 | 619,000 | 9/9/08 | 1,240,000 | 12/3/08 | 758,000 | 3/11/09 | 872,000 |
| | | | Freon-11 (µg/m$^3$) | 6/23/08 | 412 | 6/20/08 | -1230 | 9/9/08 | 295 | 12/3/08 | -401 | 3/11/09 | 178 |
| | | | $H_2O$ (µg/m$^3$) | 6/23/08 | 8,180,000 | 6/20/08 | 11,400,000 | 9/9/08 | 13,000,000 | 12/3/08 | 5,060,000 | 3/11/09 | 3,060,000 |
| | | | PCE (µg/m$^3$) | 6/23/08 | 1310 | 6/20/08 | -779 | 9/9/08 | 7020 | 12/3/08 | -1870 | 3/11/09 | 2690 |
| | | | Pressure Differential (kPa) | 6/23/08 | 0 | 6/20/08 | NS[a] | 9/9/08 | 0 | 12/3/08 | 0 | 3/11/09 | 0 |
| | | | TCA (µg/m$^3$) | 6/23/08 | 1150 | 6/20/08 | -824 | 9/9/08 | 333,000 | 12/3/08 | -4090 | 3/11/09 | 2980 |
| | | | TCE (µg/m$^3$) | 6/23/08 | -439 | 6/20/08 | 5310 | 9/9/08 | 8250 | 12/3/08 | 2460 | 3/11/09 | 4670 |
| | 10 | 10–12 | $CO_2$ (µg/m$^3$) | 6/23/08 | 11,800,000 | 6/20/08 | 4910000 | 9/9/08 | 12,000,000 | 12/3/08 | 9,180,000 | 3/11/09 | 9,470,000 |
| | | | Freon-11 (µg/m$^3$) | 6/23/08 | -435 | 6/20/08 | -178 | 9/9/08 | 613 | 12/3/08 | -481 | 3/11/09 | -482 |
| | | | $H_2O$ (µg/m$^3$) | 6/23/08 | 12,900,000 | 6/20/08 | 11,600,000 | 9/9/08 | 26,800,000 | 12/3/08 | 10,500,000 | 3/11/09 | 6,710,000 |
| | | | PCE (µg/m$^3$) | 6/23/08 | -181 | 6/20/08 | -271 | 9/9/08 | -1680 | 12/3/08 | -167 | 3/11/09 | -2500 |
| | | | Pressure Differential (kPa) | 6/23/08 | 0 | 6/20/08 | NS | 9/9/08 | 0.06 | 12/3/08 | 0 | 3/11/09 | -0.03 |
| | | | TCA (µg/m$^3$) | 6/23/08 | -755 | 6/20/08 | 12,700 | 9/9/08 | -5320 | 12/3/08 | -22,900 | 3/11/09 | -42,000 |
| | | | TCE (µg/m$^3$) | 6/23/08 | 2740 | 6/20/08 | 1160 | 9/9/08 | -911 | 12/3/08 | 552,000 | 3/11/09 | 41.7 |
| | 60 | 60–62 | $CO_2$ (µg/m$^3$) | 6/23/08 | 10,500,000 | 6/20/08 | 3,310,000 | 9/9/08 | 9,760,000 | 12/3/08 | 9,810,000 | 3/11/09 | 15,200,000 |
| | | | Freon-11 (µg/m$^3$) | 6/23/08 | -504 | 6/20/08 | 527 | 9/9/08 | 494 | 12/3/08 | -246 | 3/11/09 | -835 |
| | | | $H_2O$ (µg/m$^3$) | 6/23/08 | 13,000,000 | 6/20/08 | 12,200,000 | 9/9/08 | 23,800,000 | 12/3/08 | 11,300,000 | 3/11/09 | 7,650,000 |
| | | | PCE (µg/m$^3$) | 6/23/08 | -236 | 6/20/08 | 1270 | 9/9/08 | -2220 | 12/3/08 | 765 | 3/11/09 | -5900 |

**Table 4.0-2 (continued)**

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte (Unit) | 3rd Quarter FY08 | | | | 4th Quarter FY08 | | 1st Quarter FY09 | | 2nd Quarter FY09 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | Packer | | FLUTe | | FLUTe | | FLUTe | |
| | | | | Date | Result | Date | Result | Date | Result | Date | Result | Date | Result |
| 54-01023 | 60 | 60–62 | Pressure Differential (kPa) | 6/23/08 | 0 | 6/20/08 | NS | 9/9/08 | 0.1 | 12/3/08 | 0 | 3/11/09 | -0.11 |
| | | | TCA (µg/m$^3$) | 6/23/08 | 798 | 6/20/08 | 4310 | 9/9/08 | -4890 | 12/3/08 | -25000 | 3/11/09 | -65,000 |
| | . | | TCE (µg/m$^3$) | 6/23/08 | 2330 | 6/20/08 | -26.8 | 9/9/08 | -193 | 12/3/08 | 4200 | 3/11/09 | -2500 |
| | 100 | 100–102 | $CO_2$ (µg/m$^3$) | 6/23/08 | 8,080,000 | 6/20/08 | 1,940,000 | 9/9/08 | 3,310,000 | 12/3/08 | 8,640,000 | 3/11/09 | 13,900,000 |
| | | | Freon-11 (µg/m$^3$) | 6/23/08 | -429 | 6/20/08 | -246 | 9/9/08 | 951 | 12/3/08 | -321 | 3/11/09 | -923 |
| | | | $H_2O$ (µg/m$^3$) | 6/23/08 | 12,400,000 | 6/20/08 | 1,280,000 | 9/9/08 | 20,900,000 | 12/3/08 | 10,000,000 | 3/11/09 | 8,030,000 |
| | | | PCE (µg/m$^3$) | 6/23/08 | 97.3 | 6/20/08 | -1900 | 9/9/08 | -786 | 12/3/08 | 508 | 3/11/09 | -5300 |
| | | | Pressure Differential (kPa) | 6/23/08 | 0.1 | 6/20/08 | NS | 9/9/08 | 0.09 | 12/3/08 | -0.02 | 3/11/09 | -0.12 |
| | | | TCA (µg/m$^3$) | 6/23/08 | 1740 | 6/20/08 | 2850 | 9/9/08 | -6380 | 12/3/08 | -23,400 | 3/11/09 | -57,000 |
| | | | TCE (µg/m$^3$) | 6/23/08 | 1520 | 6/20/08 | 2670 | 9/9/08 | -3460 | 12/3/08 | 4070 | 3/11/09 | -1700 |
| | 150 | 150–152 | $CO_2$ (µg/m$^3$) | 6/23/08 | 9,540,000 | 6/20/08 | 2,500,000 | 9/9/08 | 6,820,000 | 12/3/08 | 6,640,000 | 3/11/09 | 12,500,000 |
| | | | Freon-11 (µg/m$^3$) | 6/23/08 | 200 | 6/20/08 | -166 | 9/9/08 | -544 | 12/3/08 | -498 | 3/11/09 | -685 |
| | | | $H_2O$ (µg/m$^3$) | 6/23/08 | 11,600,000 | 6/20/08 | 12,800,000 | 9/9/08 | 19,700,000 | 12/3/08 | 9,430,000 | 3/11/09 | 8,380,000 |
| | | | PCE (µg/m$^3$) | 6/23/08 | -813 | 6/20/08 | -3470 | 9/9/08 | -1520 | 12/3/08 | 1170 | 3/11/09 | -4600 |
| | | | Pressure Differential (kPa) | 6/23/08 | 0.3 | 6/20/08 | NS | 9/9/08 | 0.14 | 12/3/08 | -0.1 | 3/11/09 | -0.3 |
| | | | TCA (µg/m$^3$) | 6/23/08 | 4850 | 6/20/08 | 1030 | 9/9/08 | -1100 | 12/3/08 | -19,700 | 3/11/09 | -50,000 |
| | | | TCE (µg/m$^3$) | 6/23/08 | 1360 | 6/20/08 | 4300 | 9/9/08 | 1300 | 12/3/08 | 4080 | 3/11/09 | -1700 |

## Table 4.0-2 (continued)

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte (Unit) | 3rd Quarter FY08 | | | | 4th Quarter FY08 | | 1st Quarter FY09 | | 2nd Quarter FY09 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | Packer | | FLUTe | | FLUTe | | FLUTe | |
| | | | | Date | Result | Date | Result | Date | Result | Date | Result | Date | Result |
| 54-01023 | 200 | 200–202 | $CO_2$ (µg/m$^3$) | 6/23/08 | 9,720,000 | 6/20/08 | 28,800,000 | 9/9/08 | 6,620,000 | 12/3/08 | 6,430,000 | 3/11/09 | 9,790,000 |
| | | | Freon-11 (µg/m$^3$) | 6/23/08 | -447 | 6/20/08 | 573 | 9/9/08 | -160 | 12/3/08 | -876 | 3/11/09 | -568 |
| | | | $H_2O$ (µg/m$^3$) | 6/23/08 | 10,800,000 | 6/20/08 | 13,200,000 | 9/9/08 | 17,600,000 | 12/3/08 | 9,430,000 | 3/11/09 | 8,570,000 |
| | | | PCE (µg/m$^3$) | 6/23/08 | -27.8 | 6/20/08 | -195 | 9/9/08 | -1130 | 12/3/08 | -473 | 3/11/09 | -2200 |
| | | | Pressure Differential (kPa) | 6/23/08 | 0.3 | 6/20/08 | NS | 9/9/08 | 0.14 | 12/3/08 | -0.05 | 3/11/09 | -0.35 |
| | | | TCA (µg/m$^3$) | 6/23/08 | 2650 | 6/20/08 | -643 | 9/9/08 | 2070 | 12/3/08 | -18,100 | 3/11/09 | -37,000 |
| | | | TCE (µg/m$^3$) | 6/23/08 | 2310 | 6/20/08 | 1140 | 9/9/08 | 1310 | 12/3/08 | 5030 | 3/11/09 | -1200 |
| | 247 | 247–249 | $CO_2$ (µg/m$^3$) | 6/23/08 | 9,740,000 | 6/20/08 | 1,750,000 | 9/9/08 | 6,350,000 | 12/3/08 | 6,070,000 | 3/11/09 | 8,350,000 |
| | | | Freon-11 (µg/m$^3$) | 6/23/08 | -481 | 6/20/08 | -2310 | 9/9/08 | -63 | 12/3/08 | -315 | 3/11/09 | -759 |
| | | | $H_2O$ (µg/m$^3$) | 6/23/08 | 9,880,000 | 6/20/08 | 13,400,000 | 9/9/08 | 17,200,000 | 12/3/08 | 10,400,000 | 3/11/09 | 8,940,000 |
| | | | PCE (µg/m$^3$) | 6/23/08 | 382 | 6/20/08 | 3900 | 9/9/08 | -1650 | 12/3/08 | -355 | 3/11/09 | -2700 |
| | | | Pressure Differential (kPa) | 6/23/08 | 0.1 | 6/20/08 | NS | 9/9/08 | NS | 12/3/08 | 0.03 | 3/11/09 | -0.29 |
| | | | TCA (µg/m$^3$) | 6/23/08 | 1980 | 6/20/08 | -1500 | 9/9/08 | 2150 | 12/3/08 | -16,000 | 3/11/09 | -30,000 |
| | | | TCE (µg/m$^3$) | 6/23/08 | 2480 | 6/20/08 | 6220 | 9/9/08 | 734 | 12/3/08 | 3610 | 3/11/09 | 202 |
| 54-15461 | Ambient | Ambient | $CO_2$ (µg/m$^3$) | 6/26/08 | 605,000 | 6/25/08 | 637,000 | 9/9/08 | 616,000 | 12/3/08 | 630,000 | 3/9/09 | 970,000 |
| | | | Freon-11 (µg/m$^3$) | 6/26/08 | -933 | 6/25/08 | 653 | 9/9/08 | 28.6 | 12/3/08 | -68.7 | 3/9/09 | 199 |
| | | | $H_2O$ (µg/m$^3$) | 6/26/08 | 6,230,000 | 6/25/08 | 8,770,000 | 9/9/08 | 9,880,000 | 12/3/08 | 4,250,000 | 3/9/09 | 7,780,000 |
| | | | PCE (µg/m$^3$) | 6/26/08 | 2090 | 6/25/08 | 1490 | 9/9/08 | 4990 | 12/3/08 | 2670 | 3/9/09 | 3290 |

**Table 4.0-2 (continued)**

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte (Unit) | 3rd Quarter FY08 | | | | 4th Quarter FY08 | | 1st Quarter FY09 | | 2nd Quarter FY09 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | Packer | | FLUTe | | FLUTe | | FLUTe | |
| | | | | Date | Result | Date | Result | Date | Result | Date | Result | Date | Result |
| 54-15461 | Ambient | Ambient | Pressure Differential (kPa) | 6/26/08 | 0 | 6/25/08 | NS | 9/9/08 | 0 | 12/3/08 | 0 | 3/9/09 | 0 |
| | | | TCA (µg/m$^3$) | 6/26/08 | -8510 | 6/25/08 | 468 | 9/9/08 | 440 | 12/3/08 | -1440 | 3/9/09 | -2200 |
| | | | TCE (µg/m$^3$) | 6/26/08 | -3670 | 6/25/08 | 4540 | 9/9/08 | 5260 | 12/3/08 | 1930 | 3/9/09 | 2180 |
| | 10 | 10–12 | $CO_2$ (µg/m$^3$) | 6/26/08 | 5,920,000 | 6/25/08 | 1,490,000 | 9/9/08 | 7,960,000 | 12/3/08 | 3,170,000 | 3/9/09 | 10,300,000 |
| | | | Freon-11 (µg/m$^3$) | 6/26/08 | -819 | 6/25/08 | 17.2 | 9/9/08 | 68.7 | 12/3/08 | -533 | 3/9/09 | -524 |
| | | | $H_2O$ (µg/m$^3$) | 6/26/08 | 7,520,000 | 6/25/08 | 12,600,000 | 9/9/08 | 18,400,000 | 12/3/08 | 10,800,000 | 3/9/09 | 10,900,000 |
| | | | PCE (µg/m$^3$) | 6/26/08 | -1150 | 6/25/08 | 3980 | 9/9/08 | 716 | 12/3/08 | -2050 | 3/9/09 | -3000 |
| | | | Pressure Differential (kPa) | 6/26/08 | 0 | 6/25/08 | NS | 9/9/08 | 0 | 12/3/08 | 0 | 3/9/09 | 0 |
| | | | TCA (µg/m$^3$) | 6/26/08 | 5640 | 6/25/08 | 1160 | 9/9/08 | -21,300 | 12/3/08 | 5320 | 3/9/09 | -43,000 |
| | | | TCE (µg/m$^3$) | 6/26/08 | 6640 | 6/25/08 | 214 | 9/9/08 | 1300 | 12/3/08 | 4130 | 3/9/09 | -1300 |
| | 60 | 60–62 | $CO_2$ (µg/m$^3$) | 6/26/08 | 4,000,000 | 6/25/08 | 1,240,000 | 9/9/08 | 8,780,000 | 12/3/08 | 9,290,000 | 3/9/09 | 13,200,000 |
| | | | Freon-11 (µg/m$^3$) | 6/26/08 | 157 | 6/25/08 | 229 | 9/9/08 | 120 | 12/3/08 | -521 | 3/9/09 | -835,000 |
| | | | $H_2O$ (µg/m$^3$) | 6/26/08 | 9,580,000 | 6/25/08 | 13,000,000 | 9/9/08 | 14,600,000 | 12/3/08 | 10,200,000 | 3/9/09 | 11,600,000 |
| | | | PCE (µg/m$^3$) | 6/26/08 | -925 | 6/25/08 | 1790 | 9/9/08 | 765 | 12/3/08 | -299 | 3/9/09 | -5400 |
| | | | Pressure Differential (kPa) | 6/26/08 | 0 | 6/25/08 | NS | 9/9/08 | 0.02 | 12/3/08 | 0 | 3/9/09 | 0.07 |
| | | | TCA (µg/m$^3$) | 6/26/08 | -1060 | 6/25/08 | 8670 | 9/9/08 | -18,100 | 12/3/08 | -5850 | 3/9/09 | -53,000 |
| | | | TCE (µg/m$^3$) | 6/26/08 | 522 | 6/25/08 | 1070 | 9/9/08 | 3190 | 12/3/08 | 4260 | 3/9/09 | -1900 |

