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Date: December 18, 2008
Refer To: EP2008-0633

James P. Bearzi, Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Subject: Submittal of the Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area G, Technical Area 54, for Fiscal Year 2008

Dear Mr. Bearzi:

Enclosed please find two hard copies with electronic files of the Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area G, Technical Area 54, for Fiscal Year 2008.

If you have any questions, please contact Steve Paris at (505) 606-0915 (smparis@lanl.gov) or Ed Worth at (505) 606-0398 (eworth@doeal.gov).

Sincerely,

Michael J. Graham, Associate Director
Environmental Programs
Los Alamos National Laboratory

Sincerely,

David R. Gregory, Project Director
Environmental Operations
Los Alamos Site Office

MG/DG/DM/SP:sm

Enclosures: 1) Two hard copies with electronic files - Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area G, Technical Area 54, for Fiscal Year 2008 (LA-UR-08-7862)

Cy: (w/enc.)
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LA-UR-08-7862
December 2008
EP2008-0633

Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area G, Technical Area 54, for Fiscal Year 2008

Prepared by the Environmental Programs Directorate

LA-UR-08-7862
EP2008-0633

Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area G, Technical Area 54, for Fiscal Year 2008

December 2008

Responsible project leader:

Printed Name	Signature	Title	Organization	Date
Steve Paris		Project Leader	Environmental Programs	12/17/08

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EXECUTIVE SUMMARY

This periodic monitoring report summarizes the fiscal year (FY) 2008 vapor-monitoring and sampling activities conducted at Material Disposal Area (MDA) G, located in Technical Area 54 (TA-54) at Los Alamos National Laboratory. This report also summarizes the results of three pilot tests conducted during FY2008 at MDAs C, G, and H requested by the New Mexico Environment Department to assess the sampling methods used to collect soil vapor samples at MDA G.

The purpose of vapor sampling is to implement the proposed long-term subsurface vapor-monitoring plan described in Appendix D of the "Corrective Measures Evaluation Plan for Material Disposal Area G at Technical Area 54, Revision 2." The objective of the monitoring activities is to evaluate trends over time in volatile organic compound (VOC) and tritium concentrations in subsurface vapor at MDA G.

Monitoring conducted in FY2008 included field screening of all completed ports in the 19 existing boreholes at MDA G and the 1 open borehole and collecting pore-gas samples for laboratory analyses of VOCs and tritium from selected ports. The analytical results confirm the presence of VOCs and tritium in vapor samples. Concentrations of VOCs from pore-gas analyses at four locations sampled periodically since 1997 show stable or decreasing VOC concentrations.

Concentrations of some VOCs in the central portion of the plume exceeded a screening value of 1 based on groundwater standards or tap water screening levels. However, the concentrations of all VOCs in the deepest pore-gas sample (i.e., the sample closest to the regional aquifer) are below the screening value of 1.

A pilot test was conducted during the fourth quarter of FY2008 at MDA G to assess the potential for short-circuiting between sampling port depths in vapor-monitoring boreholes constructed with Group 4 vapor-monitoring system. Tests indicated the potential for short-circuiting between sampling ports located within 20 vertical ft of one another.

A second pilot test was conducted during the fourth quarter of FY2008 at MDA C to compare vapor-sampling results among three vapor-sampling systems currently in use at TA-54, including MDA G. This pilot test concluded that significant differences do not exist between vapor samples collected in vapor-monitoring boreholes constructed with newer flexible liner underground technology (FLUTe) systems and the older FLUTe monitoring system installed at MDA G during the 1990s. This test also concluded that no significant differences were found between samples collected using the older FLUTe system and the Group 1 stainless-steel system; however, the relative percent difference calculations indicated a slight trend toward higher results in the samples collected using the Group 1 system. In addition, a comparison of VOC data from the older FLUTe and Group 1 sampling systems did not support the possibility of adsorption of VOCs in the FLUTe system's nylon sample tubing and the potential bias of samples collected using this system.

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1.0 INTRODUCTION

This report discusses subsurface pore-gas monitoring and sampling activities conducted in fiscal year (FY) 2008 at Los Alamos National Laboratory (LANL or the Laboratory), Material Disposal Area (MDA) G at Technical Area 54 (TA-54). MDA G is located in the east-central portion of the Laboratory at TA-54, Area G, on Mesita del Buey (Figure 1.0-1). MDA G consists of inactive subsurface disposal units that include 32 pits, 193 shafts, and 4 trenches with depths ranging from 10 to 65 ft below the original ground surface. The pits, trenches, and shafts are constructed in unit 2 (caprock) and unit 1 (subsurface) of the Tshirege Member of the Bandelier Tuff (consolidated tuff units). The regional aquifer is estimated to be at an average depth of approximately 930 ft below ground surface (bgs) at MDA G, based on data from wells near the area and the predictions of the hydrogeologic conceptual model for the Pajarito Plateau (LANL 1998, 059599). Area G is relatively flat. Portions of the disposal units at MDA G are covered with concrete and asphalt to house ongoing waste-management activities conducted at Area G. Surface runoff from the site is controlled and discharges into drainages to the north (toward Cañada del Buey) and the south (toward Pajarito Canyon). Stormwater and sediment monitoring stations are distributed throughout the surface of Area G and in drainages leading to the canyons.

During the 1950s, the Laboratory, with approval of the U.S. Atomic Energy Commission and upon the recommendation of the U.S. Geological Survey, selected Mesita del Buey within TA-54 for underground disposal of Laboratory-derived waste (Rogers 1977, 005707; Rogers 1977, 005708, p. G-1). Since then, the main waste storage and disposal facilities for the Laboratory have been located at TA-54. MDA G began operations in 1957 as one of four MDAs on Mesita del Buey between Pajarito Canyon (south) and Cañada del Buey (north). MDA G is a decommissioned (i.e., removed from service) subsurface site for the past disposition of low-level waste, certain radioactively contaminated infectious waste, asbestos-contaminated material, and polychlorinated biphenyls. It was also used for the retrievable storage of transuranic waste.

Pore-gas monitoring at MDA G has been required since 1985. A summary of pore-gas monitoring at MDA G follows.

- In 1985, the Laboratory received a compliance order from the New Mexico Environment Department (NMED) that required, among other things, characterization of pore gas at Areas G and L. The Laboratory installed seven vapor-monitoring wells to characterize pore gas.
- From 1986 to 1990, the Laboratory voluntarily installed 22 additional vapor-monitoring wells to characterize the volatile organic compound (VOC) plumes at Areas G and L.
- In 1990, the U.S. Environmental Protection Agency (EPA) issued Module VIII of the Laboratory's Hazardous Waste Facility Permit. Module VIII included requirements for quarterly pore-gas sampling at MDAs G and L as input into the Resource Conservation and Recovery Act facility investigation.
- In 2005, the Compliance Order on Consent (the Consent Order) required pore-gas monitoring during the site investigations of all MDAs and submittal of a long-term pore-gas monitoring plan for each MDA.
- In September 2005, the Laboratory submitted a long-term monitoring plan for pore gas in the MDA G investigation report (LANL 2005, 090513).
- In October 2007, the Laboratory submitted a revised long-term monitoring plan for pore gas in the MDA G corrective measures evaluation plan (LANL 2007, 098608).

Subsurface vapor monitoring is being performed to characterize VOC and tritium concentration trends in the subsurface vadose zone. Field-screening data and analytical laboratory data for FY2008 are presented in this report. Also summarized in this report are the results of pilot testing conducted during FY2008 to assess the sampling methods used to collect soil vapor samples at MDA G.

Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with U.S. Department of Energy policy.

2.0 SCOPE OF ACTIVITIES

Annual sampling is required at MDA G, therefore, first and fourth quarter sampling events were conducted. Six samples were collected for VOC analysis and eight samples were collected for tritium analysis during the first quarter. Thirty-eight samples were collected for VOC and tritium analyses during fourth quarter. The main sampling occurred during the fourth quarter of FY2008. During FY2008, the following sampling activities were completed at MDA G during the first and fourth quarters.

- In May 2008, LANL submitted a revised Table D-1, MDA G Pore-Gas Monitoring Locations, to NMED (Shen 2008, 103907). The table needed to be revised because the one provided in the corrective measures evaluation plan did not identify the ports to be sampled for VOCs and tritium. Port depths in the revised table were bolded to identify the ports to be sampled nearest the lowest base elevation of the adjacent disposal unit and at the total depth, with two exceptions: location 54-25105 to be sampled across the open portion using a single packer and location 54-22116 to be sampled from the two ports containing the highest level of 1,1,1-trichloroethane (TCA), as measured by the Brüel and Kræjer (B&K) analyzer. The revised table also included the new port construction of borehole location 54-01116 which was installed to support the soil vapor extraction (SVE) test and corrected the borehole location of 54-25397 to 54-24387. Finally, location G-5, which was slated for abandonment, was removed from the table.
- Each sampling interval was purged and sampled after pore gas readings had stabilized to ensure formation air was sampled in accordance with Environmental Programs Directorate's EP-ERSS-SOP-5074, Sampling of Sub-Atmospheric Air. Table 2.0-1 shows construction of each borehole sampled: open borehole, FLUTe, or Group 1 or Group 4 stainless-steel ports. Completed vapor-monitoring wells at MDA G are constructed with FLUTe liners, as shown in Figure 2.0-1, or with Group 1 or Group 4 stainless-steel ports, as shown in Figure 2.0-2.
- Borehole ports and locations field screened and sampled are listed in Tables 2.0-1 and 2.0-2. The vapor from each port was field-screened using a Landtec GEM-500 photoionization detector (PID) equipped with an 11.7-eV lamp for percent carbon dioxide (CO_2) and oxygen (O_2) and screened for VOCs using a B&K multigas instrument, Type 1302, which measures four VOCs: (1) TCA; (2) trichloroethene (TCE); (3) tetrachloroethene (PCE); and (4) trichlorofluoromethane (Freon-11). The B&K instrument also measures CO_2 and water vapor (H_2O). Sampling occurred after readings on both the Landtec and B&K had stabilized. Figure 2.0-3 shows borehole locations that were screened and sampled at MDA G during FY2008.
- During the first quarter of FY2008, pore-gas screening at MDA G was conducted at 15 locations, and pore-gas samples were collected from sampling ports in four vapor-monitoring boreholes.
- During the first quarter of FY2008, vapor samples were collected from selected screened ports in three vapor-monitoring boreholes (Table 2.0-1) in SUMMA canisters for laboratory analysis of VOCs using EPA Method TO-15 and in two vapor-monitoring boreholes in silica gel cartridges for analysis of tritium using EPA Method 906.0.

- A limited notice to proceed for FY2008 pore gas activities was received December 7, 2007. Field screening and sampling began December 13, 2007. Because of the late start, the required sampling equipment was not available from the analytical laboratory to complete sampling at MDAs H, L, and G. Therefore, three boreholes were sampled for VOCs, and two boreholes were sampled for tritium at MDA G. Fifteen of the 19 boreholes were field screened using the Landtec and B&K. In May 2008, Table D-1, MDA G Pore-Gas Monitoring Locations, was revised and resubmitted to NMED (Shen 2008, 103907). Borehole port sample depths were clearly defined in the resubmitted table. These ports were all sampled in fourth quarter of FY2008.
- During the fourth quarter of FY2008, pore-gas screening at MDA G was conducted, and pore-gas samples were collected from sampling ports in 18 of the 19 required vapor-monitoring boreholes and from the 485- to 701-ft interval at borehole location 54-25105 using an inflatable packer sampling system. Borehole location 54-01126 was not sampled because of a damaged FLUTe membrane.
- During the fourth quarter of FY2008, vapor samples were collected from selected screened ports in 18 vapor-monitoring boreholes (Table 2.0-2) and the 1 open borehole (location 54-25105) in SUMMA canisters for laboratory analysis of VOCs using EPA Method TO-15 and in silica gel cartridges for analysis of tritium using EPA Method 906.0. Borehole location 54-25105 was screened and sampled using a packer system for vapor sampling (Figure 2.0-4).
- From June to October 2008, an SVE pilot study was conducted at MDA G to evaluate SVE as a treatment option for the MDA G VOC plumes. The results of the pilot study are reported in "Pilot Test Report for Evaluating Soil Vapor Extraction at Material Disposal Area G" (LANL 2008, 103902).
- In May and June 2008, in support of the MDA G SVE pilot study, borehole location 54-01116 was advanced to 191 ft and nine stainless-steel ports were installed. The FLUTe system (with six ports) was removed from vapor-monitoring location 54-01117; the borehole was advanced to 184 ft and nine stainless–steel ports were installed. Table D-1 was revised to include the new port depths and to identify ports to be sampled and resubmitted in Appendix H of the corrective measures evaluation report for MDA G (Shen 2008, 103907).
- During the fourth quarter of FY2008, a pilot study was conducted at MDA G to assess the potential for short-circuiting between sample port depths in boreholes constructed with Group 4 vapor-monitoring systems. The results of this pilot test are reported in "Pilot Test Report Evaluating Type 4 Vapor-Sampling Systems at Material Disposal Area G" (LANL 2008, 103020), submitted to NMED on August 15, 2008.
- During the fourth quarter of FY2008, a second pilot study was conducted at MDA C to compare vapor sampling results among three vapor-sampling systems currently in use at TA-54: the newer FLUTe system, the older FLUTe monitoring system installed in MDA G during the 1990s, and the Group 1 system currently used in numerous boreholes at TA-54 (including MDA G). The results of this pilot test are reported in "Pilot Test Report Evaluating FLUTe Vapor-Sampling Systems in Use at Material Disposal Area G" (LANL 2008, 103262), submitted to NMED on August 20, 2008.