## Table 4.0-2 (continued)

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte (Unit) | 3rd Quarter FY08 | | | | 4th Quarter FY08 | | 1st Quarter FY09 | | 2nd Quarter FY09 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | Packer | | FLUTe | | FLUTe | | FLUTe | |
| | | | | Date | Result | Date | Result | Date | Result | Date | Result | Date | Result |
| 54-15461 | 95 | 95–97 | $CO_2$ (µg/m$^3$) | 6/26/08 | 5,270,000 | 6/25/08 | 1,250,000 | 9/9/08 | 8,590,000 | 12/3/08 | 8,750,000 | 3/9/09 | 13,800,000 |
| | | | Freon-11 (µg/m$^3$) | 6/26/08 | -1050 | 6/25/08 | 286 | 9/9/08 | -418 | 12/3/08 | -515 | 3/9/09 | -908 |
| | | | $H_2O$ (µg/m$^3$) | 6/26/08 | 12,500,000 | 6/25/08 | 13,300,000 | 9/9/08 | 13,600,000 | 12/3/08 | 10,200,000 | 3/9/09 | 12,100,000 |
| | | | PCE (µg/m$^3$) | 6/26/08 | -4120 | 6/25/08 | 1130 | 9/9/08 | 216 | 12/3/08 | -222 | 3/9/09 | -5200 |
| | | | Pressure Differential (kPa) | 6/26/08 | 0 | 6/25/08 | NS | 9/9/08 | 0.01 | 12/3/08 | 0 | 3/9/09 | 0.07 |
| | | | TCA (µg/m$^3$) | 6/26/08 | 13,800 | 6/25/08 | -9570 | 9/9/08 | -13,300 | 12/3/08 | -8510 | 3/9/09 | -54,000 |
| | | | TCE (µg/m$^3$) | 6/26/08 | -1350 | 6/25/08 | 1330 | 9/9/08 | 2350 | 12/3/08 | 4540 | 3/9/09 | -2000 |
| 54-15462 | Ambient | Ambient | $CO_2$ (µg/m$^3$) | 6/26/08 | 628,000 | 6/23/08 | 617,000 | 9/11/08 | 729,000 | 12/5/08 | 585,000 | 4/2/09 | 796,000 |
| | | | Freon-11 (µg/m$^3$) | 6/26/08 | 400 | 6/23/08 | -773 | 9/11/08 | -126 | 12/5/08 | -229 | 4/2/09 | -2600 |
| | | | $H_2O$ (µg/m$^3$) | 6/26/08 | 6,540,000 | 6/23/08 | 7,890,000 | 9/11/08 | 8,550,000 | 12/5/08 | 2,520,000 | 4/2/09 | 24,300 |
| | | | PCE (µg/m$^3$) | 6/26/08 | -2470 | 6/23/08 | -2480 | 9/11/08 | -132 | 12/5/08 | 1590 | 4/2/09 | 5460 |
| | | | Pressure Differential (kPa) | 6/26/08 | NS | 6/23/08 | NS | 9/11/08 | 0 | 12/5/08 | 0 | 4/2/09 | 0 |
| | | | TCA (µg/m$^3$) | 6/26/08 | -3960 | 6/23/08 | 3060 | 9/11/08 | -2700 | 12/5/08 | -1150 | 4/2/09 | -4200 |
| | | | TCE (µg/m$^3$) | 6/26/08 | 2490 | 6/23/08 | 5790 | 9/11/08 | 477 | 12/5/08 | 1610 | 4/2/09 | 6080 |
| | 10 | 10–12 | $CO_2$ (µg/m$^3$) | 6/26/08 | 3,060,000 | 6/24/08 | 2,390,000 | 9/11/08 | 4,860,000 | 12/5/08 | 2,090,000 | 4/2/09 | 2,510,000 |
| | | | Freon-11 (µg/m$^3$) | 6/26/08 | -910 | 6/24/08 | -57.3 | 9/11/08 | 408 | 12/5/08 | -143 | 4/2/09 | -2200 |
| | | | $H_2O$ (µg/m$^3$) | 6/26/08 | 5,820,000 | 6/24/08 | 11,400,000 | 9/11/08 | 21,400,000 | 12/5/08 | 6,110,000 | 4/2/09 | 54,400 |
| | | | PCE (µg/m$^3$) | 6/26/08 | 7790 | 6/24/08 | -1110 | 9/11/08 | -1490 | 12/5/08 | 5560 | 4/2/09 | -3500 |

**Table 4.0-2 (continued)**

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte (Unit) | 3rd Quarter FY08 | | | | 4th Quarter FY08 | | 1st Quarter FY09 | | 2nd Quarter FY09 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | Packer | | FLUTe | | FLUTe | | FLUTe | |
| | | | | Date | Result | Date | Result | Date | Result | Date | Result | Date | Result |
| 54-15462 | 10 | 10–12 | Pressure Differential (kPa) | 6/26/08 | -0.02 | 6/24/08 | NS | 9/11/08 | 0 | 12/5/08 | 0 | 4/2/09 | 0.15 |
| | | | TCA (μg/m$^3$) | 6/26/08 | -1100 | 6/24/08 | 5130 | 9/11/08 | -1540 | 12/5/08 | -2680 | 4/2/09 | -4400 |
| | | | TCE (μg/m$^3$) | 6/26/08 | 879 | 6/24/08 | 1970 | 9/11/08 | -1110 | 12/5/08 | 4380 | 4/2/09 | 10,500 |
| | 60 | 60–62 | $CO_2$ (μg/m$^3$) | 6/26/08 | 2,630,000[b] | 6/24/08 | 2,410,000 | NS | NS | NS | NS | 4/2/09 | 5,070,000 |
| | | | Freon-11 (μg/m$^3$) | 6/26/08 | 144[b] | 6/24/08 | 298 | NS | NS | NS | NS | 4/2/09 | -1200 |
| | | | $H_2O$ (μg/m$^3$) | 6/26/08 | 14,200,000[b] | 6/24/08 | 12,500,000 | NS | NS | NS | NS | 4/2/09 | 58,400 |
| | | | PCE (μg/m$^3$) | 6/26/08 | 6310[b] | 6/24/08 | 216 | NS | NS | NS | NS | 4/2/09 | 7870 |
| | | | Pressure Differential (kPa) | 6/26/08 | 0[b] | 6/24/08 | ND | 9/11/08 | 0.01 | 12/5/08 | 0.21 | 4/2/09 | 0 |
| | | | TCA (μg/m$^3$) | 6/26/08 | -2300[b] | 6/24/08 | 6700 | NS | NS | NS | NS | 4/2/09 | -19,000 |
| | | | TCE (μg/m$^3$) | 6/26/08 | -1960[b] | 6/24/08 | 80.4 | NS | NS | NS | NS | 4/2/09 | 1000 |
| | 100 | 100–102 | $CO_2$ (μg/m$^3$) | 6/26/08 | 700,000 | 6/24/08 | 2,390,000 | 9/11/08 | 4,790,000 | 12/5/08 | 2,210,000 | 4/2/09 | 5,420,000 |
| | | | Freon-11 (μg/m$^3$) | 6/26/08 | -618 | 6/24/08 | -303 | 9/11/08 | -269 | 12/5/08 | -492 | 4/2/09 | -2700 |
| | | | $H_2O$ (μg/m$^3$) | 6/26/08 | 10,500,000 | 6/24/08 | 11,800,000 | 9/11/08 | 14,000,000 | 12/5/08 | 4,170,000 | 4/2/09 | 53,100 |
| | | | PCE (μg/m$^3$) | 6/26/08 | -6270 | 6/24/08 | -1090 | 9/11/08 | -1570 | 12/5/08 | 1910 | 4/2/09 | -1700 |
| | | | Pressure Differential (kPa) | 6/26/08 | 0 | 6/24/08 | NS | 9/11/08 | 0 | 12/5/08 | 0.21 | 4/2/09 | 0 |
| | | | TCA (μg/m$^3$) | 6/26/08 | 1350 | 6/24/08 | 2030 | 9/11/08 | -3600 | 12/5/08 | -7980 | 4/2/09 | -19,000 |
| | | | TCE (μg/m$^3$) | 6/26/08 | 4150 | 6/24/08 | 2630 | 9/11/08 | 1430 | 12/5/08 | 3860 | 4/2/09 | 7080 |

**Table 4.0-2 (continued)**

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte (Unit) | 3rd Quarter FY08 | | | | 4th Quarter FY08 | | 1st Quarter FY09 | | 2nd Quarter FY09 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | Packer | | FLUTe | | FLUTe | | FLUTe | |
| | | | | Date | Result | Date | Result | Date | Result | Date | Result | Date | Result |
| 54-15462 | 150 | 150–152 | $CO_2$ (µg/m$^3$) | 6/26/08 | 3,890,000 | 6/24/08 | 1,420,000 | 9/11/08 | 4,000,000 | 12/5/08 | 1,930,000 | 4/2/09 | 3,450,000 |
| | | | Freon-11 (µg/m$^3$) | 6/26/08 | -578 | 6/24/08 | 658 | 9/11/08 | 345 | 12/5/08 | -326 | 4/2/09 | -589 |
| | | | $H_2O$ (µg/m$^3$) | 6/26/08 | 13,000,000 | 6/24/08 | 11,500,000 | 9/11/08 | 21,500,000 | 12/5/08 | 4,810,000 | 4/2/09 | 48,600 |
| | | | PCE (µg/m$^3$) | 6/26/08 | 2830 | 6/24/08 | 1680 | 9/11/08 | -1040 | 12/5/08 | 744 | 4/2/09 | 2440 |
| | | | Pressure Differential (kPa) | 6/26/08 | -0.01 | 6/24/08 | NS | 9/11/08 | 0 | 12/5/08 | -0.09 | 4/2/09 | -0.11 |
| | | | TCA (µg/m$^3$) | 6/26/08 | 500 | 6/24/08 | 2370 | 9/11/08 | -3650 | 12/5/08 | -6380 | 4/2/09 | -7200 |
| | | | TCE (µg/m$^3$) | 6/26/08 | -2040 | 6/24/08 | 905 | 9/11/08 | -1410 | 12/5/08 | 2390 | 4/2/09 | 2950 |
| | 200 | 200–202 | $CO_2$ (µg/m$^3$) | 6/26/08 | 3,530,000 | 6/23/08 | 625,000 | 9/11/08 | 3,710,000 | 12/5/08 | 2,500,000 | 4/2/09 | 4,230,000 |
| | | | Freon-11 (µg/m$^3$) | 6/26/08 | -825 | 6/23/08 | 32.6 | 9/11/08 | 237 | 12/5/08 | -281 | 4/2/09 | -13,000 |
| | | | $H_2O$ (µg/m$^3$) | 6/26/08 | 6,380,000 | 6/23/08 | 8,480,000 | 9/11/08 | 21,700,000 | 12/5/08 | 5,730,000 | 4/2/09 | 50,300 |
| | | | PCE (µg/m$^3$) | 6/26/08 | 186 | 6/23/08 | 3510 | 9/11/08 | -1770 | 12/5/08 | 665 | 4/2/09 | -4100 |
| | | | Pressure Differential (kPa) | 6/26/08 | -0.01 | 6/23/08 | NS | 9/11/08 | 0 | 12/5/08 | 0 | 4/2/09 | -0.11 |
| | | | TCA (µg/m$^3$) | 6/26/08 | 2940 | 6/23/08 | 5140 | 9/11/08 | -4470 | 12/5/08 | -10,600 | 4/2/09 | -17,000 |
| | | | TCE (µg/m$^3$) | 6/26/08 | 8520 | 6/23/08 | 1940 | 9/11/08 | -1370 | 12/5/08 | 2810 | 4/2/09 | 55,900 |
| | 254 | 254–256 | $CO_2$ (µg/m$^3$) | 6/26/08 | 2,230,000 | 6/23/08 | 1,250,000 | 9/11/08 | 3,440,000 | 12/5/08 | 704,000 | 4/2/09 | 2,700,000 |
| | | | Freon-11 (µg/m$^3$) | 6/26/08 | -137 | 6/23/08 | 349 | 9/11/08 | 470 | 12/5/08 | 137 | 4/2/09 | -11,000 |

## Table 4.0-2 (continued)

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte (Unit) | 3rd Quarter FY08 | | | | 4th Quarter FY08 | | 1st Quarter FY09 | | 2nd Quarter FY09 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | Packer | | FLUTe | | FLUTe | | FLUTe | |
| | | | | Date | Result | Date | Result | Date | Result | Date | Result | Date | Result |
| 54-15462 | 254 | 254–256 | $H_2O$ (μg/m$^3$) | 6/26/08 | 4,540,000 | 6/23/08 | 13,000,000 | 9/11/08 | 22,200,000 | 12/5/08 | 5,710,000 | 4/2/09 | 42,400 |
| | | | PCE (μg/m$^3$) | 6/26/08 | 75.1 | 6/23/08 | 5780 | 9/11/08 | -1490 | 12/5/08 | 4710 | 4/2/09 | 2060 |
| | | | Pressure Differential (kPa) | 6/26/08 | -0.03 | 6/23/08 | NS | 9/11/08 | 0.03 | 12/5/08 | -0.25 | 4/2/09 | -0.03 |
| | | | TCA (μg/m$^3$) | 6/26/08 | -1090 | 6/23/08 | 298 | 9/11/08 | -3570 | 12/5/08 | -5320 | 4/2/09 | -5400 |
| | | | TCE (μg/m$^3$) | 6/26/08 | 1900 | 6/23/08 | 1390 | 9/11/08 | -2060 | 12/5/08 | -772 | 4/2/09 | 46,600 |

Notes: All results that are reported in μg/m$^3$ were converted from ppm assuming 1 atmosphere and 25$^o$C. Grey shading indicates data rejected by NMED (2009, 105599).
See Appendix A for definition of acronyms PCE, TCA, and TCE.

[a] NS = Not sampled.

[b] Results are not representative of formation air because tubing was disconnected from sampling port.

## Table 5.0-1
## Pore-Gas VOCs Detected at MDA H, Second Quarter FY2009 and Three Previous Quarters

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte | 3rd Quarter FY08 | | | | | | 4th Quarter FY08 | | | 1st Quarter FY09 | | | 2nd Quarter FY09 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | | Packer | | | FLUTe | | | FLUTe | | | FLUTe | | |
| | | | | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) |
| 54-01023 | 10 | 10–12 | Acetone | 6/23/08 | 11 | 25 | 6/20/08 | 12 | 27 | 9/9/08 | ND[a] | ND | 12/3/08 | ND | ND | 3/11/09 | 5 | 12 |
| | | | Butanone[2-] | 6/23/08 | 1.7 | 5.1 | 6/20/08 | 1.8 | 5.2 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Carbon Disulfide | 6/23/08 | ND | ND | 6/20/08 | 3.5 | 11 | 9/9/08 | 1.6 | 4.8 | 12/3/08 | 1.2 | 3.7 | 3/11/09 | ND | ND |
| | | | Cyclohexane | 6/23/08 | ND | ND | 6/20/08 | 0.99 | 3.4 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Dichlorodifluoromethane | 6/23/08 | 3.7 | 18 | 6/20/08 | 1.7 | 8.4 | 9/9/08 | 3.6 | 18 | 12/3/08 | 3.1 | 16 | 3/11/09 | 3.1 | 15 |
| | | | Ethanol | 6/23/08 | 42 | 79 | 6/20/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Ethylbenzene | 6/23/08 | ND | ND | 6/20/08 | 1.6 | 7 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Ethyltoluene[4-] | 6/23/08 | ND | ND | 6/20/08 | 1.6 | 7.8 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Hexane | 6/23/08 | 1.8 | 6.3 | 6/20/08 | 5 | 18 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | n-Heptane | 6/23/08 | ND | ND | 6/20/08 | 2 | 8.2 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Propanol[2-] | 6/23/08 | 3.8 | 9.3 | 6/20/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Toluene | 6/23/08 | 12 | 44 | 6/20/08 | 13 | 50 | 9/9/08 | 1.1 | 4.1 | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Trichloro-1,2,2-trifluoroethane[1,1,2-] | 6/23/08 | 1 | 7.8 | 6/20/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | 0.76 | 5.8 | 3/11/09 | ND | ND |
| | | | Trichloroethane[1,1,1-] | 6/23/08 | 2 | 11 | 6/20/08 | 0.87 | 4.8 | 9/9/08 | 0.97 | 5.3 | 12/3/08 | 0.74 | 4 | 3/11/09 | ND | ND |
| | | | Trichlorofluoromethane | 6/23/08 | 8.2 | 46 | 6/20/08 | 3.1 | 17 | 9/9/08 | 8.8 | 49 | 12/3/08 | 7.5 | 42 | 3/11/09 | 7.1 | 40 |
| | | | Trimethylbenzene[1,2,4-] | 6/23/08 | ND | ND | 6/20/08 | 1.8 | 8.8 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Xylene[1,2-] | 6/23/08 | ND | ND | 6/20/08 | 2.1 | 9.1 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Xylene [1,3-]+Xylene[1,4-] | 6/23/08 | ND | ND | 6/20/08 | 5.9 | 26 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | 60 | 60–62 | Acetone | 6/23/08 | 44 | 100 | 6/20/08 | 26 | 63 | 9/9/08 | ND | ND | 12/3/08 | 6 | 14 | 3/11/09 | 5.5 | 13 |
| | | | Butanol[1-] | 6/23/08 | 5.7 | 17 | 6/20/08 | ND | ND | 9/9/08 | 16 | 49 | 12/3/08 | 30 | 92 | 3/11/09 | 11 (J) | 32 (J) |
| | | | Butanone[2-] | 6/23/08 | 6.7 | 20 | 6/20/08 | 4.5 | 13 | 9/9/08 | ND | ND | 12/3/08 | 1.3 | 3.8 | 3/11/09 | ND | ND |
| | | | Carbon Disulfide | 6/23/08 | ND | ND | 6/20/08 | 8.9 | 28 | 9/9/08 | ND | ND | 12/3/08 | 21 | 64 | 3/11/09 | ND | ND |
| | | | Chlorobenzene | 6/23/08 | 1.8 | 8.1 | 6/20/08 | ND | ND | 9/9/08 | 1.7 | 8 | 12/3/08 | 2.4 | 11 | 3/11/09 | ND | ND |
| | | | Cyclohexane | 6/23/08 | ND | ND | 6/20/08 | 1.3 | 4.4 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Dichlorodifluoromethane | 6/23/08 | 4.2 | 21 | 6/20/08 | 1.8 | 8.9 | 9/9/08 | 4.4 | 22 | 12/3/08 | 4.5 | 22 | 3/11/09 | 5 | 25 |

## Table 5.0-1 (continued)

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte | 3rd Quarter FY08 | | | | | | 4th Quarter FY08 | | | 1st Quarter FY09 | | | 2nd Quarter FY09 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | | Packer | | | FLUTe | | | FLUTe | | | FLUTe | | |
| | | | | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) |
| 54-01023 | 60 | 60–62 | Ethanol | 6/23/08 | 5.4 | 10 | 6/20/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Ethylbenzene | 6/23/08 | ND | ND | 6/20/08 | 1.8 | 7.8 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Ethyltoluene[4-] | 6/23/08 | ND | ND | 6/20/08 | 1.8 | 8.6 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Hexane | 6/23/08 | 2.6 | 9.2 | 6/20/08 | 3.5 | 12 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | n-Heptane | 6/23/08 | ND | ND | 6/20/08 | 2.1 | 8.8 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Propanol[2-] | 6/23/08 | 4.2 | 10 | 6/20/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Tetrachloroethene | 6/23/08 | ND | ND | 6/20/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | 0.83 | 5.6 | 3/11/09 | 1 | 6.9 |
| | | | Toluene | 6/23/08 | 18 | 70 | 6/20/08 | 17 | 63 | 9/9/08 | ND | ND | 12/3/08 | 0.87 | 3.3 | 3/11/09 | ND | ND |
| | | | Trichloro-1,2,2-trifluoroethane[1,1,2-] | 6/23/08 | 1.4 | 11 | 6/20/08 | ND | ND | 9/9/08 | 1.3 | 10 | 12/3/08 | 1.4 | 11 | 3/11/09 | 1.2 | 9.3 |
| | | | Trichloroethane[1,1,1-] | 6/23/08 | 3.5 | 19 | 6/20/08 | 0.95 | 5.2 | 9/9/08 | 1.9 | 10 | 12/3/08 | 3.1 | 17 | 3/11/09 | 2.7 | 15 |
| | | | Trichloroethene | 6/23/08 | ND | ND | 6/20/08 | 0.98 | 5.3 | 9/9/08 | 1 | 5.6 | 12/3/08 | 1.2 | 6.3 | 3/11/09 | ND | ND |
| | | | Trichlorofluoromethane | 6/23/08 | 7.7 | 43 | 6/20/08 | 3.1 | 17 | 9/9/08 | 11 | 63 | 12/3/08 | 9.3 | 52 | 3/11/09 | 11 | 61 |
| | | | Trimethylbenzene[1,2,4-] | 6/23/08 | ND | ND | 6/20/08 | 2 | 9.8 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Xylene[1,2-] | 6/23/08 | ND | ND | 6/20/08 | 2.5 | 11 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Xylene[1,3-]+Xylene[1,4-] | 6/23/08 | ND | ND | 6/20/08 | 7.4 | 32 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | 100 | 100–102 | Acetone | 6/23/08 | 14 | 34 | 6/20/08 | 23 | 55 | 9/9/08 | 3.7 | 8.7 | 12/3/08 | 5.2 | 12 | 3/11/09 | ND | ND |
| | | | Butanol[1-] | 6/23/08 | 8.1 | 25 | 6/20/08 | ND | ND | 9/9/08 | 23 | 70 | 12/3/08 | 18 | 56 | 3/11/09 | 6.4 | 20 |
| | | | Butanone[2-] | 6/23/08 | 2.4 | 7.2 | 6/20/08 | 4.6 | 14 | 9/9/08 | 1.5 | 4.3 | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Carbon Disulfide | 6/23/08 | ND | ND | 6/20/08 | 8.8 | 28 | 9/9/08 | 6.4 | 20 | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Chlorobenzene | 6/23/08 | 2.6 | 12 | 6/20/08 | ND | ND | 9/9/08 | 3.4 | 16 | 12/3/08 | 3.6 | 16 | 3/11/09 | 0.93 | 4.3 |
| | | | Cyclohexane | 6/23/08 | ND | ND | 6/20/08 | 1.2 | 4.1 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Dichlorodifluoromethane | 6/23/08 | 4 | 20 | 6/20/08 | 1.4 | 6.9 | 9/9/08 | 2.7 | 13 | 12/3/08 | 4.3 | 21 | 3/11/09 | 5.4 | 27 |
| | | | Dichloroethene[1,1-] | 6/23/08 | ND | ND | 6/20/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | 1.3 | 5 |
| | | | Ethanol | 6/23/08 | 6.8 | 13 | 6/20/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Ethylbenzene | 6/23/08 | ND | ND | 6/20/08 | 2 | 8.7 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Ethyltoluene[4-] | 6/23/08 | ND | ND | 6/20/08 | 1.9 | 9.5 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Hexane | 6/23/08 | 3.7 | 13 | 6/20/08 | 3.2 | 11 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | n-Heptane | 6/23/08 | ND | ND | 6/20/08 | 2.2 | 8.9 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |

**Table 5.0-1 (continued)**

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte | 3rd Quarter FY08 | | | | | | 4th Quarter FY08 | | | 1st Quarter FY09 | | | 2nd Quarter FY09 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | | Packer | | | FLUTe | | | FLUTe | | | FLUTe | | |
| | | | | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) |
| 54-01023 | 100 | 100–102 | Propylene | 6/23/08 | ND | ND | 6/20/08 | 3.8 | 6.4 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Tetrachloroethene | 6/23/08 | ND | ND | 6/20/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | 0.9 | 6.1 |
| | | | Toluene | 6/23/08 | 17 | 66 | 6/20/08 | 19 | 72 | 9/9/08 | 0.91 | 3.4 | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Trichloro-1,2,2-trifluoroethane[1,1,2-] | 6/23/08 | 1.4 | 11 | 6/20/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | 1.4 | 11 | 3/11/09 | 1.7 | 13 |
| | | | Trichloroethane[1,1,1-] | 6/23/08 | 3.7 | 20 | 6/20/08 | 0.91 | 5 | 9/9/08 | 2.5 | 14 | 12/3/08 | 3.4 | 18 | 3/11/09 | 2.5 | 14 |
| | | | Trichloroethene | 6/23/08 | ND | ND | 6/20/08 | 0.96 | 5.2 | 9/9/08 | ND | ND | 12/3/08 | 0.94 | 5 | 3/11/09 | ND | ND |
| | | | Trichlorofluoromethane | 6/23/08 | 6.6 | 37 | 6/20/08 | 2 | 11 | 9/9/08 | 4.9 | 27 | 12/3/08 | 8.4 | 47 | 3/11/09 | 11 | 64 |
| | | | Trimethylbenzene[1,2,4-] | 6/23/08 | ND | ND | 6/20/08 | 2.2 | 11 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Xylene[1,2-] | 6/23/08 | ND | ND | 6/20/08 | 2.7 | 12 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Xylene[1,3-]+Xylene[1,4-] | 6/23/08 | ND | ND | 6/20/08 | 8.4 | 36 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | 150 | 150–152 | Acetone | 6/23/08 | 5 | 12 | 6/20/08 | 25 | 59 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | 4.6 | 11 |
| | | | Butanol[1-] | 6/23/08 | 14 | 41 | 6/20/08 | ND | ND | 9/9/08 | 38 | 110 | 12/3/08 | 32 | 97 | 3/11/09 | 15 | 45 |
| | | | Butanone[2-] | 6/23/08 | ND | ND | 6/20/08 | 6.4 | 19 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | 1.1 | 3.2 |
| | | | Carbon Disulfide | 6/23/08 | ND | ND | 6/20/08 | 12 | 37 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Chlorobenzene | 6/23/08 | 4.6 | 21 | 6/20/08 | ND | ND | 9/9/08 | 7.1 | 33 | 12/3/08 | 2.6 | 12 | 3/11/09 | 1.3 | 5.9 |
| | | | Cyclohexane | 6/23/08 | ND | ND | 6/20/08 | 3.3 | 11 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Dichlorodifluoromethane | 6/23/08 | 4.4 | 22 | 6/20/08 | 1.2 | 6.1 | 9/9/08 | 4.4 | 22 | 12/3/08 | 3.7 | 18 | 3/11/09 | 4.8 | 24 |
| | | | Dichloroethene[1,1-] | 6/23/08 | ND | ND | 6/20/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | 1.4 | 5.4 |
| | | | Ethylbenzene | 6/23/08 | ND | ND | 6/20/08 | 4.4 | 19 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Ethyltoluene[4-] | 6/23/08 | ND | ND | 6/20/08 | 3.8 | 18 | 9/9/08 | 5.7 | 28 | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Hexane | 6/23/08 | 1.4 | 4.8 | 6/20/08 | 9.7 | 34 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | n-Heptane | 6/23/08 | ND | ND | 6/20/08 | 6.1 | 25 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Tetrachloroethene | 6/23/08 | ND | ND | 6/20/08 | 1.2 | 8.2 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Toluene | 6/23/08 | 15 | 56 | 6/20/08 | 41 | 150 | 9/9/08 | 1.2 | 4.7 | 12/3/08 | ND | ND | 3/11/09 | 1.5 | 5.6 |
| | | | Trichloro-1,2,2-trifluoroethane[1,1,2-] | 6/23/08 | 1.6 | 12 | 6/20/08 | ND | ND | 9/9/08 | 1.5 | 11 | 12/3/08 | 1.3 | 9.7 | 3/11/09 | 1.6 | 12 |
| | | | Trichloroethane[1,1,1-] | 6/23/08 | 4.6 | 25 | 6/20/08 | ND | ND | 9/9/08 | 4.6 | 25 | 12/3/08 | 3.6 | 19 | 3/11/09 | 2.5 | 14 |