No investigation-derived waste was generated during FY2008 pore-gas monitoring.

2.1 Changes in Vapor Monitoring since FY2007

In support of the MDA G SVE pilot study, borehole locations 54-01116 and 54-01117 were redrilled and constructed with Type 1 (stainless-steel) sampling system (LANL 2008, 103902). Borehole location 54-01117 was previously constructed with a FLUTe-type sampling system. Port depths for the new

Type 1 system differ from the previous FLUTe port depths. Sampling port depths for both borehole locations are shown in Table 2.0-2. Both locations were sampled for VOCs and tritium during the fourth quarter of FY2008.

3.0 REGULATORY CRITERIA

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. Therefore, an analysis was conducted to evaluate the potential for contamination of groundwater by VOCs in pore gas using SLs based on groundwater standards or tap water SLs. The analysis evaluated the groundwater concentration that will be in equilibrium with the maximum concentration of VOCs detected at MDA G during the most recent round of monitoring.

$$C_{water} = C_{air}/\text{Henry's Law constant (H')} \qquad \textbf{Equation 3.0-1}$$

If the concentration of the VOC in groundwater is less than the SL, then no immediate potential exists for contamination of groundwater. An analysis of the MDA G data is presented in section 5.0.

4.0 FIELD SCREENING RESULTS

Monitoring activities were performed at MDA G from December 17 to December 21, 2007 (first quarter of FY2008), and from July 8 to August 4, 2008 (fourth quarter of FY2008). Monitoring at MDA G included field screening of subsurface vapor for VOCs, H_2O, percent CO_2, and percent O_2.

The FY2008 subsurface vapor monitoring was conducted at the locations and depths described in section 2.0. Each monitoring depth was first purged to ensure formation air was being collected. During the purge, the subsurface vapor was monitored for percent CO_2 and O_2 using a Landtec GEM-500 PID. The stabilized values from FY2008 monitoring events at each sampling location are listed in Tables 4.0-1 and 4.0-2. Percent CO_2 and O_2 measured during FY2008 ranged from 0.0% to 13.8% and 5.1% to 21.8%, respectively. Low O_2 and high CO_2 concentrations are correlated in samples and are indicative of an aerobic degradation of organic compounds. After purging and stabilization, VOC field-screening results were collected using the B&K multigas instrument. Stabilized values from FY2008 monitoring events at each sampling location are listed separately in Tables 4.0-3 to 4.0-6 for TCA, PCE, TCE, and Freon-11, respectively. Tables 4.0-7 and 4.0-8 present CO_2 and H_2O measured by the B&K multigas instrument.

Not all sampling ports can produce adequate airflow to allow Landtec or B&K field-screening measurements because some ports become blocked over time. Tables 4.0-1 to 4.0-8 show which ports were not functioning because of port blockage. Borehole location 54-01128 at the 30-ft sampling port could not be sampled by the B&K instrument on December 18, 2007. Borehole location 54-02009 at the 79-ft sampling port could not be sampled by the B&K instrument on December 18, 2007, or on July 11, 2008. Borehole location 54-02010 at the 53-ft sampling port could not be sampled by the B&K instrument on December 13, 2007. Borehole location 54-24397 at the 188-ft sampling port could not be sampled by the B&K instrument on December 18, 2007, or on July 14, 2008.

For the first quarter of FY2008, B&K screening results for TCA indicated instrument interference in the measurements. Screening results for TCA had high negative values for many of the boreholes. Three of the screened boreholes (locations 54-24370, 54-24394, and 54-27436) were also sampled during the first quarter of FY2008 using EPA Method TO-15. Analytical results for TCA for the three boreholes ranged from 940 µg/m^3 to 210,000 µg/m^3.

5.0 ANALYTICAL DATA RESULTS

5.1 Summary of Pore Gas Data

Subsurface vapor samples were collected from MDA G from December 17 to December 21, 2007 (first quarter of FY2008) and from July 8 to August 4, 2008 (fourth quarter of FY2008) in SUMMA canisters for laboratory analysis of VOCs using EPA Method TO-15 and in silica gel cartridges for analysis of tritium using EPA Method 906.0. Analytical data from these sampling events are presented in Tables 5.0-1 and 5.0-2. The quality assurance/quality control program used to review the data is presented in Appendix B, and analytical results, data packages, and chain-of-custody forms resulting from FY2008 sampling and analyses are included in Appendix C (on CD included with this document).

During FY2008, 29 different VOCs were detected in vapor samples collected in SUMMA canisters from MDA G. Figures 5.0-1 to 5.0-4 present borehole locations and analytical data for pore-gas VOC analyses in the first and fourth quarters of FY2008. The VOCs 1,1-dichloroethene (DCE) and TCA were most frequently detected. TCA was detected at the highest concentrations in 42 of 44 samples collected; it reached a maximum concentration of 1,400,000 µg/m^3 in borehole location 54-01116 at the 22.5-ft sampling port.

The maximum tritium concentration (269,082,000 pCi/L) was detected in borehole location 54-01111 in a sample collected from the 20-ft port depth in the fourth quarter of FY2008. This port depth, which was not previously sampled for tritium, was designated for tritium sampling in the revised Table D-1, MDA G Pore-Gas Monitoring Locations, submitted to NMED in May 2008. Tritium was also detected during the fourth quarter of FY2008 in borehole location 54-01111 at the 139-ft port depth at a concentration of 8,520,801 pCi/L. This concentration is approximately 2 orders of magnitude lower than the concentration detected at this port depth during the previous tritium sampling event (second quarter of FY2006) at this borehole location. Borehole location 54-01111 is located approximately 250 ft south of the tritium-containing waste disposal shafts. The next highest tritium concentrations detected during the fourth quarter FY2008 monitoring activities were in samples collected from borehole location 54-01110, located on the edge of the tritium shafts. Figures 5.0-5, 5.0-6, and 5.0-7 show the locations and analytical data for pore-gas tritium analysis conducted during the first and fourth quarters of FY2008. The results for detected tritium concentrations ranged from 396 pCi/L to 269,082,000 pCi/L.

Four constructed boreholes at MDA G have been sampled for VOCs more than five times since 1997. The 62-ft port depth in borehole location 54-02009 has been sampled 27 times since 1997. The 95-ft port depth in borehole location 54-02010 has been sampled 14 times since 1997. The 156-ft port depth in borehole location 54-02032 has been sampled 14 times since 1997. The 100-ft port depth in borehole location 54-02033 has been sampled 13 times since 1997. Six VOCs have been detected in more than half the samples collected at MDA G since 1997: TCA, Freon-11, TCE, PCE, 1,1-dichloroethane (DCA), and DCE. Figures 5.0-8 to 5.0-13 show the concentrations for these six VOCs in the four boreholes since 1997. Because the sample with the highest VOC concentrations detected at MDA G in FY2008 (collected from the 22.5-ft port depth in borehole location 54-01116) has only been sampled once since the borehole was instrumented, no trend analysis for this location can be conducted. In addition, a trend analysis also could not be conducted for borehole location 54-24386, which had the second highest VOC concentrations detected at MDA G in FY2008 (at the 40-ft port depth), because this borehole has only been sampled three times since it was instrumented.

5.2 Evaluation of VOC Pore Gas Data

The VOC results from first and fourth quarters of monitoring 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. The source of the Henry's law constants is the NMED soil screening level technical background document (NMED 2006, 092513). The following dimensionless form of Henry's law constant was used

$$H' = \frac{C_{air}}{C_{water}}$$

Equation 5.0-1

where C_{air} is the volumetric concentration of contaminant in air and C_{water} is the volumetric concentration of contaminant in water. Equation 5.0-1 can be used to calculate the following screening value (SV):

$$SV = \frac{C_{air}}{1{,}000 \times H' \times SL}$$

Equation 5.0-2

where C_{air} is the concentration of 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 groundwater standards or tap water SLs. These levels are the EPA maximum contaminant level (MCL) or New Mexico Water Quality Control Commission (NMWQCC) groundwater standard, whichever is lower. As specified in the Consent Order, if there is no MCL or NMWQCC standard, the EPA Region 6 tap water SL is used adjusted to 10^{-5} risk for carcinogens. The numerator in Equation 5.0-2 is the actual VOC concentration in pore gas, and the denominator represents the concentration in pore gas needed to exceed the SV. Therefore, if the SV is less than 1, the concentration of VOC in pore gas is not sufficiently high to cause the SL to be exceeded, even if the VOC plume were in contact with groundwater.

Equation 5.0-2 was used to screen the maximum concentrations of VOCs detected in pore-gas samples at MDA G during FY2008 sampling. The evaluation included the 29 VOCs detected for which there are MCLs, NMWQCC standards, or EPA Region 6 tap water SLs. Table 5.0-3 shows the maximum concentrations of six VOCs resulted in SVs greater than 1. These VOCs are chloroform, DCA, DCE, PCE, TCA, and TCE, with TCE having the highest SV (56.87). Because some SVs exceeded 1, further screening was performed using the concentrations from the deepest pore-gas sample (i.e., the sample collected closest to the regional aquifer). The deepest sample was collected from borehole location 54-25105 at a depth interval of 485 to 700 ft and had 15 VOCs detected. The results of this screening are presented in Table 5.0-4 and show that all concentrations from the deep sample resulted in SVs below 1. Based on this evaluation, the concentrations of VOCs in pore gas at MDA G do not pose an immediate potential source of groundwater contamination.

6.0 PILOT STUDY RESULTS

The results of pilot tests conducted at MDA G to evaluate the potential for short-circuiting between sample ports in vapor-monitoring boreholes constructed with Group 4 sampling systems are reported in "Pilot Test Report Evaluating Type 4 Vapor-Sampling Systems at Material Disposal Area G" (LANL 2008, 103020). The results of this testing indicate a potential for short-circuiting between ports constructed within 17 to 20 ft vertically of one another in one of the boreholes. No discernible short-circuiting was found between ports greater than 20 ft apart. Short-circuiting was not indicated in the second borehole evaluated where sample port distances ranged from 26 to 60 ft.

The results of pilot tests conducted at MDA C to compare vapor-sampling results among three vapor-sampling systems currently in use at TA-54 are reported in "Pilot Test Report Evaluating FLUTe Vapor-Sampling Systems in Use at Material Disposal Area G" (LANL 2008, 103262). The results of the pilot tests concluded that significant differences did not exist between vapor samples collected with the older versus the newer FLUTe system. The pilot test also concluded that no significant differences were found between samples collected using the FLUTe or Type 1 stainless-steel system; however, relative percent difference calculations indicated a slight trend toward higher results in the samples collected in the stainless-steel system. In addition, a comparison of VOC data from the FLUTe and stainless-steel system did not support the possibility of adsorption of VOCs in the nylon sample tubing of the FLUTe system and the potential bias of samples collected using these systems.

7.0 SUMMARY

The objectives of the monitoring and sampling activities conducted at MDA G were to

- identify changes in contaminant concentrations at the perimeter of the relatively well-characterized plume at MDA G as an indicator of outward plume expansion (i.e., extent);
- monitor for changes in contaminant concentration distributions within the plume at MDA G as an indicator of changes warranting attention (i.e., nature); and
- monitor boreholes for data needs for future modeling and trend analyses.

The VOC concentrations presented in Figures 5.0-8 to 5.0-13 indicate a decrease over time. At all locations and depths sampled since 1997, VOCs show slightly decreasing or stable trends in concentrations.

In summary,

- VOCs are present at concentrations in subsurface vapor similar to or below concentrations observed since 1997;
- concentrations of VOCs in pore gas in the boreholes sampled are not high enough to pose an immediate potential source of groundwater contamination; and
- tritium is present in subsurface vapor and its concentrations decrease as the sampling depth increases.