## Table 5.0-1 (continued)

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte | 3rd Quarter FY08 FLUTe Date | 3rd Quarter FY08 FLUTe Result (ppbv) | 3rd Quarter FY08 FLUTe Result (µg/m³) | 3rd Quarter FY08 Packer Date | 3rd Quarter FY08 Packer Result (ppbv) | 3rd Quarter FY08 Packer Result (µg/m³) | 4th Quarter FY08 FLUTe Date | 4th Quarter FY08 FLUTe Result (ppbv) | 4th Quarter FY08 FLUTe Result (µg/m³) | 1st Quarter FY09 FLUTe Date | 1st Quarter FY09 FLUTe Result (ppbv) | 1st Quarter FY09 FLUTe Result (µg/m³) | 2nd Quarter FY09 FLUTe Date | 2nd Quarter FY09 FLUTe Result (ppbv) | 2nd Quarter FY09 FLUTe Result (µg/m³) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 54-01023 | 150 | 150–152 | Trichloroethene | 6/23/08 | ND | ND | 6/20/08 | 2.3 | 12 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Trichlorofluoromethane | 6/23/08 | 6.5 | 36 | 6/20/08 | 1.6 | 8.9 | 9/9/08 | 6.2 | 35 | 12/3/08 | 5.8 | 33 | 3/11/09 | 9.2 | 52 |
| | | | Trimethylbenzene[1,2,4-] | 6/23/08 | ND | ND | 6/20/08 | 4 | 20 | 9/9/08 | 9 | 44 | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Trimethylbenzene[1,3,5-] | 6/23/08 | ND | ND | 6/20/08 | 1.3 | 6.2 | 9/9/08 | 2 | 10 | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Xylene[1,2-] | 6/23/08 | ND | ND | 6/20/08 | 5.8 | 25 | 9/9/08 | 1.1 | 5 | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Xylene[1,3-]+Xylene[1,4-] | 6/23/08 | ND | ND | 6/20/08 | 18 | 76 | 9/9/08 | 0.98 | 4.3 | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | 200 | 200–202 | Acetone | 6/23/08 | 13 | 30 | 6/20/08 | 30 | 71 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | 5 | 12 |
| | | | Butanone[2-] | 6/23/08 | 1.3 | 3.8 | 6/20/08 | 12 | 36 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Carbon Disulfide | 6/23/08 | ND | ND | 6/20/08 | 16 | 50 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Carbon Tetrachloride | 6/23/08 | ND | ND | 6/20/08 | ND | ND | 9/9/08 | 1 | 6.6 | 12/3/08 | 1.2 | 7.6 | 3/11/09 | 1.1 | 7 |
| | | | Cyclohexane | 6/23/08 | ND | ND | 6/20/08 | 9 | 31 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Dichlorodifluoromethane | 6/23/08 | 4.7 | 23 | 6/20/08 | 1 | 5.1 | 9/9/08 | 4.5 | 22 | 12/3/08 | 4.2 | 21 | 3/11/09 | 5.8 | 29 |
| | | | Dichloroethene[1,1-] | 6/23/08 | ND | ND | 6/20/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | 2.1 | 8.4 |
| | | | Ethylbenzene | 6/23/08 | ND | ND | 6/20/08 | 9.2 | 40 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Ethyltoluene[4-] | 6/23/08 | ND | ND | 6/20/08 | 7.4 | 36 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Hexane | 6/23/08 | 2 | 7.1 | 6/20/08 | 30 | 110 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | n-Heptane | 6/23/08 | ND | ND | 6/20/08 | 16 | 66 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Propylene | 6/23/08 | ND | ND | 6/20/08 | 14 | 24 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Tetrachloroethene | 6/23/08 | ND | ND | 6/20/08 | 0.93 | 6.3 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Toluene | 6/23/08 | 13 | 48 | 6/20/08 | 86 | 320 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Trichloro-1,2,2-trifluoroethane[1,1,2-] | 6/23/08 | 1.6 | 12 | 6/20/08 | ND | ND | 9/9/08 | 1.9 | 14 | 12/3/08 | 1.7 | 13 | 3/11/09 | 2.4 | 19 |
| | | | Trichloroethane[1,1,1-] | 6/23/08 | 3.6 | 20 | 6/20/08 | ND | ND | 9/9/08 | 4.9 | 26 | 12/3/08 | 3.7 | 20 | 3/11/09 | 3.7 | 20 |
| | | | Trichloroethene | 6/23/08 | ND | ND | 6/20/08 | 1.5 | 8 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Trichlorofluoromethane | 6/23/08 | 7.5 | 42 | 6/20/08 | 1.2 | 6.8 | 9/9/08 | 6.1 | 34 | 12/3/08 | 4.8 | 27 | 3/11/09 | 6.7 | 38 |
| | | | Trimethylbenzene[1,2,4-] | 6/23/08 | ND | ND | 6/20/08 | 7.6 | 37 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Trimethylbenzene[1,3,5-] | 6/23/08 | ND | ND | 6/20/08 | 2.4 | 12 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Xylene[1,2-] | 6/23/08 | ND | ND | 6/20/08 | 12 | 54 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Xylene[1,3-]+Xylene[1,4-] | 6/23/08 | ND | ND | 6/20/08 | 35 | 150 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |

## Table 5.0-1 (continued)

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte | 3rd Quarter FY08 | | | | | | 4th Quarter FY08 | | | 1st Quarter FY09 | | | 2nd Quarter FY09 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | | Packer | | | FLUTe | | | FLUTe | | | FLUTe | | |
| | | | | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) |
| 54-01023 | 247 | 247–249 | Acetone | 6/23/08 | 12 | 27 | 6/20/08 | 56 | 130 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Benzene | 6/23/08 | ND | ND | 6/20/08 | ND | ND | 9/9/08 | 1.8 | 5.9 | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Butadiene[1,3-] | 6/23/08 | ND | ND | 6/20/08 | 2.6 | 5.6 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Butanol[1-] | 6/23/08 | 36 | 110 | 6/20/08 | ND | ND | 9/9/08 | 54 | 160 | 12/3/08 | 70 | 210 | 3/11/09 | 32 | 98 |
| | | | Butanone[2-] | 6/23/08 | 1.2 | 3.5 | 6/20/08 | 39 | 120 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Carbon Disulfide | 6/23/08 | ND | ND | 6/20/08 | 27 | 85 | 9/9/08 | 2.8 | 8.8 | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Carbon Tetrachloride | 6/23/08 | ND | ND | 6/20/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | 1.2 | 7.8 | 3/11/09 | 1.1 | 7 |
| | | | Chlorobenzene | 6/23/08 | 11 | 53 | 6/20/08 | ND | ND | 9/9/08 | 19 | 88 | 12/3/08 | 9.6 | 44 | 3/11/09 | 4.8 | 22 |
| | | | Cyclohexane | 6/23/08 | ND | ND | 6/20/08 | 26 | 89 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Dichlorodifluoromethane | 6/23/08 | 4.4 | 22 | 6/20/08 | ND | ND | 9/9/08 | 2.8 | 14 | 12/3/08 | 3.4 | 17 | 3/11/09 | 4.3 | 21 |
| | | | Ethylbenzene | 6/23/08 | ND | ND | 6/20/08 | 19 | 83 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Ethyltoluene[4-] | 6/23/08 | ND | ND | 6/20/08 | 13 | 63 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Hexane | 6/23/08 | 2.3 | 8.1 | 6/20/08 | 83 | 290 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | n-Heptane | 6/23/08 | ND | ND | 6/20/08 | 40 | 160 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Propylene | 6/23/08 | ND | ND | 6/20/08 | 36 | 62 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Tetrachloroethene | 6/23/08 | ND | ND | 6/20/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | 2.1 | 14 | 3/11/09 | ND | ND |
| | | | Toluene | 6/23/08 | 14 | 53 | 6/20/08 | 190 | 730 | 9/9/08 | 8.2 | 31 | 12/3/08 | 1.2 | 4.6 | 3/11/09 | 0.98 | 3.7 |
| | | | Trichloro-1,2,2-trifluoroethane[1,1,2-] | 6/23/08 | 1.5 | 11 | 6/20/08 | ND | ND | 9/9/08 | 1.1 | 8.5 | 12/3/08 | 1.3 | 10 | 3/11/09 | 1.6 | 12 |
| | | | Trichloroethane[1,1,1-] | 6/23/08 | 3.1 | 17 | 6/20/08 | ND | ND | 9/9/08 | 1.8 | 9.6 | 12/3/08 | 1.9 | 10 | 3/11/09 | 1.3 | 7 |
| | | | Trichloroethene | 6/23/08 | ND | ND | 6/20/08 | 2 | 11 | 9/9/08 | ND | ND | 12/3/08 | 0.89 (J) | 4.8 (J) | 3/11/09 | ND | ND |
| | | | Trichlorofluoromethane | 6/23/08 | 7.7 | 43 | 6/20/08 | ND | ND | 9/9/08 | 4 | 22 | 12/3/08 | 4.4 | 25 | 3/11/09 | 4.6 | 26 |
| | | | Trimethylbenzene[1,2,4-] | 6/23/08 | ND | ND | 6/20/08 | 13 | 63 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Trimethylbenzene[1,3,5-] | 6/23/08 | ND | ND | 6/20/08 | 4.2 | 20 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Xylene[1,2-] | 6/23/08 | ND | ND | 6/20/08 | 24 | 110 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| | | | Xylene[1,3-]+Xylene[1,4-] | 6/23/08 | ND | ND | 6/20/08 | 70 | 300 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/11/09 | ND | ND |
| 54-15461 | 10 | 10–12 | Acetone | 6/26/08 | ND | ND | 6/25/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | 3.8 | 9.2 | 3/9/09 | ND | ND |
| | | | Butadiene[1,3-] | 6/26/08 | ND | ND | 6/25/08 | 1.6 | 3.6 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Carbon Disulfide | 6/26/08 | ND | ND | 6/25/08 | ND | ND | 9/9/08 | 1.6 | 5 | 12/3/08 | ND | ND | 3/9/09 | 2.2 | 6.7 |

## Table 5.0-1 (continued)

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte | 3rd Quarter FY08 | | | | | | 4th Quarter FY08 | | | 1st Quarter FY09 | | | 2nd Quarter FY09 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | | Packer | | | FLUTe | | | FLUTe | | | FLUTe | | |
| | | | | Date | Result (ppbv) | Result (µg/m$^3$) | Date | Result (ppbv) | Result (µg/m$^3$) | Date | Result (ppbv) | Result (µg/m$^3$) | Date | Result (ppbv) | Result (µg/m$^3$) | Date | Result (ppbv) | Result (µg/m$^3$) |
| 54-15461 | 10 | 10–12 | Cyclohexane | 6/26/08 | ND | ND | 6/25/08 | 2.2 | 7.5 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Dichlorodifluoromethane | 6/26/08 | 3.7 | 18 | 6/25/08 | ND | ND | 9/9/08 | 1.4 | 6.8 | 12/3/08 | ND | ND | 3/9/09 | 2.6 | 13 |
| | | | Ethanol | 6/26/08 | 12 | 23 | 6/25/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Ethylbenzene | 6/26/08 | ND | ND | 6/25/08 | 2.2 | 9.6 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Ethyltoluene[4-] | 6/26/08 | ND | ND | 6/25/08 | 4.5 | 22 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Hexane | 6/26/08 | ND | ND | 6/25/08 | 8.9 | 31 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | n-Heptane | 6/26/08 | ND | ND | 6/25/08 | 1.6 | 6.7 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Propanol[2-] | 6/26/08 | 3.6 (J) | 9 (J) | 6/25/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Propylene | 6/26/08 | ND | ND | 6/25/08 | 11 | 18 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Toluene | 6/26/08 | 1.2 | 4.6 | 6/25/08 | 16 | 59 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Trichloroethane[1,1,1-] | 6/26/08 | 1.7 | 9.4 | 6/25/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | 1.3 | 7.3 |
| | | | Trichlorofluoromethane | 6/26/08 | 2.8 | 16 | 6/25/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | 1.6 | 9 |
| | | | Trimethylbenzene[1,2,4-] | 6/26/08 | ND | ND | 6/25/08 | 6.2 | 30 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Trimethylbenzene[1,3,5-] | 6/26/08 | ND | ND | 6/25/08 | 1.8 | 8.9 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Xylene[1,2-] | 6/26/08 | ND | ND | 6/25/08 | 3.4 | 15 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Xylene[1,3-+Xylene[1,4-] | 6/26/08 | ND | ND | 6/25/08 | 8 | 35 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | 60 | 60–62 | Butadiene[1,3-] | 6/26/08 | ND | ND | 6/25/08 | 1.2 | 2.7 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Butanone[2-] | 6/26/08 | ND | ND | 6/25/08 | 7.2 | 21 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Carbon Disulfide | 6/26/08 | 1.4 | 4.4 | 6/25/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | 1.4 | 4.3 |
| | | | Cyclohexane | 6/26/08 | ND | ND | 6/25/08 | 1.2 | 4.1 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Dichlorodifluoromethane | 6/26/08 | 2.2 | 11 | 6/25/08 | ND | ND | 9/9/08 | 3.3 | 16 | 12/3/08 | 3.2 | 16 | 3/9/09 | 3.2 | 16 |
| | | | Ethylbenzene | 6/26/08 | ND | ND | 6/25/08 | 1.9 | 8.3 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Ethyltoluene[4-] | 6/26/08 | ND | ND | 6/25/08 | 4.4 | 22 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Hexane | 6/26/08 | ND | ND | 6/25/08 | 4.2 | 15 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | n-Heptane | 6/26/08 | ND | ND | 6/25/08 | 1.4 | 5.6 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Propylene | 6/26/08 | ND | ND | 6/25/08 | 9.6 | 16 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Toluene | 6/26/08 | ND | ND | 6/25/08 | 12 | 44 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Trichloroethane[1,1,1-] | 6/26/08 | ND | ND | 6/25/08 | ND | ND | 9/9/08 | 1.9 | 10 | 12/3/08 | 1.8 | 9.9 | 3/9/09 | 1.8 | 9.7 |