8.0 REFERENCES AND MAP DATA SOURCES

8.1 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 number. This information is also included in text citations. ER ID numbers 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; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; 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)

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LANL (Los Alamos National Laboratory), October 2007. "Corrective Measures Evaluation Plan for Material Disposal Area G at Technical Area 54, Revision 2," Los Alamos National Laboratory document LA-UR-07-6882, Los Alamos, New Mexico. (LANL 2007, 098608)

LANL (Los Alamos National Laboratory), August 2008. "Pilot Test Report Evaluating Type 4 Vapor-Sampling Systems at Material Disposal Area G," Los Alamos National Laboratory document LA-UR-08-5227, Los Alamos, New Mexico. (LANL 2008, 103020)

LANL (Los Alamos National Laboratory), August 2008. "Pilot Test Report for Evaluating FLUTe Vapor-Sampling Systems in Use at Material Disposal Area G," Los Alamos National Laboratory document LA-UR-08-5385, Los Alamos, New Mexico. (LANL 2008, 103262)

LANL (Los Alamos National Laboratory), October 2008. "Pilot Test Report for Evaluating Soil-Vapor Extraction at Material Disposal Area G at Technical Area 54," Los Alamos National Laboratory document LA-UR-08-6883, Los Alamos, New Mexico. (LANL 2008, 103902)

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)

Rogers, M.A., June 1977. "History and Environmental Setting of LASL Near-Surface Land Disposal Facilities for Radioactive Wastes (Areas A, B, C, D, E, F, G, and T)," Vol. I, Los Alamos Scientific Laboratory report LA-6848-MS, Los Alamos, New Mexico. (Rogers 1977, 005707)

Rogers, M.A., June 1977. "History and Environmental Setting of LASL Near-Surface Land Disposal Facilities for Radioactive Wastes (Areas A, B, C, D, E, F, G, and T)," Vol. II, Los Alamos Scientific Laboratory report LA-6848-MS, Los Alamos, New Mexico. (Rogers 1977, 005708)

Shen, H., May 15, 2008. RE: MDA G 3rd Quarter Sampling Event [and previous correspondence, including attached revised Table D-1]. E-mail message to S. Paris (LANL) from H. Shen (NMED), Santa Fe, New Mexico. (Shen 2008, 103907)

8.2 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; Los Alamos National Laboratory, 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; Los Alamos National Laboratory, 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; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 1991.
Fence	Security and Industrial Fences and Gates; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 10 September 2007.
LANL boundary	LANL Areas Used and Occupied; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Division; 19 September 2007.
Material disposal area	Materials Disposal Areas; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; ER2004-0221; 1:2,500 Scale Data; 23 April 2004.
Paved road	Paved Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 10 September 2007.
Structure	Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 10 September 2007.
TA boundary	Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Division; 19 September 2007.
Unpaved road	Dirt Road Arcs; Los Alamos National Laboratory, 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; Los Alamos National Laboratory, Environment and Remediation Support Services Division, EP2007-0754; 30 November 2007.

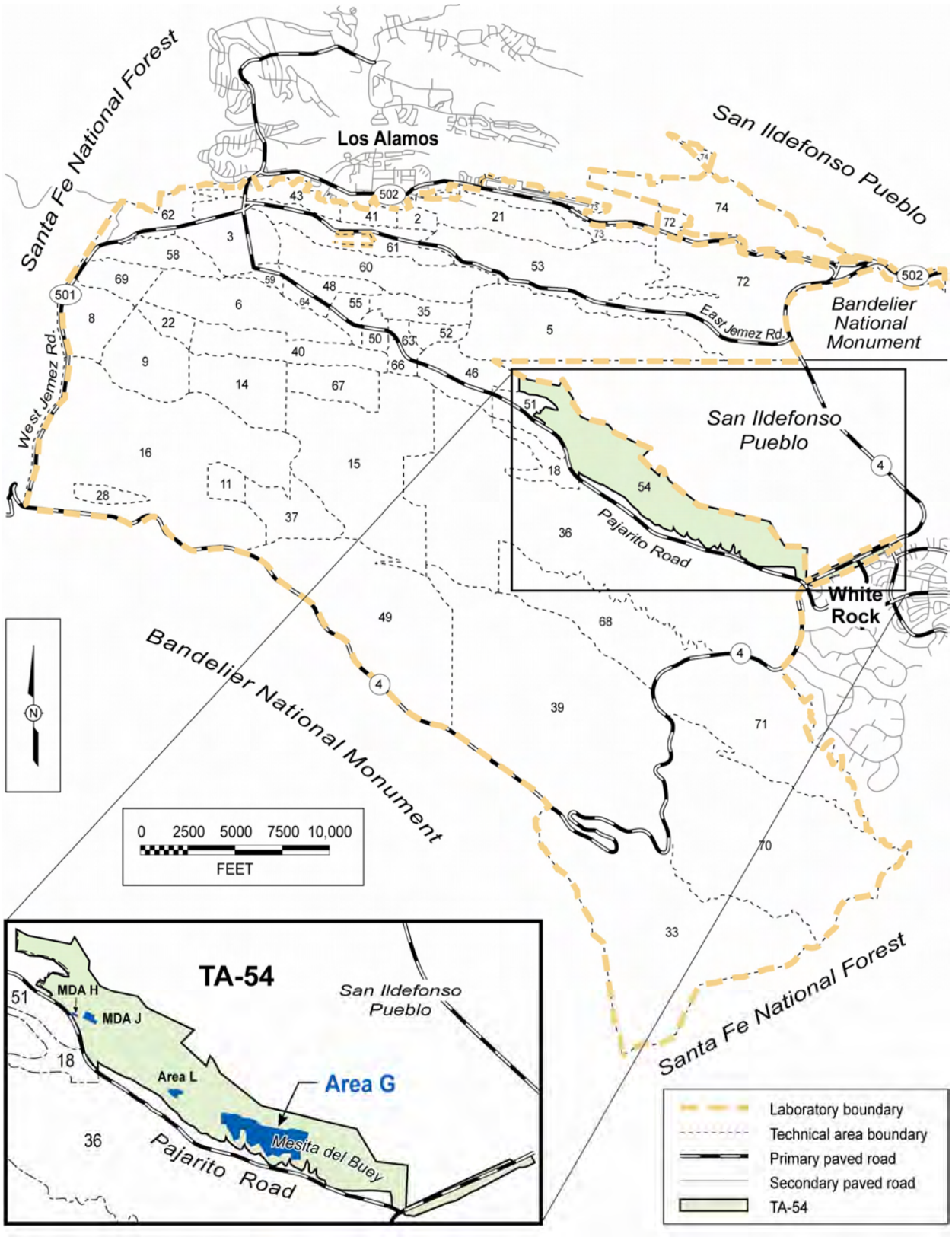

Figure 1.0-1 Location of Area G in TA-54 with respect to Laboratory TAs and surrounding land holdings

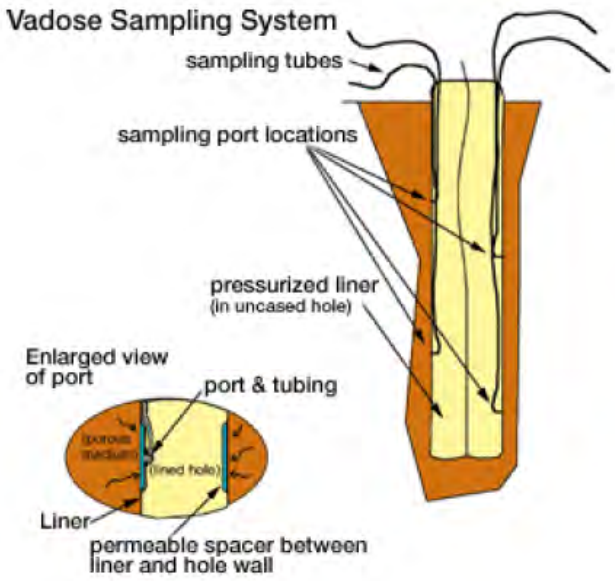

Figure 2.0-1 FLUTe membrane liner system for vadose zone pore-gas sampling

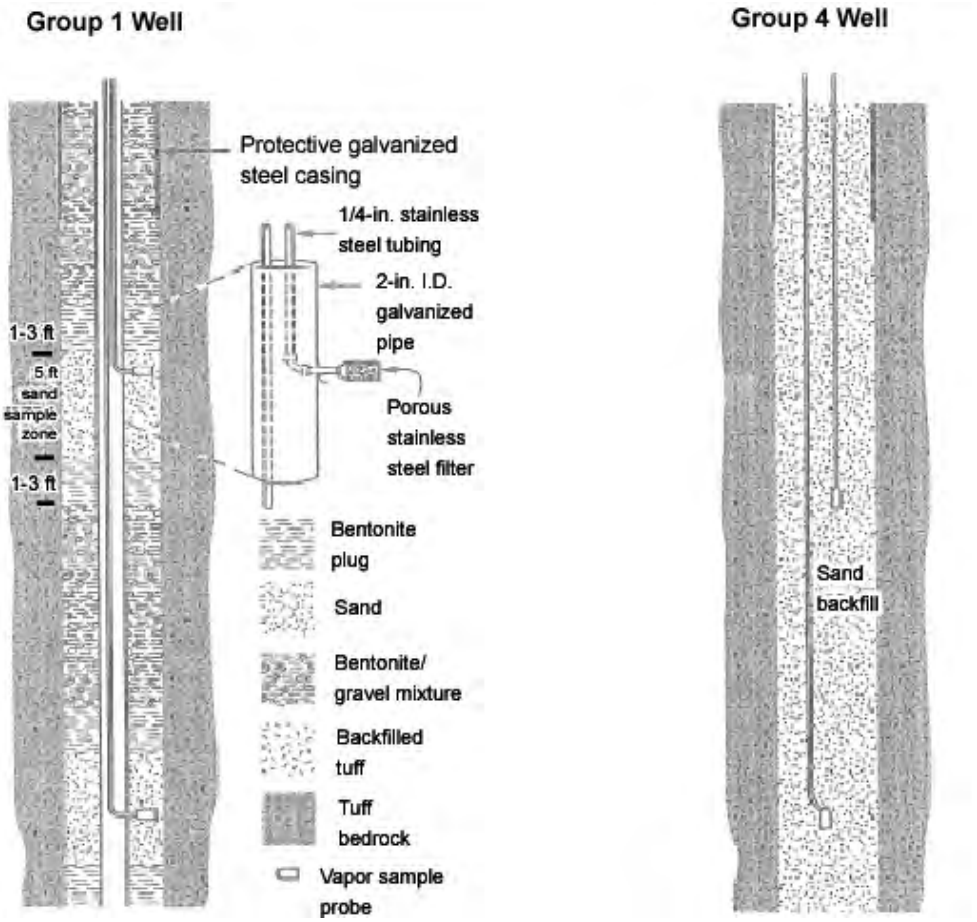

Figure 2.0-2 Construction details of instrumented boreholes for vadose zone pore-gas sampling