## Table 5.0-1 (continued)

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte | 3rd Quarter FY08 | | | | | | 4th Quarter FY08 | | | 1st Quarter FY09 | | | 2nd Quarter FY09 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | | Packer | | | FLUTe | | | FLUTe | | | FLUTe | | |
| | | | | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) |
| 54-15461 | 60 | 60–62 | Trichlorofluoromethane | 6/26/08 | 1.4 | 7.9 | 6/25/08 | ND | ND | 9/9/08 | 2.4 | 14 | 12/3/08 | 2.3 | 13 | 3/9/09 | 2.3 | 13 |
| | | | Trimethylbenzene[1,2,4-] | 6/26/08 | ND | ND | 6/25/08 | 6 | 30 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Trimethylbenzene[1,3,5-] | 6/26/08 | ND | ND | 6/25/08 | 1.8 | 8.9 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Xylene[1,2-] | 6/26/08 | ND | ND | 6/25/08 | 3.3 | 14 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Xylene[1,3-+Xylene[1,4-] | 6/26/08 | ND | ND | 6/25/08 | 7.3 | 32 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | 95 | 95–97 | Acetone | 6/26/08 | ND | ND | 6/25/08 | ND | ND | 9/9/08 | 4.7 | 11 | 12/3/08 | ND | ND | 3/9/09 | 11 | 27 |
| | | | Butadiene[1,3-] | 6/26/08 | ND | ND | 6/25/08 | 1.1 | 2.5 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Butanone[2-] | 6/26/08 | ND | ND | 6/25/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | 1.8 | 5.3 |
| | | | Cyclohexane | 6/26/08 | ND | ND | 6/25/08 | 1.3 | 4.4 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Dichlorodifluoromethane | 6/26/08 | 2 | 9.7 | 6/25/08 | ND | ND | 9/9/08 | 3.5 | 17 | 12/3/08 | 3.4 | 17 | 3/9/09 | 3.5 | 17 |
| | | | Ethylbenzene | 6/26/08 | ND | ND | 6/25/08 | 1.9 | 8.2 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Ethyltoluene[4-] | 6/26/08 | ND | ND | 6/25/08 | 4.3 | 21 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Hexane | 6/26/08 | ND | ND | 6/25/08 | 4.5 | 16 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | n-Heptane | 6/26/08 | ND | ND | 6/25/08 | 1.2 | 4.8 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Propanol[2-] | 6/26/08 | 170 | 430 | 6/25/08 | ND | ND | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Propylene | 6/26/08 | 41 | 70 | 6/25/08 | 8.8 | 15 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Toluene | 6/26/08 | 1.6 | 5.9 | 6/25/08 | 11 | 40 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Trichloroethane[1,1,1-] | 6/26/08 | 0.86 | 4.7 | 6/25/08 | ND | ND | 9/9/08 | 2 | 11 | 12/3/08 | 1.8 | 10 | 3/9/09 | 2 | 11 |
| | | | Trichlorofluoromethane | 6/26/08 | 1.2 | 6.7 | 6/25/08 | ND | ND | 9/9/08 | 2.8 | 16 | 12/3/08 | 2.6 | 14 | 3/9/09 | 2.9 | 16 |
| | | | Trimethylbenzene[1,2,4-] | 6/26/08 | ND | ND | 6/25/08 | 5.7 | 28 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Trimethylbenzene[1,3,5-] | 6/26/08 | ND | ND | 6/25/08 | 1.8 | 8.8 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Xylene[1,2-] | 6/26/08 | ND | ND | 6/25/08 | 3.3 | 14 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| | | | Xylene[1,3-]+Xylene[1,4-] | 6/26/08 | ND | ND | 6/25/08 | 7.3 | 32 | 9/9/08 | ND | ND | 12/3/08 | ND | ND | 3/9/09 | ND | ND |
| 54-15462 | 10 | 10–12 | Acetone | 6/26/08 | 13 | 30 | 6/24/08 | 54 | 130 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 10 | 25 |
| | | | Benzene | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | 50 | 160 | 4/2/09 | 4.9 | 16 |
| | | | Butadiene[1,3-] | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | 10 | 23 | 4/2/09 | ND | ND |
| | | | Butanone[2-] | 6/26/08 | 1.4 | 4 | 6/24/08 | 5.9 | 17 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 2.8 | 8.4 |
| | | | Cyclohexane | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 2.7 | 9.4 |

## Table 5.0-1 (continued)

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte | 3rd Quarter FY08 | | | | | | 4th Quarter FY08 | | | 1st Quarter FY09 | | | 2nd Quarter FY09 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | | Packer | | | FLUTe | | | FLUTe | | | FLUTe | | |
| | | | | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) |
| 54-15462 | 10 | 10–12 | Dichlorodifluoromethane | 6/26/08 | 3.6 | 18 | 6/24/08 | 1.4 | 7 | 9/11/08 | 1.6 | 8.1 | 12/5/08 | ND | ND | 4/2/09 | 1.7 | 8.6 |
| | | | Ethylbenzene | 6/26/08 | ND | ND | 6/24/08 | 1.1 | 4.8 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 1.3 | 5.8 |
| | | | Ethyltoluene[4-] | 6/26/08 | ND | ND | 6/24/08 | 2.1 | 10 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Hexane | 6/26/08 | 1.2 | 4.3 | 6/24/08 | 1.2 | 4.2 | 9/11/08 | ND | ND | 12/5/08 | 11 | 38 | 4/2/09 | 2.5 | 8.8 |
| | | | n-Heptane | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 1.4 | 6 |
| | | | Propanol[2-] | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 96 | 240 |
| | | | Propylene | 6/26/08 | ND | ND | 6/24/08 | 4.1 | 7.1 | 9/11/08 | ND | ND | 12/5/08 | 38 | 66 | 4/2/09 | 10 | 18 |
| | | | Tetrahydrofuran | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 1.6 | 4.6 |
| | | | Toluene | 6/26/08 | 2.1 | 8.1 | 6/24/08 | 4.8 | 18 | 9/11/08 | ND | ND | 12/5/08 | 45 | 170 | 4/2/09 | 280 | 1000 |
| | | | Trichloro-1,2,2-trifluoroethane[1,1,2-] | 6/26/08 | 1.2 | 9 | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Trichloroethane[1,1,1-] | 6/26/08 | 5.1 | 28 | 6/24/08 | 2.3 | 13 | 9/11/08 | 3.1 | 17 | 12/5/08 | ND | ND | 4/2/09 | 1.7 | 9.5 |
| | | | Trichlorofluoromethane | 6/26/08 | 2.6 | 15 | 6/24/08 | 1.2 | 6.5 | 9/11/08 | 1.3 | 7.3 | 12/5/08 | ND | ND | 4/2/09 | 1.1 | 6.1 |
| | | | Trimethylbenzene[1,2,4-] | 6/26/08 | ND | ND | 6/24/08 | 2.8 | 14 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Xylene[1,2-] | 6/26/08 | ND | ND | 6/24/08 | 1.8 | 7.7 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 1.8 | 7.6 |
| | | | Xylene[1,3-]+Xylene[1,4-] | 6/26/08 | ND | ND | 6/24/08 | 4.2 | 18 | 9/11/08 | ND | ND | 12/5/08 | 14 | 60 | 4/2/09 | 3.5 | 15 |
| | 60 | 60–62 | Acetone | 6/26/08 | 8.4 | 20[b] | 6/24/08 | 80 | 190 | NS[c] | NS | NS | NS | NS | NS | 4/2/09 | 35 | 84 |
| | | | Butanol[1-] | 6/26/08 | ND | ND[b] | 6/24/08 | ND | ND | NS | NS | NS | NS | NS | NS | 4/2/09 | 12 | 37 |
| | | | Butanone[2-] | 6/26/08 | 4.4 | 13[b] | 6/24/08 | 9.8 | 29 | NS | NS | NS | NS | NS | NS | 4/2/09 | 4.8 | 14 |
| | | | Carbon Disulfide | 6/26/08 | ND | ND[b] | 6/24/08 | ND | ND | NS | NS | NS | NS | NS | NS | 4/2/09 | 6.5 | 20 |
| | | | Chlorobenzene | 6/26/08 | ND | ND[b] | 6/24/08 | ND | ND | NS | NS | NS | NS | NS | NS | 4/2/09 | 1.3 | 5.9 |
| | | | Dichlorodifluoromethane | 6/26/08 | 1.8 | 8.9[b] | 6/24/08 | 2 | 9.7 | NS | NS | NS | NS | NS | NS | 4/2/09 | 4.1 | 20 |
| | | | Ethanol | 6/26/08 | 80 | 150[b] | 6/24/08 | 7 | 13 | NS | NS | NS | NS | NS | NS | 4/2/09 | ND | ND |
| | | | Ethyltoluene[4-] | 6/26/08 | ND | ND[b] | 6/24/08 | 2.3 | 11 | NS | NS | NS | NS | NS | NS | 4/2/09 | ND | ND |
| | | | Hexane | 6/26/08 | 1 | 3.5[b] | 6/24/08 | ND | ND | NS | NS | NS | NS | NS | NS | 4/2/09 | ND | ND |
| | | | Methanol | 6/26/08 | 150 | 200[b] | 6/24/08 | ND | ND | NS | NS | NS | NS | NS | NS | 4/2/09 | ND | ND |
| | | | Propanol[2-] | 6/26/08 | ND | ND[b] | 6/24/08 | ND | ND | NS | NS | NS | NS | NS | NS | 4/2/09 | 92 | 230 |
| | | | Propylene | 6/26/08 | ND | ND[b] | 6/24/08 | 5.3 | 9.1 | NS | NS | NS | NS | NS | NS | 4/2/09 | ND | ND |
| | | | Tetrahydrofuran | 6/26/08 | ND | ND[b] | 6/24/08 | ND | ND | NS | NS | NS | NS | NS | NS | 4/2/09 | 2.5 | 7.3 |

## Table 5.0-1 (continued)

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte | 3rd Quarter FY08 | | | | | | 4th Quarter FY08 | | | 1st Quarter FY09 | | | 2nd Quarter FY09 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | | Packer | | | FLUTe | | | FLUTe | | | FLUTe | | |
| | | | | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) |
| 54-15462 | 60 | 60–62 | Toluene | 6/26/08 | 2.5 | 9.5[b] | 6/24/08 | 4.5 | 17 | NS | NS | NS | NS | NS | NS | 4/2/09 | 45 | 170 |
| | | | Trichloro-1,2,2-trifluoroethane[1,1,2-] | 6/26/08 | ND | ND[b] | 6/24/08 | ND | ND | NS | NS | NS | NS | NS | NS | 4/2/09 | 1.5 | 11 |
| | | | Trichloroethane[1,1,1-] | 6/26/08 | 2.6 | 14[b] | 6/24/08 | 3 | 16 | NS | NS | NS | NS | NS | NS | 4/2/09 | 5.3 | 29 |
| | | | Trichlorofluoromethane | 6/26/08 | 1.3 | 7.6[b] | 6/24/08 | 1.4 | 8.1 | NS | NS | NS | NS | NS | NS | 4/2/09 | 2.8 | 16 |
| | | | Trimethylbenzene[1,2,4-] | 6/26/08 | ND | ND[b] | 6/24/08 | 3.1 | 15 | NS | NS | NS | NS | NS | NS | 4/2/09 | ND | ND |
| | | | Xylene[1,2-] | 6/26/08 | ND | ND[b] | 6/24/08 | 1.9 | 8.2 | NS | NS | NS | NS | NS | NS | 4/2/09 | ND | ND |
| | | | Xylene[1,3-]+Xylene[1,4-] | 6/26/08 | 1 | 4.5[b] | 6/24/08 | 4 | 17 | NS | NS | NS | NS | NS | NS | 4/2/09 | 0.89 | 3.9 |
| | 100 | 100–102 | Acetone | 6/26/08 | 58 | 140 | 6/24/08 | 26 | 62 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 30 | 70 |
| | | | Benzene | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | 17 | 54 | 4/2/09 | 0.85 (J) | 2.7 (J) |
| | | | Butadiene[1,3-] | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | 3.2 | 7 | 4/2/09 | ND | ND |
| | | | Butanol[1-] | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 18 | 53 |
| | | | Butanone[2-] | 6/26/08 | 180 | 520 | 6/24/08 | 2.2 | 6.4 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 4.2 | 12 |
| | | | Chlorobenzene | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 2.3 | 10 |
| | | | Cyclohexane | 6/26/08 | 4.2 | 14 | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Dichlorodifluoromethane | 6/26/08 | ND | ND | 6/24/08 | 2.5 | 12 | 9/11/08 | 3 | 14 | 12/5/08 | 1.5 | 7.5 | 4/2/09 | 3.9 | 19 |
| | | | Ethanol | 6/26/08 | 110 | 210 | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Ethylbenzene | 6/26/08 | 0.93 | 4 | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | 1.4 | 6.3 | 4/2/09 | ND | ND |
| | | | Ethyltoluene[4-] | 6/26/08 | 0.88 | 4.3 | 6/24/08 | 1.4 | 6.7 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Hexane | 6/26/08 | 5.1 | 18 | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | 8.7 | 31 | 4/2/09 | ND | ND |
| | | | n-Heptane | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | 3.8 | 16 | 4/2/09 | ND | ND |
| | | | Propylene | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | 16 | 27 | 4/2/09 | ND | ND |
| | | | Tetrahydrofuran | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 2.9 | 8.4 |
| | | | Toluene | 6/26/08 | 3.8 | 14 | 6/24/08 | 3.6 | 14 | 9/11/08 | ND | ND | 12/5/08 | 19 | 70 | 4/2/09 | 22 | 84 |
| | | | Trichloro-1,2,2-trifluoroethane[1,1,2-] | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | 1.1 | 8.6 | 12/5/08 | ND | ND | 4/2/09 | 1.4 | 11 |
| | | | Trichloroethane[1,1,1-] | 6/26/08 | ND | ND | 6/24/08 | 3.9 | 21 | 9/11/08 | 6.7 | 37 | 12/5/08 | ND | ND | 4/2/09 | 6 | 33 |
| | | | Trichloroethene | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | 1 | 5.4 | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Trichlorofluoromethane | 6/26/08 | ND | ND | 6/24/08 | 1.9 | 10 | 9/11/08 | 2.4 | 14 | 12/5/08 | 1.1 | 6.1 | 4/2/09 | 2.8 | 16 |