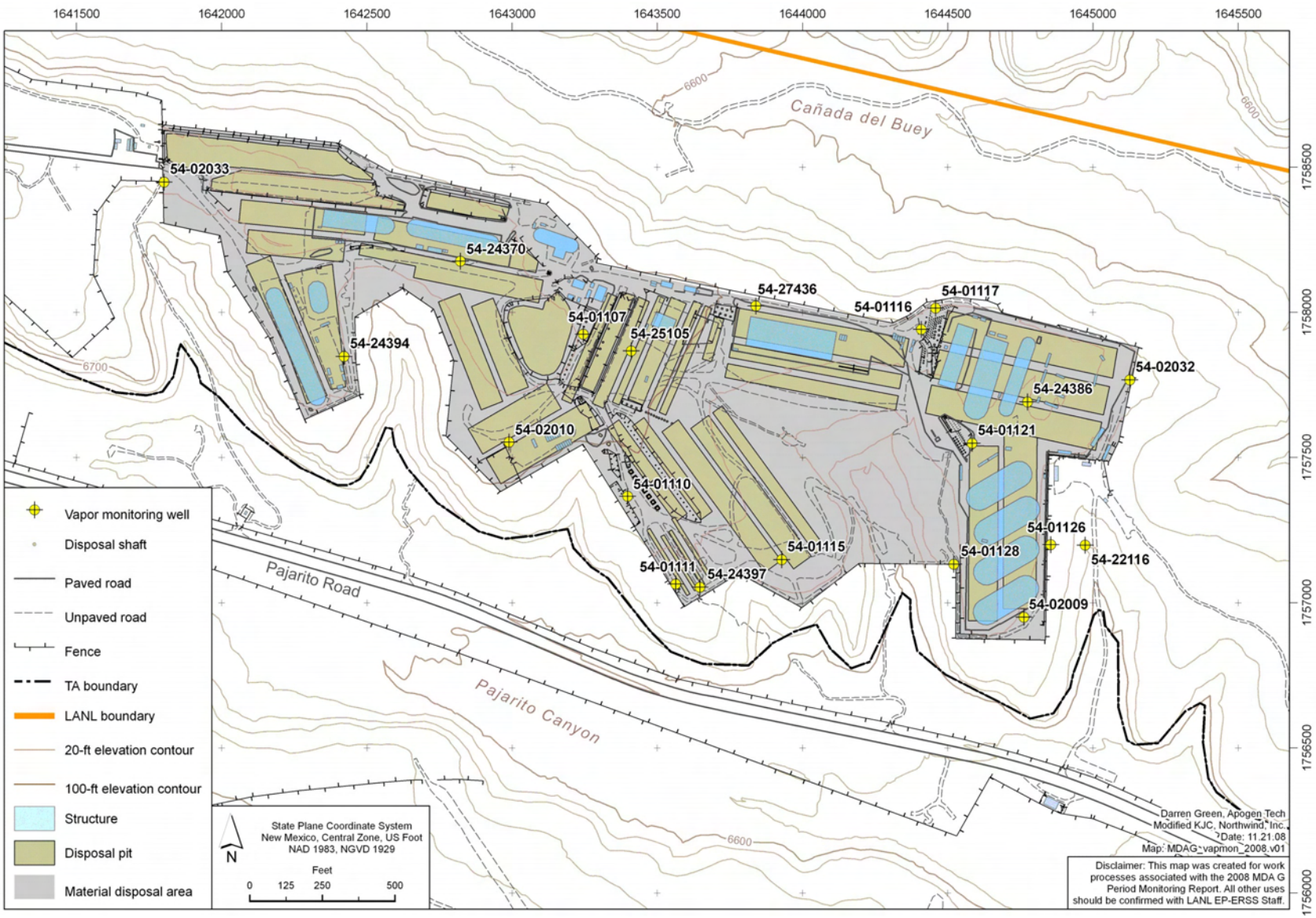

Figure 2.0-3 Locations of MDA G boreholes for pore-gas sampling

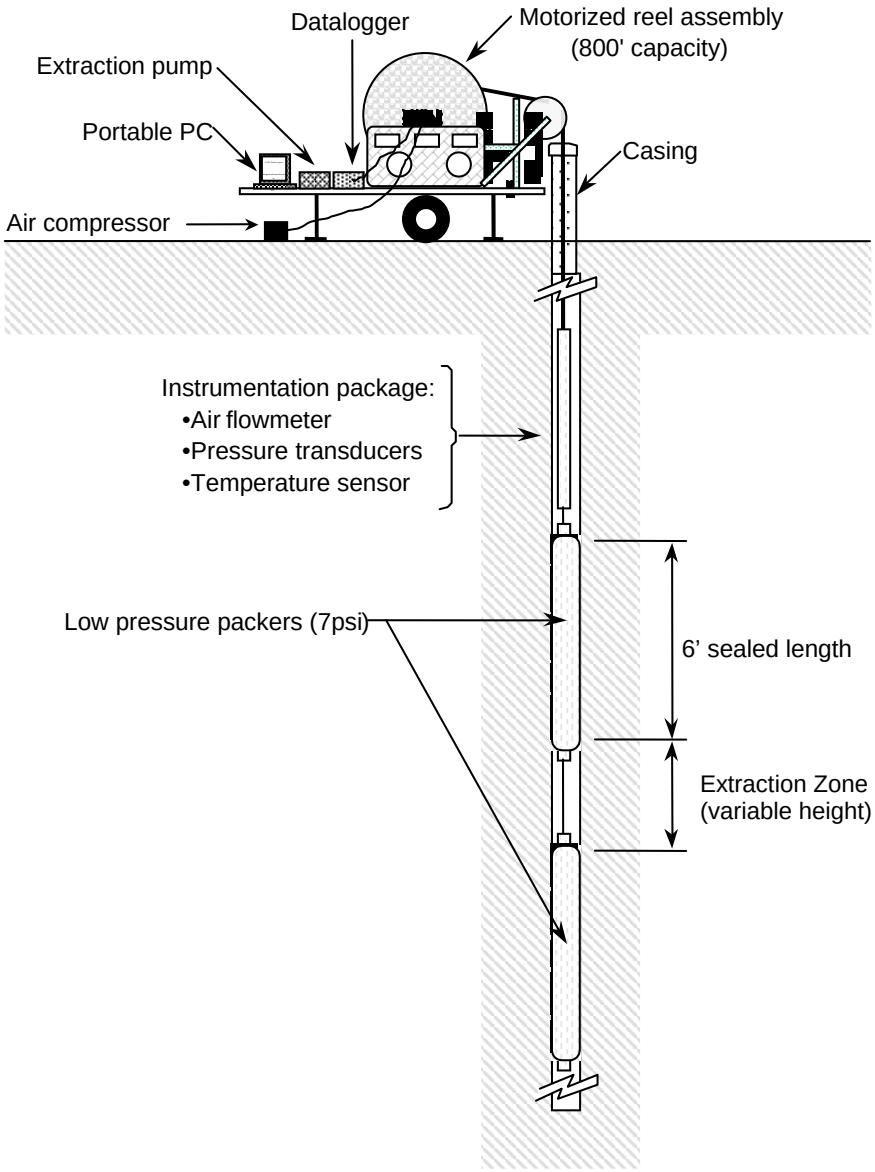

Figure 2.0-4 Packer system for vadose zone pore-gas sampling

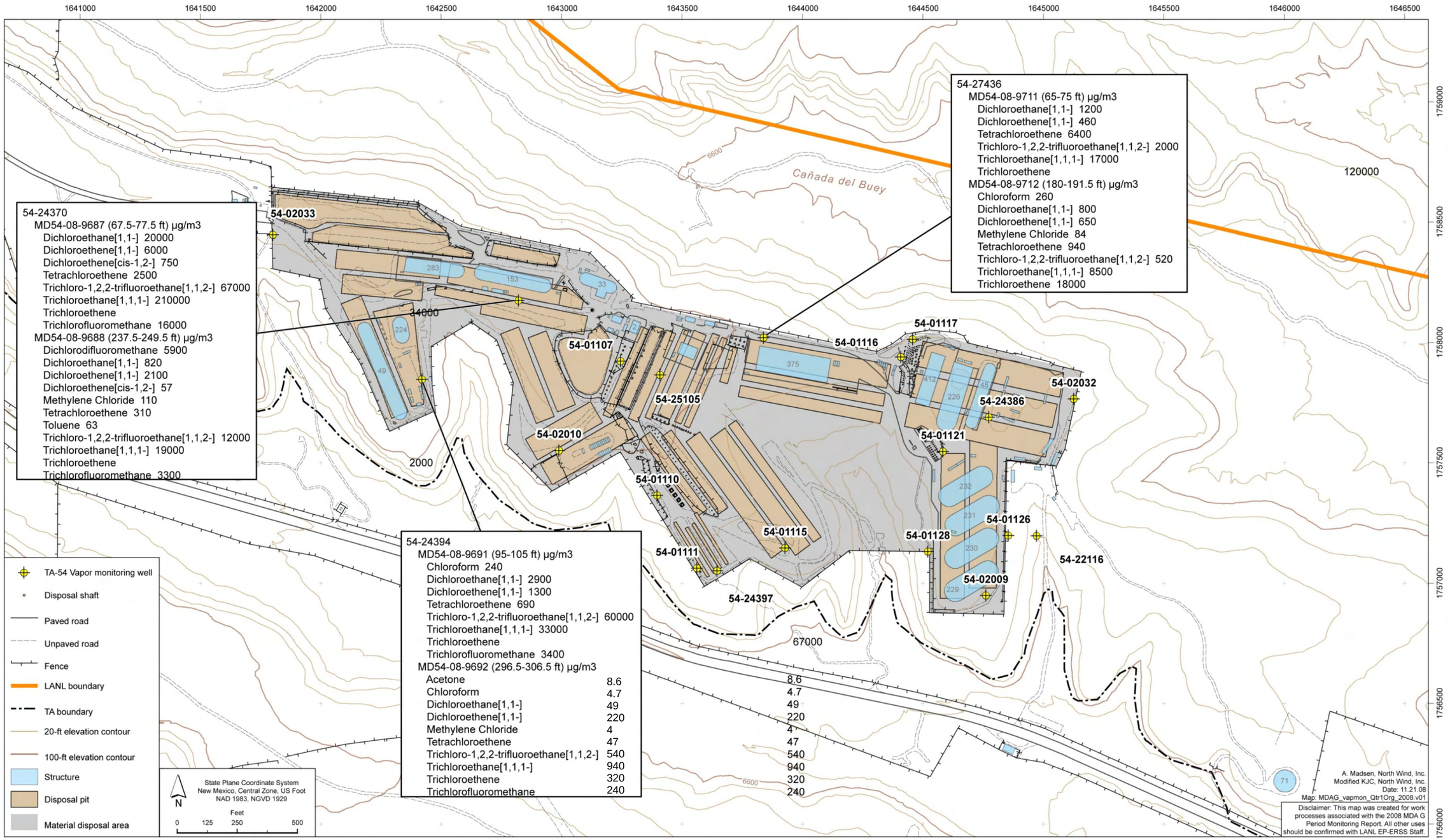

Figure 5.0-1 VOCs (µg/m^3) detected in subsurface pore gas at MDA G during the first quarter of FY2008

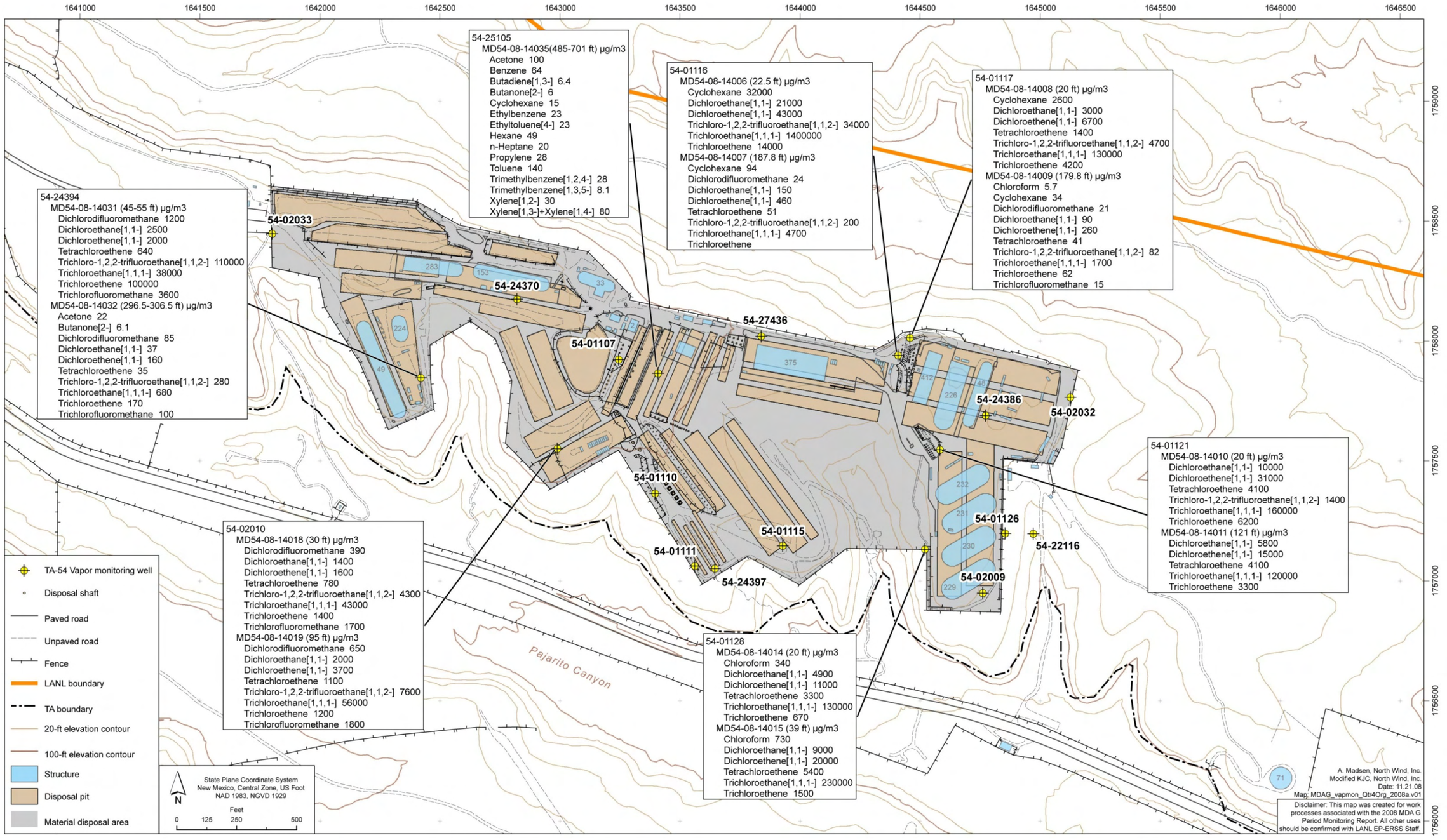

Figure 5.0-2 VOCs (µg/m^3) detected in subsurface pore gas from borehole locations 54-01116, 54-01117, 54-01121, 54-01128, 54-02010, 54-24394, and 54-25105 at MDA G during the fourth quarter of FY2008

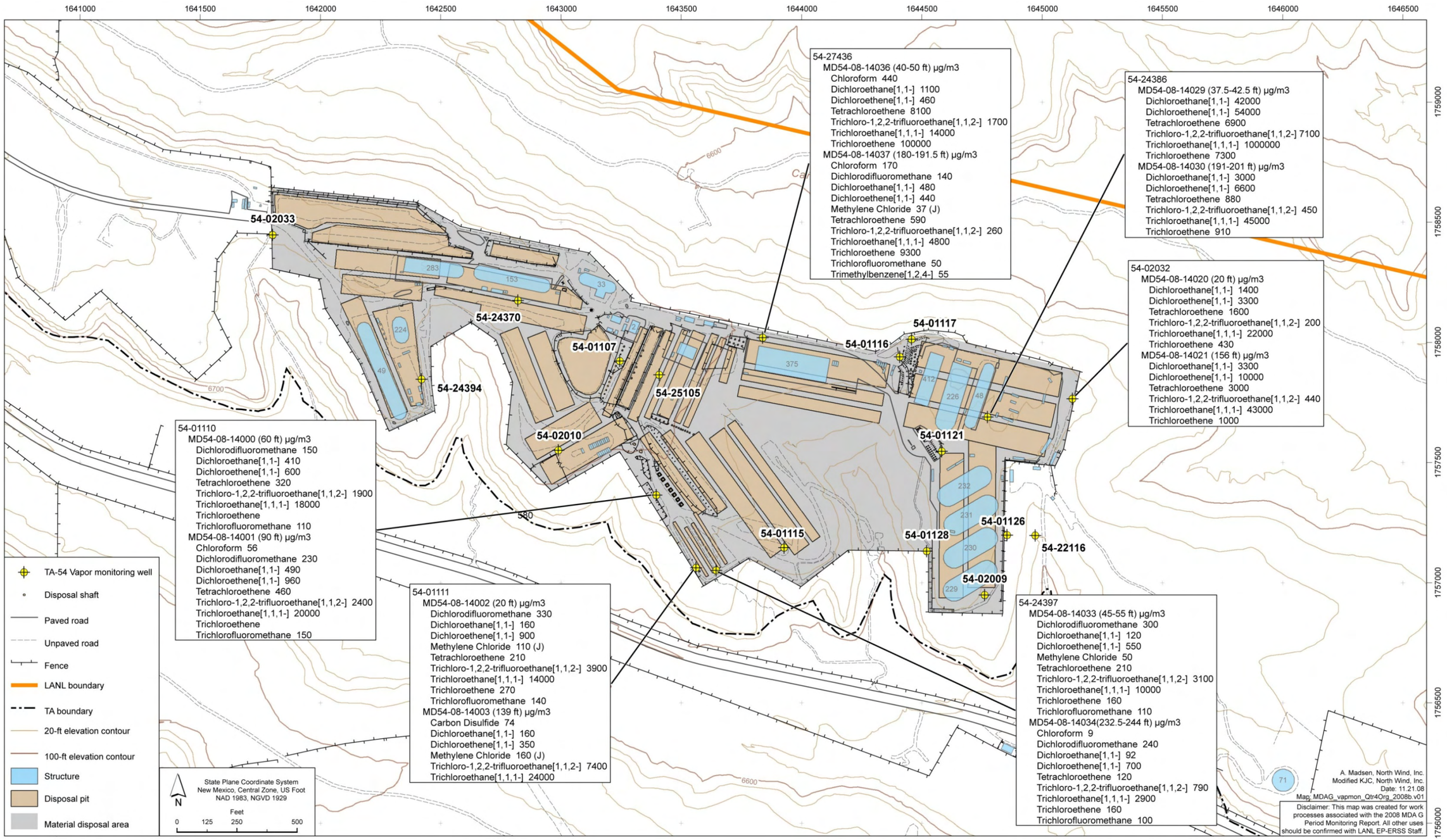

Figure 5.0-3 VOCs (µg/m^3) detected in subsurface pore gas from borehole locations 54-01110, 54-01111, 54-02032, 54-24386, 54-24397, and 54-27436 at MDA G during the fourth quarter of FY2008

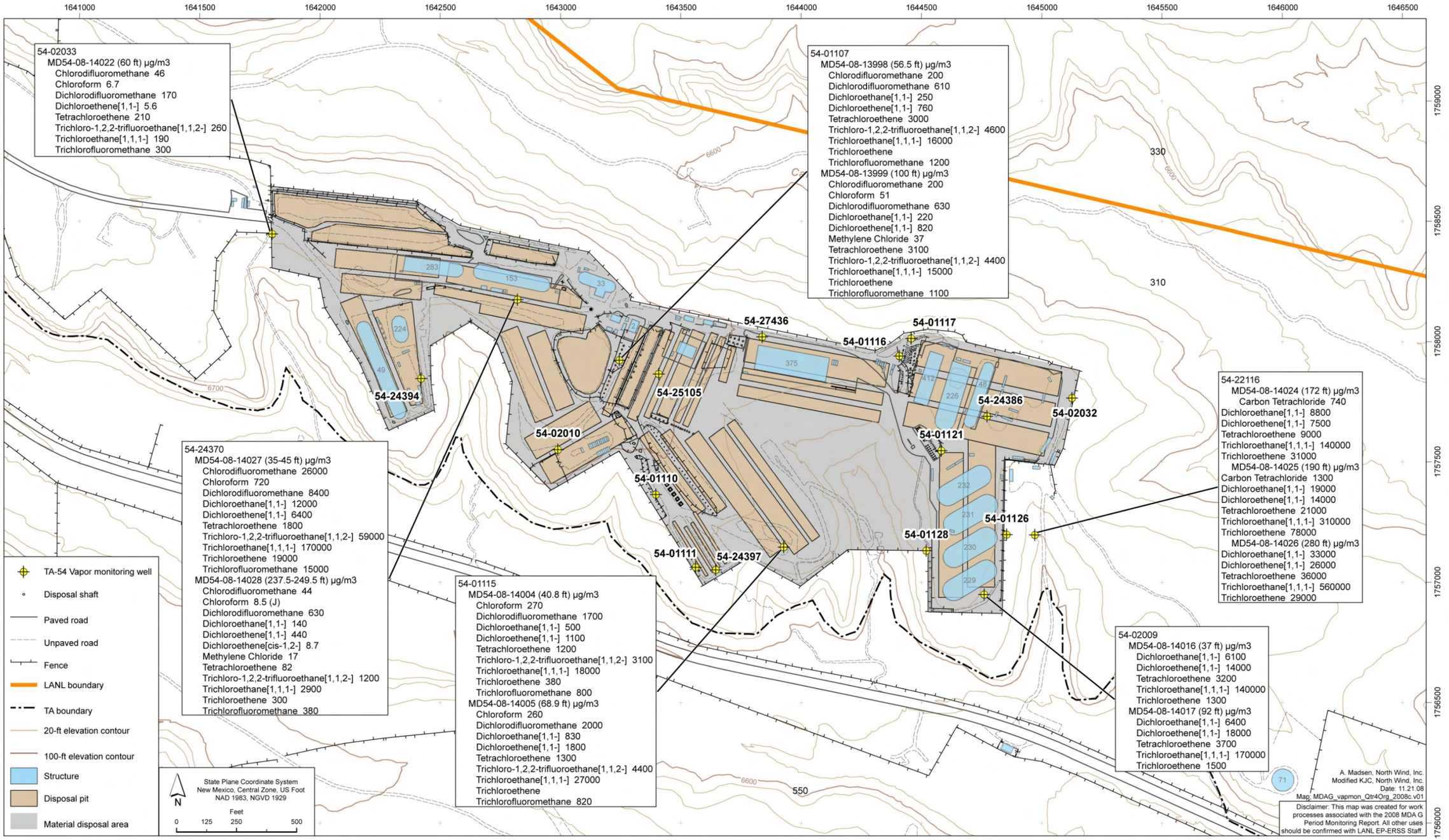

Figure 5.0-4 VOCs (µg/m^3) detected in subsurface pore gas from borehole locations 54-01107, 54-01115, 54-02009, 54-02033, 54-22116, and 54-24370 at MDA G during the fourth quarter of FY2008

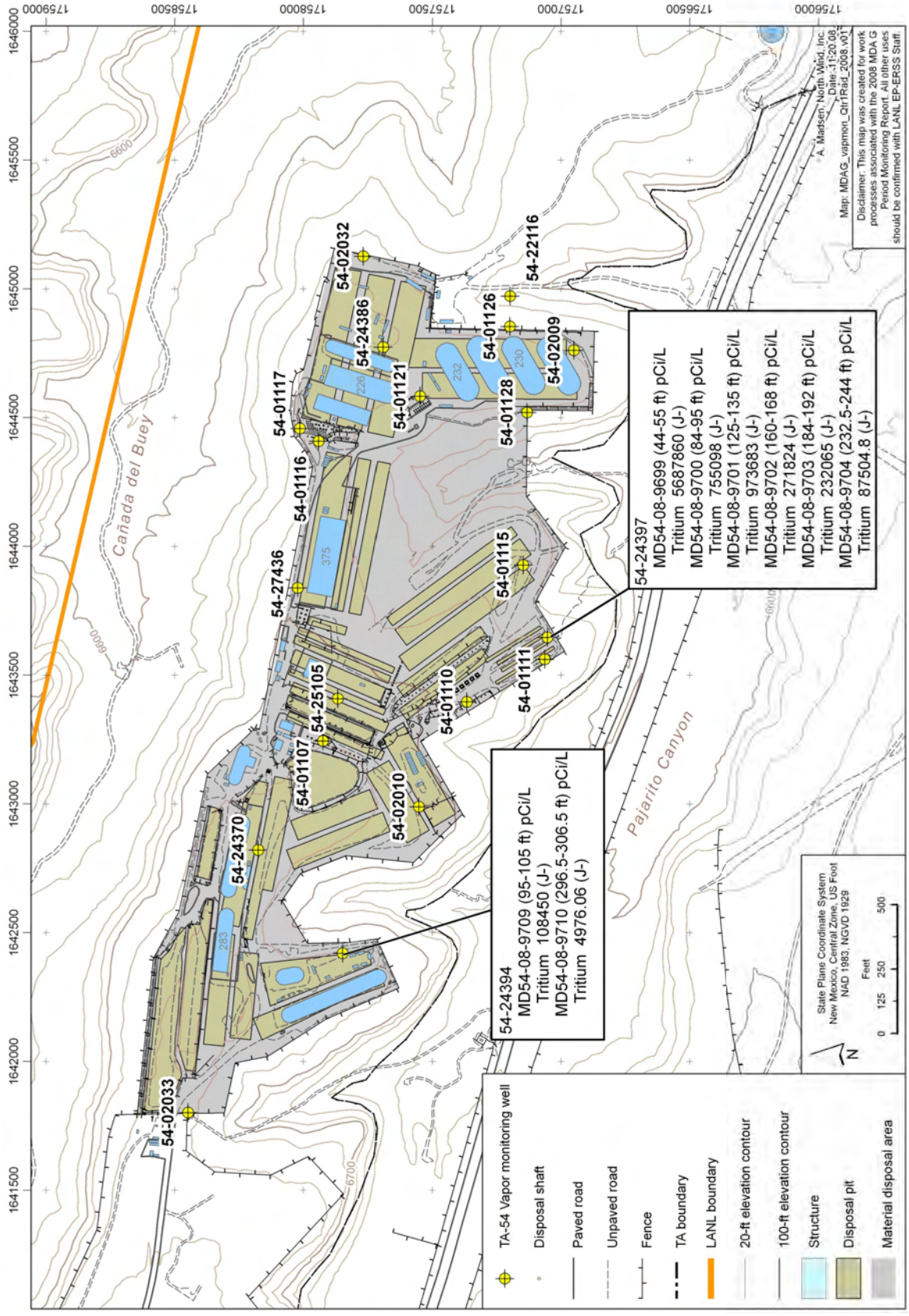

Figure 5.0-5 Tritium (pCi/L) detected in subsurface pore gas at MDA G during the first quarter of FY2008