## Table 5.0-1 (continued)

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte | 3rd Quarter FY08 | | | | | | 4th Quarter FY08 | | | 1st Quarter FY09 | | | 2nd Quarter FY09 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | | Packer | | | FLUTe | | | FLUTe | | | FLUTe | | |
| | | | | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) |
| 54-15462 | 100 | 100–101 | Trimethylbenzene[1,2,4-] | 6/26/08 | 0.9 | 4.4 | 6/24/08 | 1.9 | 9.2 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Xylene[1,2-] | 6/26/08 | 0.93 | 4 | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | 0.93 | 4 | 4/2/09 | ND | ND |
| | | | Xylene[1,3-]+Xylene[1,4-] | 6/26/08 | 2.2 | 9.7 | 6/24/08 | 2.6 | 11 | 9/11/08 | ND | ND | 12/5/08 | 3.5 | 15 | 4/2/09 | ND | ND |
| | 150 | 150–152 | Acetone | 6/26/08 | 11 | 26 | 6/24/08 | 44 | 100 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 49 | 120 |
| | | | Benzene | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | 0.89 | 2.8 | 4/2/09 | 1.2 | 3.7 |
| | | | Butanol[1-] | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 29 | 89 |
| | | | Butanone[2-] | 6/26/08 | 7.3 | 21 | 6/24/08 | 3.6 | 11 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 0.89 | 2.6 |
| | | | Carbon Disulfide | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | 1.2 | 3.8 | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Chlorobenzene | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 5.2 | 24 |
| | | | Dichlorodifluoromethane | 6/26/08 | 2.9 | 14 | 6/24/08 | 1.3 | 6.6 | 9/11/08 | 4.5 | 22 | 12/5/08 | 1.4 | 7 | 4/2/09 | 3.1 | 15 |
| | | | Ethyltoluene[4-] | 6/26/08 | ND | ND | 6/24/08 | 1.9 | 9.4 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Hexane | 6/26/08 | 1.6 | 5.6 | 6/24/08 | 1.2 | 4.4 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Toluene | 6/26/08 | 4.6 | 17 | 6/24/08 | 5.6 | 21 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 31 | 120 |
| | | | Trichloro-1,2,2-trifluoroethane[1,1,2-] | 6/26/08 | 0.92 | 7 | 6/24/08 | ND | ND | 9/11/08 | 1.7 | 13 | 12/5/08 | ND | ND | 4/2/09 | 1.1 | 8.4 |
| | | | Trichloroethane[1,1,1-] | 6/26/08 | 4.9 | 27 | 6/24/08 | 1.8 | 9.8 | 9/11/08 | 7.8 | 43 | 12/5/08 | ND | ND | 4/2/09 | 3.3 | 18 |
| | | | Trichloroethene | 6/26/08 | ND | ND | 6/24/08 | ND | ND | 9/11/08 | 0.93 | 5 | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Trichlorofluoromethane | 6/26/08 | 2.2 | 12 | 6/24/08 | ND | ND | 9/11/08 | 3.5 | 20 | 12/5/08 | 1 | 5.8 | 4/2/09 | 1.9 | 11 |
| | | | Trimethylbenzene[1,2,4-] | 6/26/08 | ND | ND | 6/24/08 | 2.6 | 13 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Xylene[1,2-] | 6/26/08 | ND | ND | 6/24/08 | 1.7 | 7.4 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Xylene[1,3-]+Xylene[1,4-] | 6/26/08 | 1.4 | 6.2 | 6/24/08 | 3.9 | 17 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | 200 | 200–202 | Acetone | 6/26/08 | 36 | 84 | 6/23/08 | 38 | 90 | 9/11/08 | ND | ND | 12/5/08 | 6 | 14 | 4/2/09 | 33 | 78 |
| | | | Butanol[1-] | 6/26/08 | ND | ND | 6/23/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 42 | 130 |
| | | | Butanone[2-] | 6/26/08 | 6.6 | 19 | 6/23/08 | 6.2 | 18 | 9/11/08 | ND | ND | 12/5/08 | 1 | 3 | 4/2/09 | 5.7 | 17 |
| | | | Carbon Disulfide | 6/26/08 | ND | ND | 6/23/08 | ND | ND | 9/11/08 | 1 | 3.2 | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Chlorobenzene | 6/26/08 | ND | ND | 6/23/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 6.2 | 29 |
| | | | Dichlorodifluoromethane | 6/26/08 | 3 | 15 | 6/23/08 | ND | ND | 9/11/08 | 5.6 | 28 | 12/5/08 | 2 | 9.7 | 4/2/09 | 4.5 | 22 |
| | | | Ethanol | 6/26/08 | 4.2 | 7.8 | 6/23/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 32 | 60 |
| | | | Hexane | 6/26/08 | 1.1 | 3.9 | 6/23/08 | 1.3 | 4.7 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | ND | ND |

## Table 5.0-1 (continued)

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | Analyte | 3rd Quarter FY08 | | | | | | 4th Quarter FY08 | | | 1st Quarter FY09 | | | 2nd Quarter FY09 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | FLUTe | | | Packer | | | FLUTe | | | FLUTe | | | FLUTe | | |
| | | | | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) | Date | Result (ppbv) | Result (µg/m³) |
| 54-15462 | 200 | 200–202 | Tetrahydrofuran | 6/26/08 | ND | ND | 6/23/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 2.9 | 8.4 |
| | | | Toluene | 6/26/08 | 2.6 | 9.7 | 6/23/08 | 2.4 | 8.9 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 53 | 200 |
| | | | Trichloro-1,2,2-trifluoroethane[1,1,2-] | 6/26/08 | 0.94 | 7.2 | 6/23/08 | ND | ND | 9/11/08 | 2 | 15 | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Trichloroethane[1,1,1-] | 6/26/08 | 5.1 | 28 | 6/23/08 | ND | ND | 9/11/08 | 7.3 | 40 | 12/5/08 | ND | ND | 4/2/09 | 5 | 27 |
| | | | Trichlorofluoromethane | 6/26/08 | 2.3 | 13 | 6/23/08 | ND | ND | 9/11/08 | 3.8 | 21 | 12/5/08 | 1.5 | 8.3 | 4/2/09 | 2.8 | 15 |
| | | | Xylene[1,3-]+Xylene[1,4-] | 6/26/08 | 1 | 4.5 | 6/23/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | 254 | 254–256 | Acetone | 6/26/08 | 4.6 | 11 | 6/23/08 | 210 | 500 | 9/11/08 | ND | ND | 12/5/08 | 4.3 | 10 | 4/2/09 | 300 | 720 |
| | | | Butanol[1-] | 6/26/08 | ND | ND | 6/23/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 50 | 150 |
| | | | Butanone[2-] | 6/26/08 | 1.4 | 4 | 6/23/08 | 30 | 90 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 8.4 | 25 |
| | | | Carbon Disulfide | 6/26/08 | 3.9 | 12 | 6/23/08 | ND | ND | 9/11/08 | 1.6 | 4.9 | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Carbon Tetrachloride | 6/26/08 | ND | ND | 6/23/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | 6.4 | 40 | 4/2/09 | ND | ND |
| | | | Chlorobenzene | 6/26/08 | ND | ND | 6/23/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | 11 | 49 |
| | | | Chloroform | 6/26/08 | ND | ND | 6/23/08 | ND | ND | 9/11/08 | ND | ND | 12/5/08 | 1.8 | 8.6 | 4/2/09 | ND | ND |
| | | | Dichlorodifluoromethane | 6/26/08 | 2.7 | 13 | 6/23/08 | ND | ND | 9/11/08 | 4.1 | 20 | 12/5/08 | 4.5 | 22 | 4/2/09 | ND | ND |
| | | | Ethanol | 6/26/08 | ND | ND | 6/23/08 | 6.3 | 12 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Hexane | 6/26/08 | 2.2 | 7.7 | 6/23/08 | 2.1 | 7.5 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | n-Heptane | 6/26/08 | ND | ND | 6/23/08 | 2.2 | 9 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Propylene | 6/26/08 | ND | ND | 6/23/08 | 8.3 | 14 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Toluene | 6/26/08 | 2.5 | 9.4 | 6/23/08 | 4.4 | 16 | 9/11/08 | ND | ND | 12/5/08 | 2.2 | 8.3 | 4/2/09 | 200 | 750 |
| | | | Trichloro-1,2,2-trifluoroethane[1,1,2-] | 6/26/08 | ND | ND | 6/23/08 | ND | ND | 9/11/08 | 1.4 | 11 | 12/5/08 | 2 | 15 | 4/2/09 | ND | ND |
| | | | Trichloroethane[1,1,1-] | 6/26/08 | 3.5 | 19 | 6/23/08 | ND | ND | 9/11/08 | 5 | 27 | 12/5/08 | ND | ND | 4/2/09 | ND | ND |
| | | | Trichlorofluoromethane | 6/26/08 | 1.9 | 11 | 6/23/08 | ND | ND | 9/11/08 | 2.8 | 16 | 12/5/08 | 3.3 | 19 | 4/2/09 | ND | ND |
| | | | Xylene[1,3-]+Xylene[1,4-] | 6/26/08 | ND | ND | 6/23/08 | 2.2 | 9.7 | 9/11/08 | ND | ND | 12/5/08 | ND | ND | 4/2/09 | ND | ND |

Notes: See Appendix A for data qualifier definitions. Grey shading indicates data rejected by NMED (2009, 105599).

[a] ND = Not detected.

[b] Results are not representative of formation air because tubing was disconnected from sampling port.

[c] NS = Not sampled.

## Table 5.0-2
## Tritium Pore-Vapor Results at MDA H

| Borehole ID | Port Depth (ft bgs) | Sampling Port Depth or Interval (ft bgs) | 3rd Quarter FY08 | | 4rd Quarter FY08 | | 1st Quarter FY09 | | 2nd Quarter FY09 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Date | Result (pCi/L) | Date | Result (pCi/L) | Date | Result (pCi/L) | Date | Result (pCi/L) |
| 54-01023 | 10 | 10–12 | 6/23/08 | 93,478(J) | 9/16/08 | 5,168,463 | 12/12/08 | 4,977,757 | 3/10/09 | 4,635,189 |
| | 60 | 60–62 | 6/23/08 | 10,655,915(J) | 9/16/08 | 7,231,583 | 12/12/08 | 5,020,148 | 3/10/09 | 3,998,479 |
| | 100 | 100–102 | 6/23/08 | 5,034,305(J) | 9/16/08 | 2,465,693 | 12/12/08 | 1,017,055 | 3/10/09 | 2,337,198 |
| | 150 | 150–152 | 6/23/08 | 1,749,462(J) | 9/16/08 | 1,269,785 | 12/12/08 | 1,024,599 | 3/10/09 | 1,155,927 |
| | 200 | 200–202 | 6/23/08 | 1,012,160(J) | 9/16/08 | 752,970 | 12/12/08 | 1,080,792 | 3/10/09 | 1,244,833 |
| | 247 | 247–249 | 6/23/08 | 70,339(J) | 9/16/08 | 602,321 | 12/12/08 | 944,477 | 3/10/09 | 746,273 |
| 54-15461 | 10 | 10–12 | 6/26/08 | R[a] | 9/15/08 | 3,423 | 12/11/08 | 2,564 | 3/11/09 | 2,370 |
| | 60 | 60–62 | 6/26/08 | R | 9/15/08 | 691 | 12/11/08 | 619 | 3/11/09 | 8,707 |
| | 95 | 95–97 | 6/26/08 | R | 9/15/08 | 434 | 12/11/08 | 713 | 3/11/09 | 21,855 |
| 54-15462 | 10 | 10–12 | 6/26/08 | R | 9/22/08 | 14,425 | 12/11/08 | 672 | 4/6/09 | ND[b] |
| | 60 | 60–62 | 6/26/08 | R | NS[c] | NS | NS | NS | 4/6/09 | ND |
| | 100 | 100–102 | 6/26/08 | R | 9/22/08 | ND | 12/11/08 | 361 | 4/6/09 | ND |
| | 150 | 150–152 | 6/26/08 | R | 9/22/08 | ND | 12/11/08 | 6,224 | 4/3/09 | ND |
| | 200 | 200–202 | 6/26/08 | R | 9/22/08 | 396 | 12/11/08 | 334 | 4/3/09 | 370 |
| | 254 | 254–256 | 6/26/08 | R | 9/22/08 | 5,529 | 12/11/08 | 1,119 | 4/3/09 | ND |

Note: See Appendix A for data qualifier definitions.

[a] R = Data rejected during validation.

[b] ND = Not detected.

[c] NS = Not sampled.

**Table 5.2-1**
**Screening of VOCs Detected in Pore Gas at MDA H**

| VOC | Maximum Detected Pore-Gas Concentration (µg/m³) | SL (µg/L) | Calculated Concentrations in Pore Gas Corresponding to Groundwater SL (µg/m³) | SV (unitless) |
|---|---|---|---|---|
| Acetone | 720 | 22,000[a] | 32,200 | 0.02 |
| Benzene | 16 | 5[b] | 1140 | 0.014 |
| Butanol[1-] | 150 | 3700[a] | 1332 | 0.11 |
| Butanone[2-] | 25 | 7100[a] | 7810 | 0.0032 |
| Carbon Disulfide | 20 | 1000[a] | 1,200,000 | 0.000017 |
| Carbon Tetrachloride | 7 | 5[b] | 6250 | 0.0011 |
| Chlorobenzene | 49 | 100[b] | 15,000 | 0.0033 |
| Cyclohexane | 9.4 | 13,000[a] | 79,300,000 | 0.00000012 |
| Dichlorodifluoromethane | 29 | 390[a] | 1,599,000 | 0.000018 |
| Dichloroethene[1,1-] | 8.4 | 5 | 5500 | 0.0015 |
| Ethanol | 60 | na[c] | na | na |
| Ethylbenzene | 5.8 | 700[b] | 226100 | 0.000026 |
| Hexane | 8.8 | 880[a] | 4400000 | 0.000002 |
| n-Heptane | 6 | na | na | na |
| Propanol[2-] | 240 | na | na | na |
| Propylene | 18 | na | na | na |
| Tetrachloroethene | 6.9 | 5[b] | 3770 | 0.0018 |
| Tetrahydrofuran | 8.4 | na | na | na |
| Toluene | 1000 | 750[d] | 204,000 | 0.0049 |
| Trichloro-1,2,2-trifluoroethane[1,1,2-] | 19 | 59,000[a] | 1,262,600,000 | 0.000000015 |
| Trichloroethane[1,1,1-] | 33 | 60[d] | 42,300 | 0.00078 |
| Trichlorofluoromethane | 64 | 1300[a] | 5,200,000 | 0.000012 |
| Xylene[1,2-] | 7.6 | 1400[a] | 298,200 | 0.000025 |
| Xylene[1,3-]+Xylene[1,4-] | 15 | 200[a,e] | 54,000 | 0.00028 |

Note: Calculated concentrations in pore gas corresponding to groundwater SLs derived from denominator of Equation 3.0-3.

[a] EPA regional screening level table from http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm.

[b] EPA MCL (40 Code of Federal Regulations 141.61).

[c] na = Not available.

[d] NMWQCC groundwater standard (20.6.2.3103 New Mexico Administrative Code).

[e] SL for Xylene[1,3-]+Xylene[1,4-] is for xylene mixture.