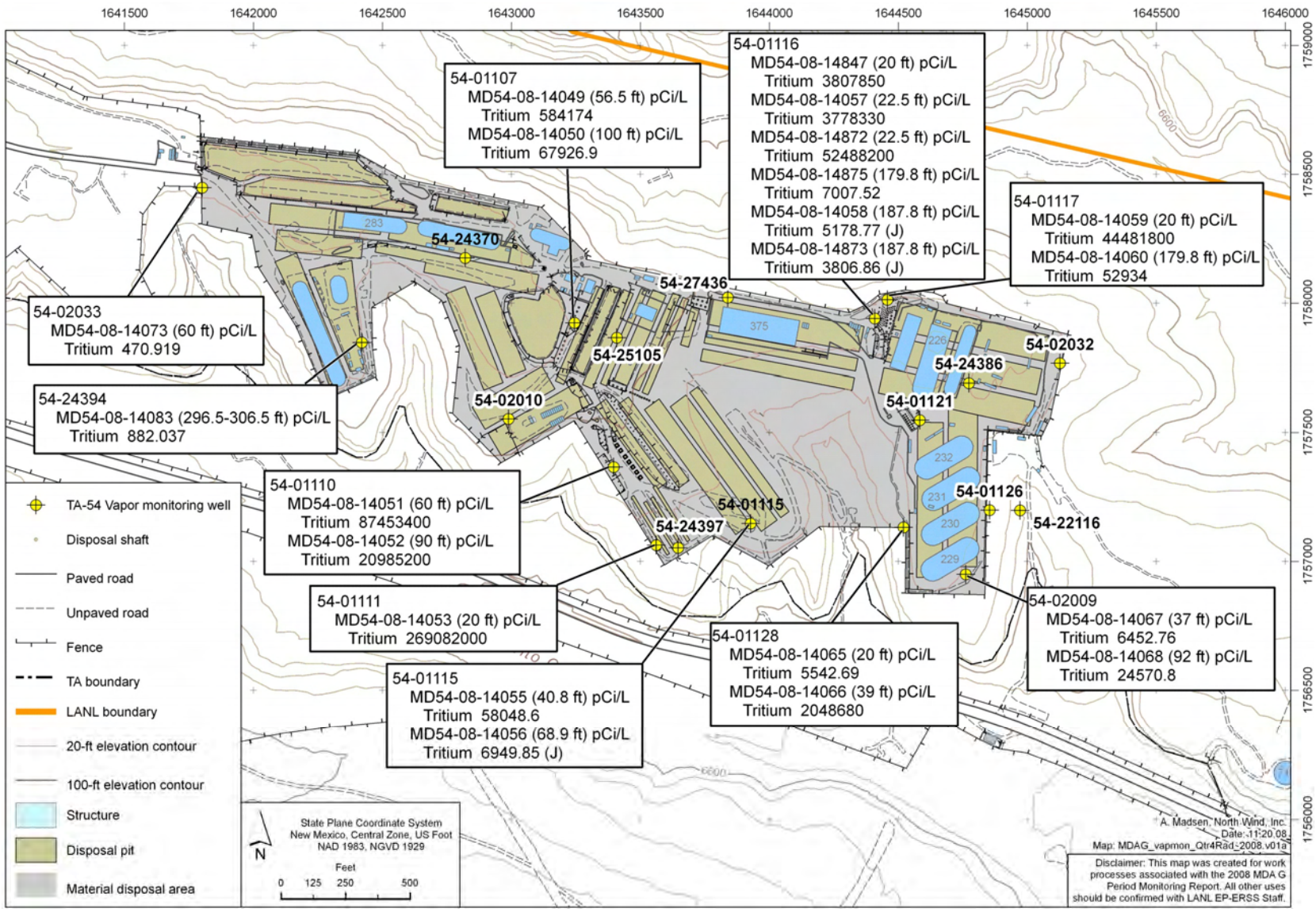

Figure 5.0-6 Tritium (pCi/L) detected in subsurface pore gas from borehole locations 54-01107, 54-01110, 54-01111, 54-01115, 54-01116, 54-01117, 54-01128, 54-02009, 54-02033, and 54-24394 at MDA G during the fourth quarter of FY2008

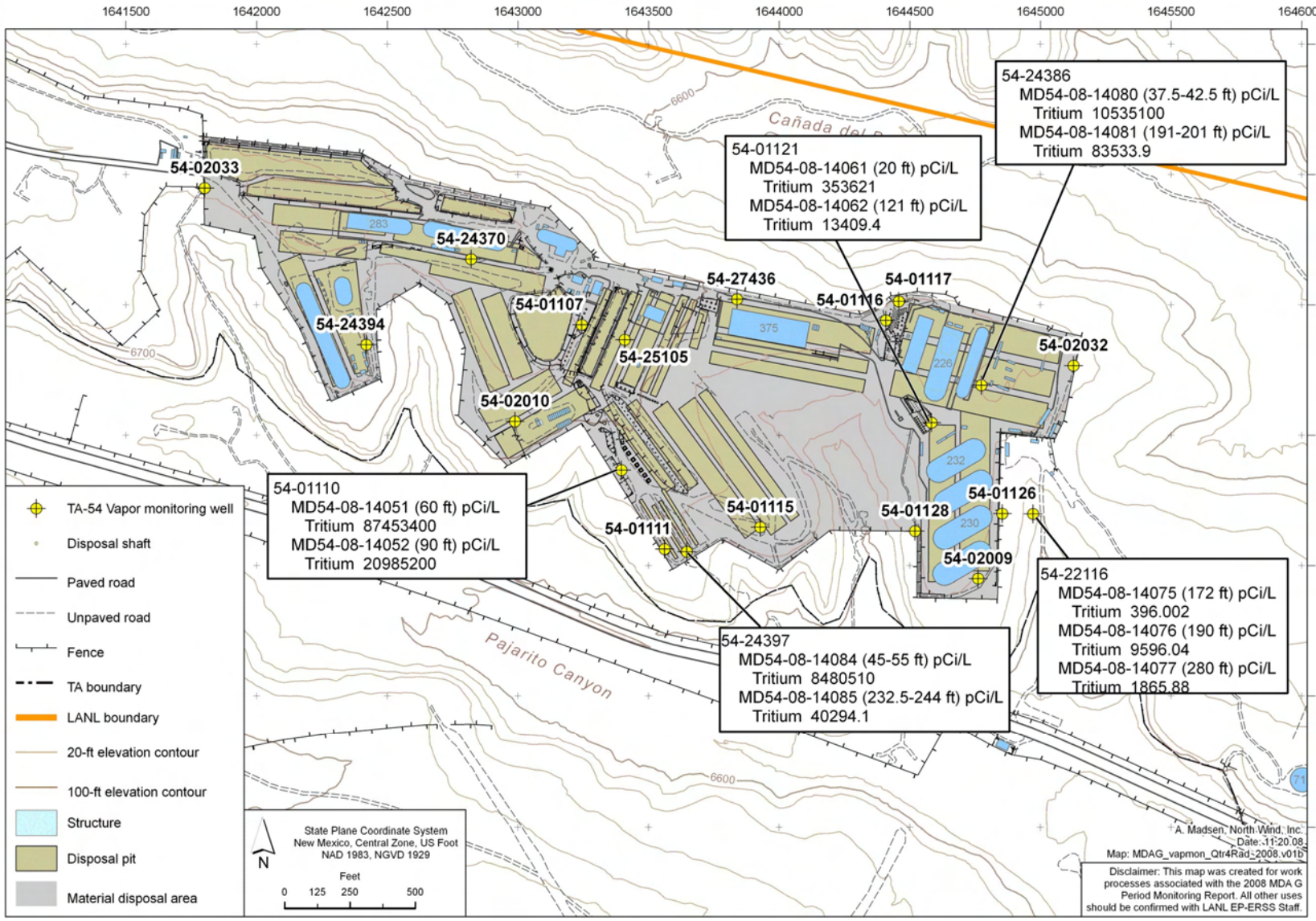

Figure 5.0-7 Tritium (pCi/L) detected in subsurface pore gas from borehole locations 54-01110, 54-01121, 54-22116, 54-24386, and 54-24397 at MDA G during the fourth quarter of FY2008

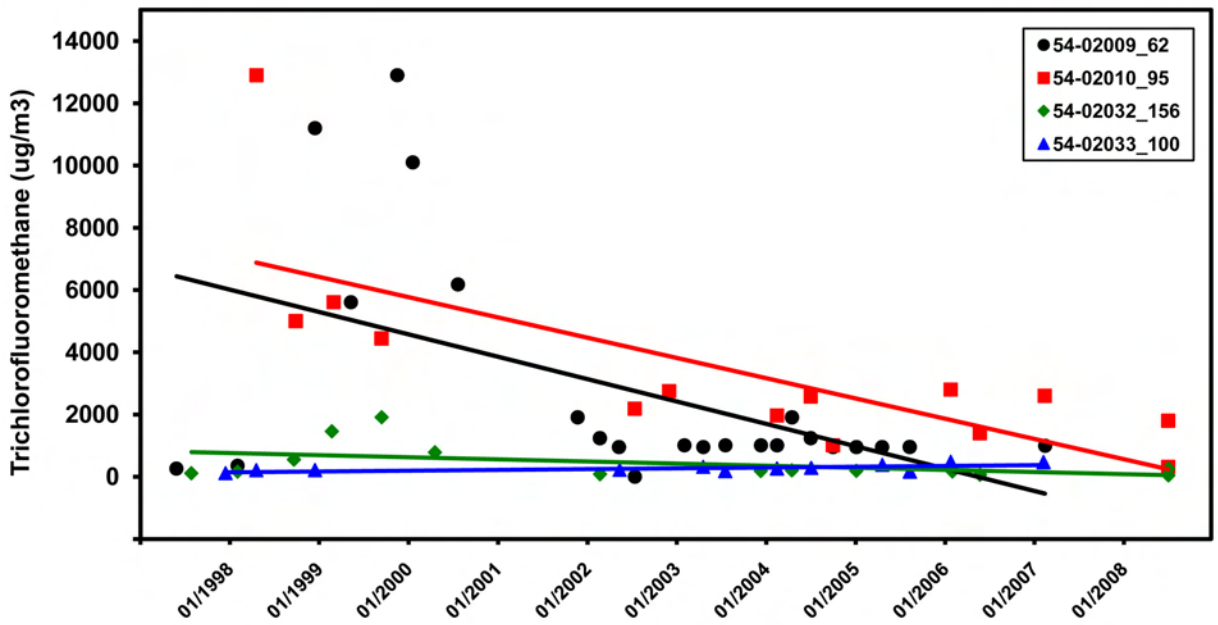

Figure 5.0-8 Trends in Freon-11 concentrations at MDA G from SUMMA analyses

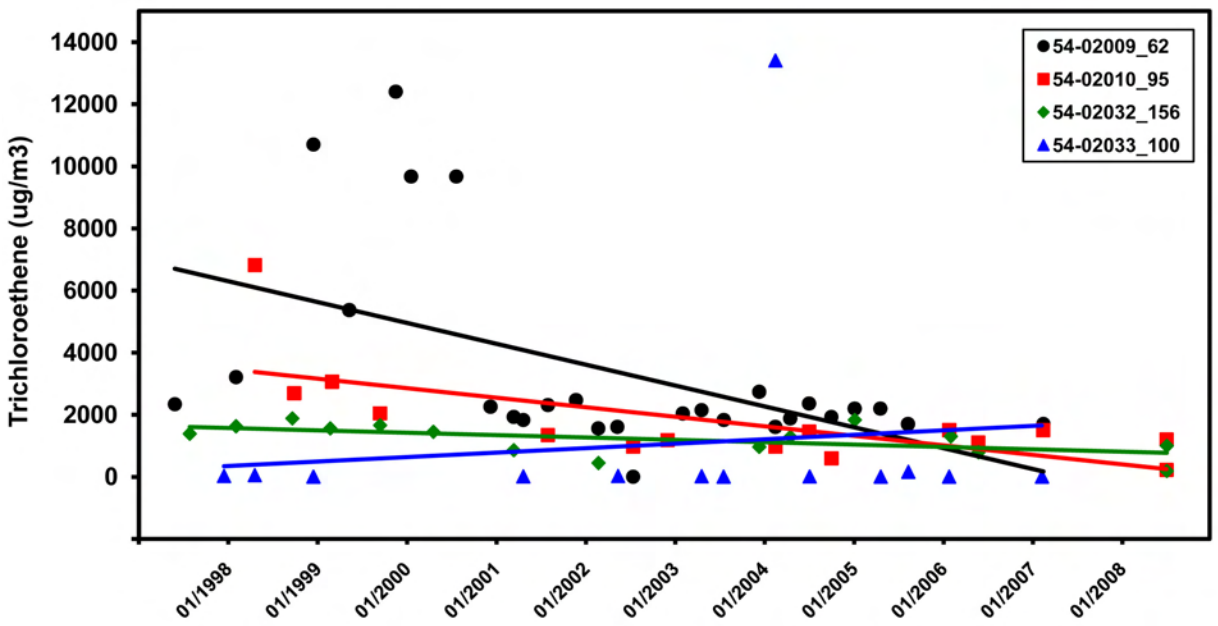

Figure 5.0-9 Trends in TCE concentrations at MDA G from SUMMA analyses

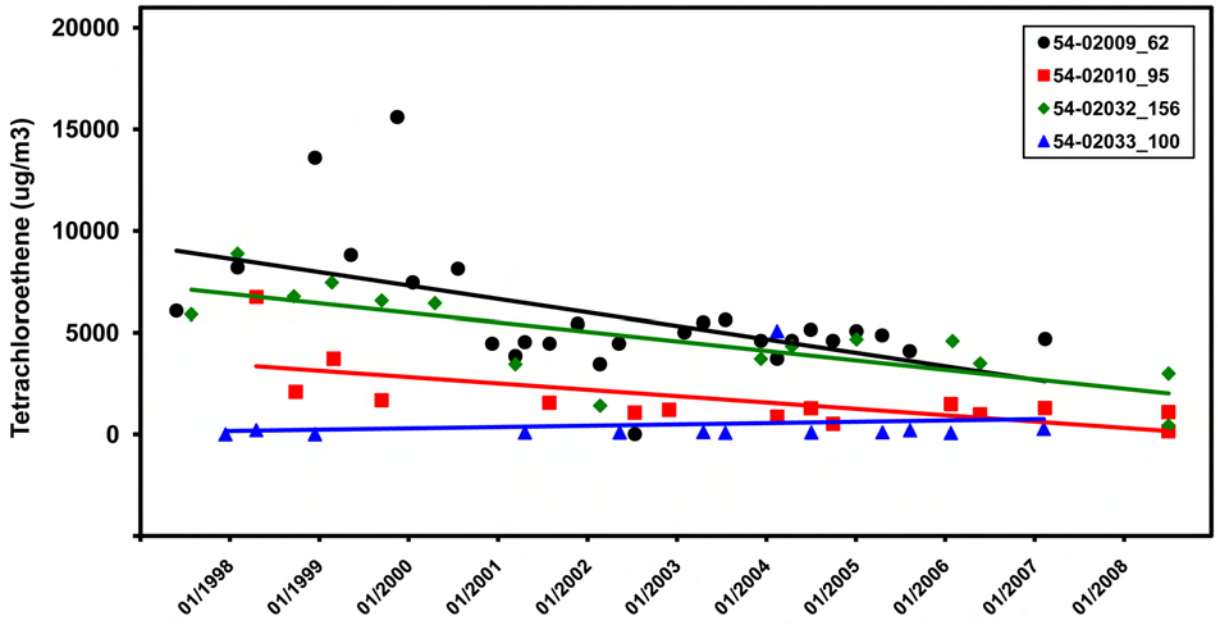

Figure 5.0-10 Trends in PCE concentrations at MDA G from SUMMA analyses

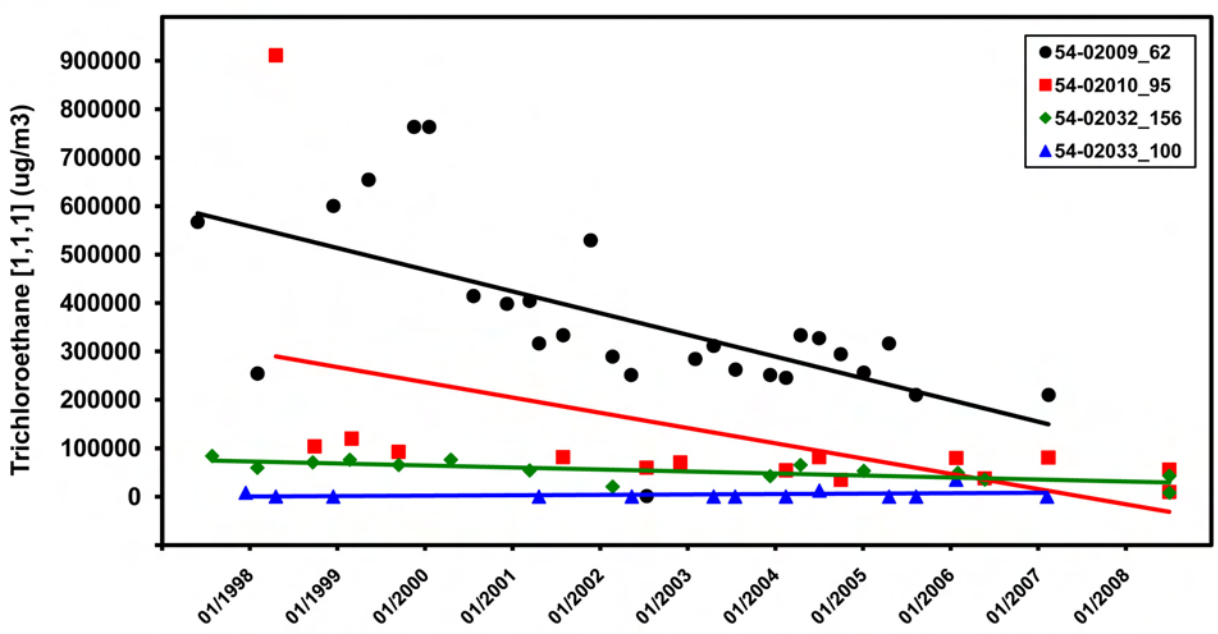

Figure 5.0-11 Trends in TCA concentrations at MDA G from SUMMA analyses

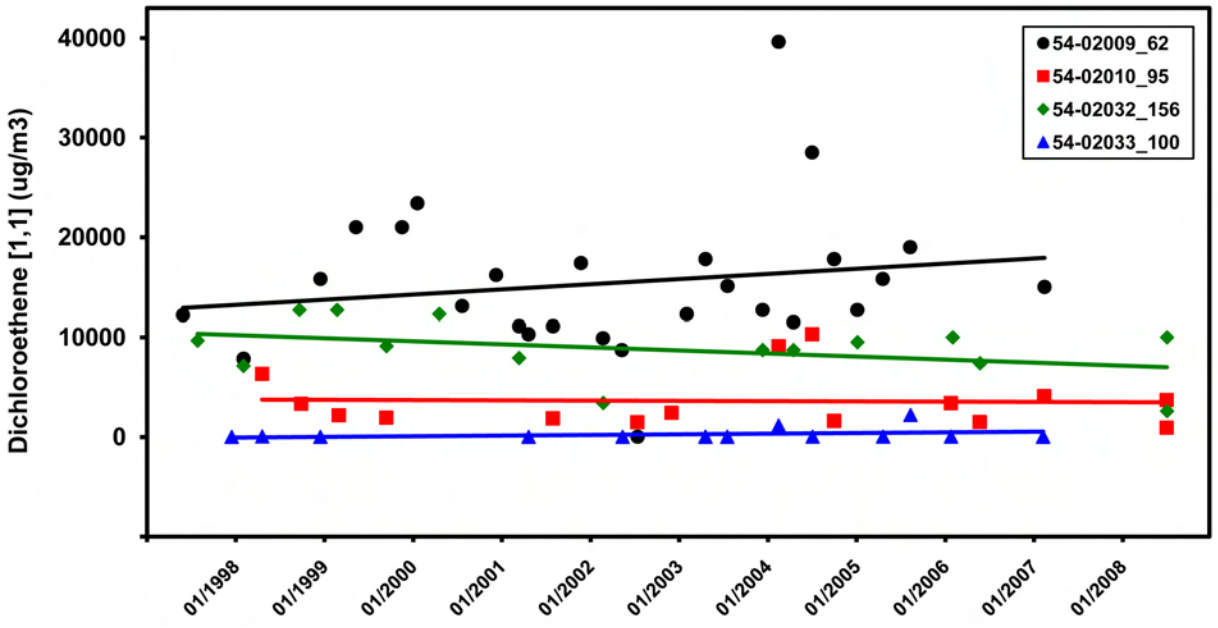

Figure 5.0-12 Trends in DCE concentrations at MDA G from SUMMA analyses

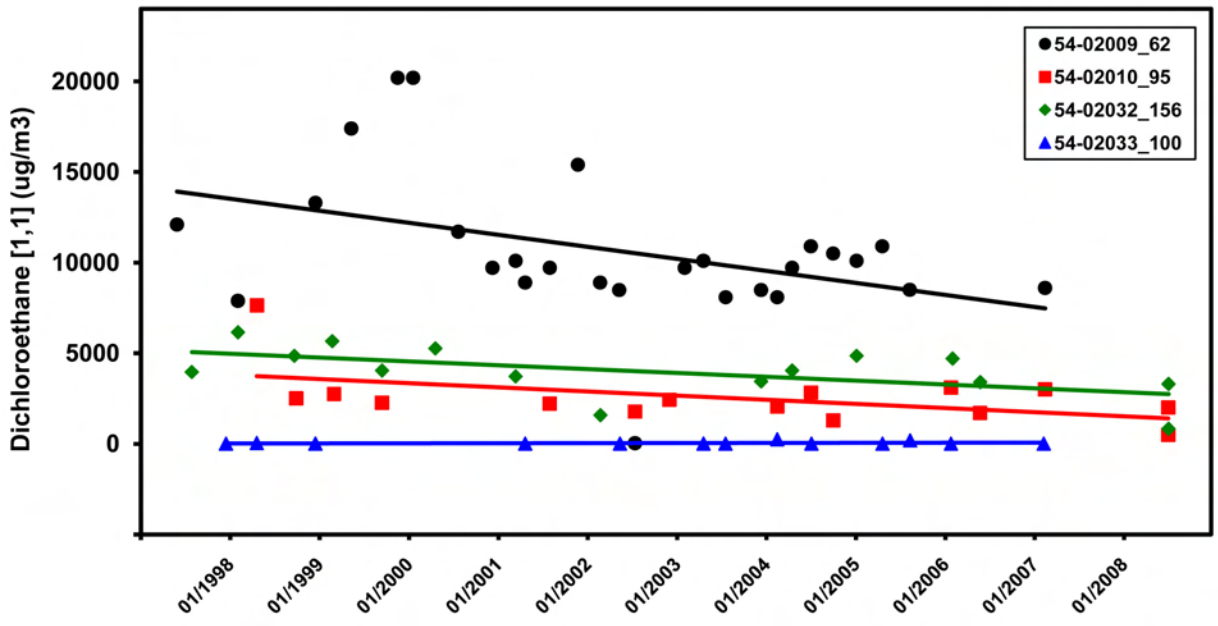

Figure 5.0-13 Trends in DCA concentrations at MDA G from SUMMA analyses

Table 2.0-1
First Quarter FY2008 MDA G Subsurface Vapor-Monitoring Locations

Location ID	Borehole Construction Type	Screening Conducted	VOC Sampling Locations[a] (ft)	Tritium Sampling Locations[a] (ft)
54-01107	FLUTe	Yes	20, 44.5, 56.5, 74, 91, 100	20, 44.5, 56.5, 74, 91, 100
54-01110	FLUTe	Yes	20, 48, 60, 70, 85, 90	20, 48, 60, 70, 85, 90
54-01111	FLUTe	Yes	20, 39.5, 50, 70, 78, 100, 139	20, 39.5, 50, 70, 78, 100, 139
54-01115[b]	FLUTe	Yes	7.9, 26.5, 40.8, 53, 63.6, 68.9	7.9, 26.5, 40.8, 53, 63.6, 68.9
54-01117	FLUTe	Yes	20, 31.5, 55, 73, 82, 85	20, 31.5, 55, 73, 82, 85
54-01121	FLUTe	Yes	20, 26, 61.5, 70, 76, 98, 121	20, 26, 61.5, 70, 76, 98, 121
54-01126[b,c]	FLUTe	No	7.5, 17.5, 28.5, 35, 42.5, 49.5	7.5, 17.5, 28.5, 35, 42.5, 49.5
54-01128[b]	FLUTe	Yes	7.5, 15, 20, 30, 39	7.5, 15, 20, 30, 39
54-02009	Group 1	Yes	37, 62, 79, 92	37, 62, 79, 92
54-02010	Group 1	Yes	30, 53, 95	30, 53, 95
54-02032	Group 4	Yes	20, 60, 100, 130, 156	20, 60, 100, 130, 156
54-02033	Group 4	Yes	20, 60, 100, 160, 200, 220, 260, 277	20, 60, 100, 160, 200, 220, 260, 277
54-22116	FLUTe	No	28, 46, 64, 82, 100, 118, 136, 154, 172, 190, 208, 226, 244, 262, 280	28, 46, 64, 82, 100, 118, 136, 154, 172, 190, 208, 226, 244, 262, 280
54-24370	Group 1	Yes	40, **72.5**, 120, 174.7, 200, **243.7**	40, 72.5, 120, 174.7, 200, 243.7
54-24386	Group 1	No	40, 83, 117, 135, 195	40, 83, 117, 135, 195
54-24394	Group 1	Yes	50, **100**, 150, 192, 245, **300**	50, **100**, 150, 192, 245, **300**
54-24397	Group 1	Yes	50, 90, 130, 165, 188, 239	**50, 90, 130, 165, 188, 239**
54-25105[d]	Open	No	485–701	485–701
54-27436	Group 1	Yes	45, **70**, 115, 163, **185**	45, 70, 115, 163, 185

[a] Bolded depths denote locations of SUMMA and/or tritium samples collected during the first quarter of FY2008.