# Appendix A

*Acronyms and Abbreviations,*
*Metric Conversion Table, and Data Qualifier Definitions*

## A-1.0 ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| B&K | Brüel and Kjær |
| bgs | below ground surface |
| DCE | 1,1-dichloroethylene |
| DER | duplicate error ratio |
| EPA | Environmental Protection Agency (U.S.) |
| FLUTe | Flexible Liner Underground Technology |
| FY | fiscal year |
| kPa | kilopascal |
| LANL | Los Alamos National Laboratory |
| LCS | laboratory control sample |
| MCL | maximum contaminant level |
| MDA | material disposal area |
| NMED | New Mexico Environment Department |
| NMWQCC | New Mexico Water Quality Control Commission |
| PCE | tetrachloroethene |
| PID | photoionization detector |
| QA | quality assurance |
| QC | quality control |
| RPD | relative percent difference |
| RPF | Records Processing Facility |
| SL | screening level |
| SV | screening value |
| SOW | statement of work |
| TA | technical area |
| TCA | 1,1,1-trichloroethane |
| TCE | trichloroethene |
| TPU | total propagated uncertainty |
| VOC | volatile organic compound |

## A-2.0 METRIC CONVERSION TABLE

| Multiply SI (Metric) Unit | by | To Obtain U.S. Customary Unit |
|---|---|---|
| kilometers (km) | 0.622 | miles (mi) |
| kilometers (km) | 3281 | feet (ft) |
| meters (m) | 3.281 | feet (ft) |
| meters (m) | 39.37 | inches (in.) |
| centimeters (cm) | 0.03281 | feet (ft) |
| centimeters (cm) | 0.394 | inches (in.) |
| millimeters (mm) | 0.0394 | inches (in.) |
| micrometers or microns (µm) | 0.0000394 | inches (in.) |
| square kilometers ($km^2$) | 0.3861 | square miles ($mi^2$) |
| hectares (ha) | 2.5 | acres |
| square meters ($m^2$) | 10.764 | square feet ($ft^2$) |
| cubic meters ($m^3$) | 35.31 | cubic feet ($ft^3$) |
| kilograms (kg) | 2.2046 | pounds (lb) |
| grams (g) | 0.0353 | ounces (oz) |
| grams per cubic centimeter ($g/cm^3$) | 62.422 | pounds per cubic foot ($lb/ft^3$) |
| milligrams per kilogram (mg/kg) | 1 | parts per million (ppm) |
| micrograms per gram (µg/g) | 1 | parts per million (ppm) |
| liters (L) | 0.26 | gallons (gal.) |
| milligrams per liter (mg/L) | 1 | parts per million (ppm) |
| degrees Celsius (°C) | 9/5 + 32 | degrees Fahrenheit (°F) |

## A-3.0 DATA QUALIFIER DEFINITIONS

| Data Qualifier | Definition |
|---|---|
| U | The analyte was analyzed for but not detected. |
| J | The analyte was positively identified, and the associated numerical value is estimated to be more uncertain than would normally be expected for that analysis. |
| J+ | The analyte was positively identified, and the result is likely to be biased high. |
| J- | The analyte was positively identified, and the result is likely to be biased low. |
| UJ | The analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific detection or quantitation limit. |
| R | The data are rejected as a result of major problems with quality assurance/quality control parameters. |

# Appendix B

*Quality Assurance/Quality Control Program*

## B-1.0 INTRODUCTION

This appendix discusses analytical methods and data quality review and summarizes the effects of data quality exceptions on the acceptability of the laboratory analytical data.

Quality assurance (QA), quality control (QC), and data validation procedures were implemented in accordance with the Los Alamos National Laboratory (LANL or the Laboratory) "Quality Assurance Project Plan Requirements for Sampling and Analysis" (LANL 1996, 054609) and the Laboratory's statement of work (SOW) for analytical services (LANL 2000, 071233). The results of the QA/QC activities were used to estimate the accuracy, bias, and precision of the analytical measurements. QC samples, including method blanks, blank spikes, matrix spikes, laboratory control samples (LCSs), internal standards, initial and continuing calibrations, and surrogates, were used to assess laboratory accuracy and bias.

The type and frequency of QC analyses are described in the analytical services SOW (LANL 2000, 071233). Other QC factors, such as sample preservation and holding times, were also assessed. The requirements for sample preservation and holding times are presented in the standard operating procedure (SOP) ERSS-SOP-5056, Sample Containers and Preservation. Evaluating these QC indicators allows estimates to be made of the accuracy, bias, and precision of the analytical suites. A focused data validation was also performed for all the data packages (identified by request number) that included a more detailed review of the raw data results. The SOPs used for data validation are presented in Table B-1.0-1. Copies of the analytical data, laboratory logbooks, and instrument printouts are provided in Appendix C (on CD included with this document).

A systematic low bias in previously reported tritium pore-vapor measurements was identified (Whicker et al. 2009, 106429), and all tritium data presented in this report are corrected for this bias (Marczak 2009, 106500). The tritium results were corrected using the percent moisture value determined by the analytical laboratory. Details are discussed in section B-4.0.

Analytical data were reviewed and evaluated based on U.S. Environmental Protection Agency (EPA) National Functional Guidelines for organic chemical data review, where applicable (EPA 1994, 048639; EPA 1999, 066649). Data have also been assessed using guidelines established in SW-846 (EPA 1997, 057589). As a result of the data validation and assessment efforts, qualifiers have been assigned to the appropriate analytical records. Definitions of the data qualifiers are presented in Appendix A.

### B-1.1 Maintenance of Chain of Custody

To maintain chain of custody is to document or demonstrate the possession of an item by only authorized individuals. The chain-of-custody process, described in ERSS-SOP-5058, Chain of Custody for Analytical Data Record Packages, provides confidence in and documentation of analytical data integrity by establishing the traceability of the sample from the time of collection through processing to final maintenance as a record. The chain-of-custody forms are provided in Appendix C (on CD).

### B-1.2 Sample Documentation

Establishing sample documentation acceptability, described inEP-ERSS-SOP-5058, is the first step toward verifying an analytical system has produced data of known quality. Documentation depends on the accessibility of review items that accurately and completely describe the work performed. In the absence of adequate sample documentation, data quality cannot be independently verified.

### B-1.3 Sample Preservation

Sample preservation is the use of specific types of sample containers and preservation techniques, as described in EP-ERSS-SOP-5056, Sample Containers and Preservation. Sample preservation is mandatory for hazardous site investigations because the integrity of any sample decreases over time. Physical factors (light, pressure, temperature, etc.), chemical factors (changes in pH, volatilization, etc.), and biological factors may alter the original quality of a sample. Because the various target parameters are uniquely altered at varying rates, distinct sample containers, preservation techniques, and holding times have been established to maintain sample integrity for a reasonable and acceptable period of time.

### B-1.4 Holding Time

Holding time, the maximum amount of time a sample can be stored without potential unacceptable changes in analyte concentrations, is described in EP-ERSS-SOP-5056. Extraction holding time refers to the time that elapses between sample collection and sample preparation; analytical holding time refers to the time that elapses between sample preparation and analysis.

### B-1.5 Initial and Continuing Calibration Verification (Including Interference-Check Standards)

Calibration verification establishes a quantitative relationship between the response of the analytical procedure and the concentration of the target analyte. There are two aspects of calibration verification: initial and continuing. The initial calibration verifies the accuracy of the calibration curve and the individual calibration standards being used to perform the calibration. The continuing calibration ensures that the initial calibration is still holding and correct as the instrument is used to process samples. Interference-check samples are used to determine if a high concentration of a single analyte in a sample interferes with the accurate quantitation of other analytes.

### B-1.6 Analyte Identification (Including Spectra Review and Thermal Ionization Cavity Review)

Analyte identification is the process of associating an instrument signal with a compound or analyte of interest. Evaluation of signal retention times, spectral overlap, multipeak pattern matching, and mass spectral library searches are tools for making analyte identification determinations.

### B-1.7 Analyte Quantitation

Analyte quantitation is the association of an instrument signal with a concentration and the determination that a recorded signal is detected or not detected. Detection limits, instrument calibration linear ranges, internal standards, and carrier recoveries are tools for making analyte quantitation evaluations.

Organic chemical results are not detected if reported results are less than or equal to the method detection limit adjusted by sample-specific dilution or concentration factors.

Radionuclide results reported at less than the minimum detectable activity are not detected. Each radiochemical result is also compared with the corresponding 1-sigma total propagated uncertainty (TPU). If the result is not greater than 3 times the TPU, it is also qualified as not detected.

Uncertainty and minimum detectable activity results for tritium have been modified in the same manner as the analytical results to account for the bound water found in silica gel used for sample collection.

### B-1.8 Method Blank

A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as those used in the environmental sample processing and which is extracted and analyzed in the same manner as the corresponding environmental samples. Method blanks are used to assess the potential for sample contamination during extraction and analysis. All target analytes should be below the contract-required detection limit in the method blank (LANL 2000, 071233).

### B-1.9 Matrix Spike Recoveries

A matrix spike is an aliquot of sample spiked with a known concentration of the target analyte(s). Matrix spike samples are used to measure the ability to recover prescribed analytes from a native sample matrix. Spiking typically occurs before sample preparation and analysis. Acceptable percentage recoveries for matrix spikes vary by method but should generally be greater than 10% for an analytical result to be usable (LANL 2000, 071233).

### B-1.10 Surrogate and Tracer Recoveries

A surrogate (an organic chemical compound) and a tracer (a radiochemical isotope) are similar in composition and behavior to target analytes but are not typically found in environmental samples. Surrogates and tracers are added to every blank, sample, and spike to evaluate the efficiency with which target analytes are recovered during extraction and analysis. The recovery percentages of the surrogates and tracers vary by method but should generally be greater than 10% for an analytical result to be usable (LANL 2000, 071233).

### B-1.11 Internal Standard Responses and Carrier Recoveries

Internal standards and carriers are chemical compounds added to blank, sample, and standard extracts at known concentrations. They are used to compensate for (1) analyte concentration changes that might occur during storage of the extract and (2) quantitation variations that can occur during analysis. Internal standard responses and carrier recoveries are used to adjust the reported concentrations for the quantitation of target analytes. The response factors for internal standards vary by method but should generally be within the range of ≥50% to ≤200%. The recoveries for carriers vary by method but should generally be greater than 10% for an analytical result to be usable (LANL 2000, 071233).

### B-1.12 LCS Recoveries

An LCS is a known matrix that has been spiked with compound(s) representative of the target analytes. The LCS is used to document laboratory performance. The acceptance criteria for LCSs are method-specific, but should generally be greater than 10% for an analytical result to be usable (LANL 2000, 071233).

### B-1.13 Laboratory and Field Duplicates (Including Serial Dilutions)

Laboratory duplicates are two portions of a sample taken from the same sample container (prepared for analysis and analyzed independently but under identical conditions) used to assess or demonstrate acceptable laboratory-method precision at the time of analysis. Each duplicate sample is equally representative of the original material. Duplicate analyses are also performed to generate data and to determine the long-term precision of an analytical method on various matrices. All relative percent differences (RPDs) between samples and field duplicates should be ±35% (LANL 2000, 071233).

The RPD is defined by the equation RPD = [|D1 – D2| / (D1 + D2)] × 100%, where D1 and D2 represent the analytical measurements on duplicate samples.

For radionuclides, the duplicate error ratio (DER) may also be used to quantify precision. The DER is defined by the equation DER = |S–D| / sqrt($2\sigma S^2$ + $2\sigma D^2$), where S represents the original sample value, D represents the duplicate value, and 2σS and 2σD represent the 2-sigma uncertainties surrounding the original and duplicate samples, respectively. A DER below 3 indicates sample-to-field-duplicate precision that is in control.

Field duplicates are independent samples collected as closely as possible at the same point in space and time. They are two separate samples taken from the same source, stored in separate containers, and analyzed independently.

### B-1.14 Field Blanks and Equipment Blanks

A field blank is a sample of analyte-free medium taken to the sampling site and exposed to the atmosphere during sample-collection activities. Field blanks are used to measure contamination introduced during sample collection.

An equipment blank is a sample used to verify cleanliness of the sampling equipment. It is collected after completion of decontamination and before sampling.

## B-2.0 LABORATORY ANALYSIS SUMMARY

During the second quarter of fiscal year (FY) 2009, 15 volatile organic compound (VOC) samples, 2 VOC field duplicates, 2 VOC field blanks, 1 VOC equipment blank, 15 tritium samples, 2 tritium field duplicates, and 2 tritium field blanks were collected at Solid Waste Management Unit 54-004, also known as Material Disposal Area (MDA) H. Analyses were conducted for VOCs using EPA Method TO-15 and for tritium using EPA Method 906.0. Table B-2.0-1 lists the analytical method used for VOC and tritium analyses. All QC procedures were followed as required by the analytical services SOW (LANL 2000, 071233). Validated analytical results have been corrected for tritium underreporting.

Sampling locations, sampling ports, and validated analytical results are presented in Tables 5.0-1 and 5.0-2 of this periodic monitoring report. The data, including the qualified data but not the rejected data, are usable for evaluation purposes. The entire data set meets the standards for use in this report.

The tritium and VOC analyses are summarized in the following sections. The required minimum detectable activity or estimated quantitation limit is prescribed in the analytical services SOW (LANL 2000, 071233).

## B-3.0 ORGANIC CHEMICAL ANALYSES

Four VOC results were qualified as rejected (R) because they were not analyzed with a valid calibration curve or a standard at the reporting limit.

### B-3.1 Maintenance of Chain of Custody

Chain of custody was properly maintained for all samples.

### B-3.2 Sample Documentation

All samples were properly documented in the field.

### B-3.3 Sample Preservation

No sample preservation is required for VOCs.

### B-3.4 Holding Time

The holding times were met for all samples.

### B-3.5 Initial and Continuing Calibration Verification

Initial or continuing calibration criteria were not met for 39 VOC results and were qualified as estimated (J) if detected or UJ if not detected.

Initial or continuing calibration verification were recovered outside the method-specific limits for two VOC results and are qualified as estimated not detected (UJ).

### B-3.6 Analyte Identification (Including Internal Standards, and Spectra Review)

Analyte identification criteria were met for all sample analyses.

### B-3.7 Method Blank

Method blank results for VOC analyses were within acceptable limits for all results.

### B-3.8 Surrogate Recoveries

All surrogate recoveries for VOC analyses were within acceptable limits.

### B-3.9 Internal Standard Responses

All internal standard responses for VOC analyses were within acceptable limits.

### B-3.10 LCS Recoveries

The LCS recoveries were within acceptable limits for all results.

### B-3.11 Laboratory and Field Duplicates

Laboratory and field duplicates indicate acceptable precision. The two field duplicates collected during the second quarter of FY2009 had RPDs less than 35%.

### B-3.12 Field Blanks and Equipment Blanks

Equipment blank results were within acceptable limits for all but 21 VOC results. The 21 results were less than or equal to 5 times the concentration detected in the equipment blank and were qualified as not detected.

One field blank was collected on March 11, 2009, in association with sampling activities at borehole location 54-01023. Results for six VOCs in borehole location 54-01023 were less than or equal to 5 times the concentration of the related analyte in the field blank and were qualified as not detected.

One field blank was collected on April 2, 2009, in association with sampling activities at borehole location 54-15462. Results for six VOCs in borehole location 54-15462 were less than or equal to 5 times the concentration of the related analytes in the field blank and were qualified as not detected.

## B-4.0 RADIONUCLIDE ANALYSES

No tritium data were rejected.

During a technical review of EP-ERSS-SOP-5074, Sampling Sub-Atmospheric Air, the Laboratory determined that analytical results were not being corrected for water bound in silica gel used to collect vapor samples, thereby identifying a systematic low bias in previously reported tritium results (Whicker et al. 2009, 106429). The bias results from the properties of silica gel, the sample medium used to collect water vapor from pore-gas samples. Silica gel contains nontritiated water vapor bound to the silica gel molecules that cannot be completely removed by drying, before its use in sampling, without degrading the silica gel properties. Thus, when water vapor is collected from pore space, the tritiated sample water vapor is mixed/diluted into the clean water bound to the silica gel molecules. The amount of dilution is proportional to the amount of silica gel–bound water in the original sample and the amount of moisture collected in the sample. The tritium results were corrected using the percent moisture value determined by the analytical laboratory (Marczak 2009, 106500). The corrected tritium results are reported in Table 5.0-2 and in Appendix C.

### B-4.1 Maintenance of Chain of Custody

Chain of custody was properly maintained for all samples.

### B-4.2 Sample Documentation

Samples were properly documented in the field.

### B-4.3 Sample Preservation

No sample preservation is required for tritium.

### B-4.4 Holding Times

The holding times were met for all tritium analyses.

### B-4.5 Initial and Continuing Calibration Verification

Initial and continuing calibrations are acceptable for all tritium analyses.

### B-4.6 Analyte Identification

Analyte identification criteria were not met for two tritium analyses. Affected results were qualified as not detected because the sample concentration was less than or equal to the minimum detection concentration.

### B-4.7 Analyte Quantitation

Analyte quantitation criteria were met for all tritium analyses.

### B-4.8 Method Blanks

Method blank results were within acceptable limits for all tritium sample analyses.

### B-4.9 LCS Recoveries

The LCS recoveries were within acceptable limits for all tritium analyses.

### B-4.10 Laboratory and Field Duplicates

Laboratory duplicate analyses indicate acceptable precision for all tritium analyses. The two field duplicates collected during the second quarter of FY2009 had DERs less than 3.

### B-4.11 Field Blanks and Equipment Blanks

Equipment blank results were within acceptable limits for all but three tritium results. Three results were less than or equal to 5 times the concentration of the tritium detected in the equipment blank and were qualified as not detected.

Two field blanks were collected on April 6, 2009, in association with sampling activities at borehole location 54-15462. Three tritium results for the samples collected in borehole location 54-15462 were less than or equal to 5 times the concentration of tritium in the field blanks and were qualified as not detected.

## B-5.0 FIELD-MONITORING SUMMARY

### B-5.1 Volatile Organic Compounds

Field-monitoring data are less costly to generate than analytical laboratory data and are immediately available to guide field decisions. Field-monitoring results are generated by rapid methods of analysis that provide less precision than analytical laboratory analyses. Field-monitoring data provide analyte (or at least chemical class) identification and quantification, although the quantification may be relatively imprecise.

Field monitoring of subsurface vapor monitoring at MDA H is conducted using EP-ERSS-SOP-5074, Sampling of Subatmospheric Air. This procedure covers the use of the Brüel and Kjær (B&K) Type 1302 multigas analyzer and the Landtec GEM 500 photoionization detector (PID).

The B&K is maintained through calibration and changing or cleaning of filters as needed. The B&K is calibrated before use each quarter by a certified calibration laboratory. The B&K is adjusted before each day’s use to compensate for ambient pressure and temperature. An operational check is conducted before each day's use through the analysis of ambient air readings and triplicate readings of known quantities of mixed organic analytes in nitrogen. These verification check analyses confirm analytical stability, the instrument zero point for each analyte is correctly set, and the stored calibration curve remains applicable to current instrument response to the presence of organic chemicals. Concentrations of gas standards analyzed before each day's use are expected to be within ±20% of their known values. Additionally, during each sample analysis, a low-sample flow condition triggers an alarm on the B&K, and the VOC measurement is then not completed.

The presence of nontarget VOCs bias B&K target analyte results if they have an acoustic response to infrared light similar to the target analyte. Trichlorofluoromethane (Freon-11) generates a measurable acoustic signal in response to light with a wavelength of 11.6 µm proportional to its concentration. Other VOCs generating an acoustic signal in response to light at this wavelength include 1,2-dichloro-1,1,2,2-tetrafluoroethane (Freon-114) and dichlorofluoromethane (Freon-21), neither of which is reported by EPA Method TO-15. Tetrachloroethene (PCE) generates an acoustic signal in response to light with a wavelength of 11.1 µm. Other VOCs responding to light at this wavelength include styrene and 1,1,2-richloro-1,2,2-trifluoroethane (Freon-113), neither of which are reported by EPA Method TO-15; dichlorodifluoromethane (Freon-12); ethanol; and 1,1-dichloroethylene (DCE). Results indicate that DCE and Freon-113 are detected in most samples at MDA H at concentrations which generate a measurable acoustic signal in response to light with a wavelength which is included in the acoustic signal interpreted as PCE which may make the PCE readings appear higher on the B&K. Table B-5.0-1 presents VOCs that interfere with each of the four B&K target analytes.

Data generated using the B&K Type 1302 are supported by calibration records that bracket the periods of analyses. Calibration information is reported below for the B&K Type 1302 photoacoustic analyzer used to generate results presented in this periodic monitoring report.

- On January 12, 2009, the B&K with serial number 1692083 was calibrated before the second quarter monitoring event. The zero points were set for 1,1,1-trichloroethane (TCA); trichloroethene (TCE); Freon-11, PCE; carbon dioxide ($CO_2$); and water vapor ($H_2O$). Span concentrations of TCA at 78.0 ppm, TCE at 83.3 ppm, Freon-11 at 23.0 ppm, PCE at 19.4 ppm, and $CO_2$ at 1750 ppm were used to generate calibration response curves.
- The B&K with serial number 1692083 was recalibrated on April 23, 2009, after the second quarter monitoring event.
- On March 12, 2009, the B&K with serial number 1732805 was calibrated before the second quarter monitoring event. The zero points were set for TCA, TCE, Freon-11, PCE, $CO_2$, and $H_2O$. Span concentrations of TCA at 10.57 ppm, TCE at 8.5 ppm, Freon-11 at 30.5 ppm, PCE at 19.3 ppm, and $CO_2$ at 990 ppm were used to generate calibration response curves.
- The B&K with serial number 1732805 was recalibrated on June 16, 2009, after the second quarter monitoring event,

The Landtec GEM 500 PID is calibrated by a certified calibration laboratory. During calibration, methane ($CH_4$), oxygen ($O_2$), and $CO_2$ zero points are set, and each analyte's calibration response curve is developed. The $CH_4$ reading is filtered to an infrared absorption frequency of 3.41 mm (nominal), the frequency specific to hydrocarbon bonds. Landtec instruments are calibrated using certified $CH_4$ mixtures and will give correct readings, provided no other hydrocarbon gases present are present within the sample (e.g., ethane, propane, butane). If other hydrocarbons are present, the $CH_4$ reading will be higher (never lower) than the actual $CH_4$ concentration being monitored. The extent to which the $CH_4$ reading is affected depends upon the concentration of the $CH_4$ in the sample and the concentration of the other hydrocarbons. The effect of other hydrocarbons is nonlinear and difficult to predict. The $CO_2$ reading is filtered to an infrared absorption frequency of 4.29 µm (nominal), the frequency specific to $CO_2$. Therefore, any other gases usually found on landfill sites will not affect the $CO_2$ reading. The $O_2$ sensor is a galvanic cell type and suffers no influence from $CO_2$, hydrogen sulfide, nitrate, sulfide, or hydrogen.

Calibration is confirmed before each day's use through the analysis of multiple readings of ambient air. Zero readings of $CH_4$ and $CO_2$ are expected. $O_2$ is expected to read 20.9%. $O_2$ readings within ± 25% of 20.9% are acceptable.

Data generated using the Landtec GEM-500 PID are supported by calibration records that arrive with the rented instrument previous to the period of analyses. Calibration is performed by Geotech's Colorado Service Center in Denver, Colorado. Calibration information is reported below for the Landtec PID used to generate results presented in this periodic monitoring report.

- Unit 560 was calibrated on February 17, 2009. The zero points were set for $CH_4$, $CO_2$, and $O_2$. Calibration was performed so that $CH_4$ and $CO_2$ reached ±15% of a known concentration, and $O_2$ was set to read ambient air at 20.9%. Pump flow was confirmed to be 450 cc/min.

### B-5.2 Tritium

Silica gel is the medium used at the Laboratory to collect moisture from pore-vapor samples. This moisture is analyzed for tritium using liquid scintillation counting. Dry silica gel contains bound water, which dilutes the tritium sample. A correction factor for this dilution is developed for each sample based on the percent moisture value determined by the analytical laboratory (Marczak 2009, 106500; Whicker et al. 2009, 106429).

Silica gel is prepared for sampling by drying it at a temperature above 100$^{o}$C. This drying does not remove bound water. The amount of silica gel used in each sample is weighed before the sample is collected (typically about 135 g). The sample canister with silica gel is weighed before sampling. The sampling procedure, EP-ERSS-SOP-5074, Sampling of Sub-Atmospheric Air, requires collecting at least 5 g of moisture. After sampling, the sample canister with silica gel is weighed again.

The sample (canister plus silica gel) is shipped to the analytical laboratory where the canister with the silica gel is weighed again. The silica gel is emptied into a distillation apparatus and heated to 110$^{o}$C, driving moisture off the silica gel. This moisture is collected and analyzed for tritium by liquid scintillation. The laboratory also weighs the empty canister. The laboratory calculates the percent moisture of the sample as the amount of moisture collected divided by the calculated weight of the wet silica gel. The value of the tritium concentration and the calculated percent moisture are reported to the Laboratory in the analytical data package and the electronic data deliverable.

The correction factor for the impact of bound water is determined for each sample using the percent moisture value determined by the analytical laboratory (Marczak 2009, 106500). Tritium results presented in this report have been corrected for bound-water dilution.

## B-6.0 REFERENCES

*The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.*

*Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.*

EPA (U.S. Environmental Protection Agency), February 1994. “USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review,” EPA-540/R-94/013, Office of Emergency and Remedial Response, Washington, D.C. (EPA 1994, 048639)

EPA (U.S. Environmental Protection Agency), 1997. “Test Methods for Evaluating Solid Waste, Laboratory Manual, Physical/Chemical Methods,” SW-846, 3rd ed., Update III, Office of Solid Waste and Emergency Response, Washington, D.C. (EPA 1997, 057589)

EPA (U.S. Environmental Protection Agency), October 1999. “USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review,” EPA540/R-99/008, Office of Emergency and Remedial Response, Washington, D.C. (EPA 1999, 066649)

LANL (Los Alamos National Laboratory), March 1996. “Quality Assurance Project Plan Requirements for Sampling and Analysis,” Los Alamos National Laboratory document LA-UR-96-441, Los Alamos, New Mexico. (LANL 1996, 054609)

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Marczak, S., July 2009. “Technical Implementation of the Correction Factor Calculation for Tritium in Pore-Gas Data,” Los Alamos National Laboratory document LA-UR-09-4629, Los Alamos, New Mexico. (Marczak 2009, 106500)

Whicker, J.J., J.M. Dewart, S.P. Allen, W.F. Eisele, M.C. McNaughton, and A.A. Green, June 17, 2009. “Corrections for Measurement of Tritium in Subterranean Vapor Using Silica Gel,” Los Alamos National Laboratory document LA-UR-09-03837, Los Alamos, New Mexico. (Whicker et al. 2009, 106429)

**Table B-1.0-1**
**Data Validation Procedures**

| Procedure | Title | Effective Date |
|---|---|---|
| SOP-5161, Rev. 0 | Routine Validation of Volatile Organic Compound (VOC) Analytical Data | 6/10/2008 |
| SOP-5166, Rev. 0 | Routine Validation of Gamma Spectroscopy, Chemical Separation Alpha Spectrometry, Gas Proportional Counting, and Liquid Scintillation Analytical Data | 6/30/2008 |

**Table B-2.0-1**
**Analytical Methods Used for Sample Analyses**

| Analytical Method | Analytical Description | Target Compound List |
|---|---|---|
| EPA Method TO-15 | VOCs in pore gas | See analytical services SOW (LANL 2000, 071233) |
| EPA Method 906.0 | Tritium in pore gas | Tritium |

**Table B-5.0-1**
**B&K Target Analytes**
**and Potential Interfering Analytes**

| Target | Potential Interfering Analyte |
|---|---|
| PCE | Styrene |
| PCE | Freon-113 |
| PCE | Freon-12 |
| PCE | DCE |
| PCE | Ethylene oxide |
| PCE | Ethanol |
| PCE | Dipropylnitrosamine |
| PCE | 1,1-Dimethylhydrazine |
| PCE | 1,4-Diethylene dioxide |
| PCE | Cyclohexene |
| PCE | tert-Butyl alcohol |
| PCE | m-Vinyltoluene |
| PCE | Vinyl chloride |
| PCE | Tetrahydrofurane |
| PCE | Silicium tetrafluoride |
| PCE | Nitromethane |
| PCE | Nitrogen trifluoride |
| PCE | α-Methylstyrene |
| PCE | Monomethyl hydrazine |
| PCE | Methyl iodide |
| PCE | n-Hexane |
| PCE | Acetic anhydride |
| PCE | 1,3-Butadiene |
| Freon-11 | Freon-114 |
| Freon-11 | Freon-21 |
| Freon-11 | Carbonyl sulphide |
| Freon-11 | Methyl acetate |
| Freon-11 | Chloropicrine |
| Freon-11 | Cyclohexane |
| Freon-11 | Dimethylnitrosamine |
| Freon-11 | Epichlorohydrine |
| Freon-11 | Ethane |
| Freon-11 | Ethylene oxide |
| Freon-11 | Ethyl formate |
| Freon-11 | 2-Nitropropane |

**Table B-5.0-1 (continued)**

| Target | Potential Interfering Analyte |
|---|---|
| Freon-11 | Phosgene |
| Freon-11 | Vinyl acetate |
| TCA | Fluorobenzene |
| TCA | Ethyl benzene |
| TCA | Dimethyl formamide |
| TCA | Dichloromethane |
| TCA | 1,2-Dichloroethane |
| TCA | o-Dichlorobenzene |
| TCA | Dibutyl phthalate |
| TCA | Chloromethane |
| TCA | m-Xylene |
| TCA | 1,1,2-Trichloroethane |
| TCA | o-Toluidine |
| TCA | Toluene |
| TCA | Phenol |
| TCA | Chlorobenzene |
| TCA | Carbon dioxide |
| TCA | Boron trifluoride |
| TCA | Aniline |
| TCA | Acetophenone |
| TCA | Hydrogen cyanide |
| TCA | n-Heptane |
| TCE | Arsine |
| TCE | Butanone |
| TCE | 1,2-Difluoroethane |
| TCE | Diethyl ketone |
| TCE | Dinitrogendifluoride |
| TCE | 2-Pentanone |
| TCE | 2-Propanol |
| TCE | Sulfur hexafluoride |
| TCE | Vinyl chloride |

# Appendix C

*Analytical Suites and Results and Analytical Reports*
*(on CD included with this document)*