[b] Angled borehole.

[c] FLUTe system damaged; no samples collected.

[d] Open borehole.

Table 2.0-2
Fourth Quarter FY2008 MDA G Subsurface Vapor-Monitoring Locations

Location ID	Borehole Construction Type	Screening Conducted	VOC Sampling Locations[a] (ft)	Tritium Sampling Locations[a] (ft)
54-01107	FLUTe	Yes	20, 44.5, **56.5**, 74, 91, **100**	20, 44.5, **56.5**, 74, 91, **100**
54-01110	FLUTe	Yes	20, 48, **60**, 70, 85, **90**	20, 48, **60**, 70, 85, **90**
54-01111	FLUTe	Yes	**20**, 39.5, 50, 70, 78, 100, **139**	**20,** 39.5, 50, 70, 78, 100, **139**
54-01115[b]	FLUTe	Yes	7.9, 26.5, **40.8,** 53, 63.6, **68.9**	7.9, 26.5, **40.8**, 53, 63.6, **68.9**
54-01116[c]	Stainless	Yes	**22.5**, 42.5, 67.5, 82.5, 97.5, 132.5, 151.5, 165, **187.8**	**22.5**, 42.5, 67.5, 82.5, 97.5, 132.5, 151.5, 165, **187.8**
54-01117[c]	Stainless	Yes	**20**, 42.5, 67.5, 82, 97.5, 132.5, 150, 159.5, **179.8**	**20**, 42.5, 67.5, 82, 97.5, 132.5, 150, 159.5, **179.8**
54-01121	FLUTe	Yes	**20**, 26, 61.5, 70, 76, 98, **121**	**20,** 26, 61.5, 70, 76, 98, **121**
54-01126[b,d]	FLUTe	No	7.5, 17.5, 28.5, 35, 42.5, 49.5	7.5, 17.5, 28.5, 35, 42.5, 49.5
54-01128[b]	FLUTe	Yes	7.5, 15, **20**, 30, **39**	7.5, 15, **20**, 30, **39**
54-02009	Group 1	Yes	**37**, 62, 79, **92**	**37**, 62, 79, **92**
54-02010	Group 1	Yes	**30**, 53, **95**	**30**, 53, **95**
54-02032	Group 4	Yes	**20**, 60, 100, 130, **156**	**20**, 60, 100, 130, **156**
54-02033	Group 4	Yes	20, **60**, 100, 160, 200, 220, 260, **277**	20, **60**, 100, 160, 200, 220, 260, **277**
54-22116	FLUTe	Yes	28, 46, 64, 82, 100, 118, 136, 154, **172**, **190**, 208, 226, 244, 262, **280**	28, 46, 64, 82, 100, 118, 136, 154, **172, 190**, 208, 226, 244, 262, **280**
54-24370	Group 1	Yes	**40**, 72.5, 120, 174.7, 200, **243.7**	**40**, 72.5, 120, 174.7, 200, **243.7**
54-24386	Group 1	Yes	**40**, 83, 117, 135, **195**	**40**, 83, 117, 135, **195**
54-24394	Group 1	Yes	**50**, 100, 150, 192, 245, **300**	**50**, 100, 150, 192, 245, **300**
54-24397	Group 1	Yes	**50,** 90, 130, 165, 188**, 239**	**50**, 90, 130, 165, 188, **239**
54-25105[e]	Open	Yes	**485–701**	**485–701**
54-27436	Group 1	Yes	**45**, 70, 115, 163, **185**	**45**, 70, 115, 163, **185**

[a] Bolded depths denote locations of SUMMA and/or tritium samples collected during the fourth quarter of FY2008.

[b] Angled borehole.

[c] Borehole redrilled and new sample ports installed.

[d] FLUTe system damaged; no samples collected.

[e] Open borehole.

Table 4.0-1
Carbon Dioxide Screening Results Using a Landtec GEM-500 PID

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (%)	Q4 FY2008 Result (%)
54-01107	20	3.4	2.3
54-01107	44.5	3.2	2.1
54-01107	56.5	3.4	2.3
54-01107	74	3.5	2.3
54-01107	91	2.8	1.5
54-01107	100	2.9	2.2
54-01110	20	0.5	0.1
54-01110	48	0.7	0.3
54-01110	60	0.8	0.4
54-01110	70	0.8	0.4
54-01110	85	0.9	0.4
54-01110	90	0.9	0.4
54-01111	20	0.8	0.4
54-01111	39.5	0.7	0.2
54-01111	50	0.6	0.2
54-01111	70	0.6	0.1
54-01111	78	0.6	0.1
54-01111	100	0.6	0.1
54-01111	139	0.4	0.1
54-01115	7.9 [15]	0.9	1.3
54-01115	26.5 [50]	2.8	2.1
54-01115	40.8 [77]	3.4	2.2
54-01115	53 [100]	3.7	2.3
54-01115	63.6 [120]	3.8	2.2
54-01115	68.9 [130]	3.8	2.3
54-01116	22.5	[a]	0.9
54-01116	42.5	[a]	1.4
54-01116	67.5	[a]	1.5
54-01116	82.5	[a]	1.5
54-01116	97.5	[a]	1.5
54-01116	132.5	[a]	1.3
54-01116	151.5	[a]	1.1
54-01116	165	[a]	0.9
54-01116	187.8	[a]	0.2
54-01117	20	1.2	[b]
54-01117	31.5	1.1	[b]

Table 4.0-1 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (%)	Q4 FY2008 Result (%)
54-01117	55	1.1	[b]
54-01117	73	1.0	[b]
54-01117	82	0.9	[b]
54-01117	85	0.6	[b]
54-01117	20	[b]	0.7
54-01117	42.5	[b]	0.7
54-01117	67.5	[b]	0.8
54-01117	82	[b]	0.7
54-01117	97.5	[b]	0.8
54-01117	132.5	[b]	0.5
54-01117	150	[b]	0.4
54-01117	159.5	[b]	0.4
54-01117	179.8	[b]	0
54-01121	20	3.6	2.6
54-01121	26	3.6	2.6
54-01121	61.5	3.5	2.4
54-01121	70	3.5	2.4
54-01121	76	3.4	2.3
54-01121	98	2.9	1.8
54-01121	121	2.8	1.7
54-01126	7.5 [15]	—[c]	—
54-01126	17.5 [35]	—	—
54-01126	28.5 [57]	—	—
54-01126	35 [70]	—	—
54-01126	42.5 [85]	—	—
54-01126	49.5 [99]	—	—
54-01128	7.5 [15]	1.3	0.8
54-01128	15 [30]	2.5	1.6
54-01128	20 [40]	3.3	2.1
54-01128	30 [60]	3.8	2.4
54-01128	39 [78]	4.2	2.7
54-02009	37	2.1	1.3
54-02009	62	2.1	1.3
54-02009	79	1.8	Blocked port[d]
54-02009	92	1.8	0.9
54-02010	30	3.0	3.7
54-02010	53	2.8	3.4
54-02010	95	3.4	3.3

Table 4.0-1 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (%)	Q4 FY2008 Result (%)
54-02032	20	0.6	0.9
54-02032	60	0.7	0.8
54-02032	100	0.7	0
54-02032	130	0.7	0
54-02032	156	0.7	0.7
54-02033	20	0.5	0.9
54-02033	60	0.7	0.9
54-02033	100	0.7	1.0
54-02033	160	0.6	0.8
54-02033	200	0.5	0.7
54-02033	220	0.4	0.7
54-02033	260	0.4	0.6
54-02033	277	0.3	0.6
54-22116	28	—	0.5
54-22116	46	—	0.6
54-22116	64	—	0.3
54-22116	82	—	0.8
54-22116	100	—	0.9
54-22116	118	—	0.1
54-22116	136	—	2.0
54-22116	154	—	1.6
54-22116	172	—	0.8
54-22116	190	—	2.6
54-22116	208	—	na[e]
54-22116	226	—	na
54-22116	244	—	na
54-22116	262	—	na
54-22116	280	—	na
54-24370	40	13.6	11.9
54-24370	72.5	13.8	12.6
54-24370	120	9.7	11.8
54-24370	174.7	7.2	6.8
54-24370	200	6.3	6.2
54-24370	243.7	3.1	0.8
54-24386	40	—	6.6
54-24386	83	—	4.7
54-24386	117	—	4.0
54-24386	135	—	3.7

Table 4.0-1 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (%)	Q4 FY2008 Result (%)
54-24386	195	—	0.4
54-24394	50	2.6	2.7
54-24394	100	2.2	2.8
54-24394	150	2.2	2.6
54-24394	192	2.0	2.3
54-24394	245	1.6	1.8
54-24394	300	0	0.2
54-24397	50	0.8	0.4
54-24397	90	0.8	0.4
54-24397	130	0.7	0.4
54-24397	165	0.7	0.5
54-24397	188	0.5	0.1
54-24397	240	0.2	0
54-25105	485	—	0
54-27436	45	1.6	0
54-27436	70	1.5	0.9
54-27436	115	1.2	0.9
54-27436	163	1.1	0.8
54-27436	185	0.3	0.3

Note: For angled boreholes, the depth below surface borehole length is given in brackets.

[a] Borehole not available for pore-gas sampling.

[b] Boreholes redrilled and new ports added, ports differ from first quarter to fourth quarter.

[c] — = Monitoring not conducted.

[d] Borehole port not functioning for pore-gas sample collection.

[e] na = Landtec not available for field measurements.

Table 4.0-2
Oxygen Screening Results Using a Landtec GEM-500 PID

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (%)	Q4 FY2008 Result (%)
54-01107	20	17.4	18.6
54-01107	44.5	17.5	18.9
54-01107	56.5	17.2	18.3
54-01107	74	17.2	18.2
54-01107	91	18.1	19.4
54-01107	100	18.0	18.2
54-01110	20	20.6	21.3
54-01110	48	20.5	21.1
54-01110	60	20.5	20.9
54-01110	70	20.3	20.9
54-01110	85	20.4	20.7
54-01110	90	20.3	20.6
54-01111	20	20.4	21.1
54-01111	39.5	20.3	21.0
54-01111	50	20.3	21.0
54-01111	70	20.4	21.0
54-01111	78	20.4	20.9
54-01111	100	20.6	20.0
54-01111	139	20.7	21.0
54-01115	7.9 [15]	20.3	19.9
54-01115	26.5 [50]	18.8	19.3
54-01115	40.8 [77]	18.2	19.0
54-01115	53 [100]	17.9	19.0
54-01115	63.6 [120]	17.8	19.0
54-01115	68.9 [130]	17.7	18.9
54-01116	22.5	[a]	20.7
54-01116	42.5	[a]	20.3
54-01116	67.5	[a]	20.3
54-01116	82.5	[a]	20.4
54-01116	97.5	[a]	20.4
54-01116	132.5	[a]	20.4
54-01116	151.5	[a]	20.7
54-01116	165	[a]	20.9
54-01116	187.8	[a]	21.2
54-01117	20	19.9	[b]
54-01117	31.5	19.8	[b]

Table 4.0-2 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (%)	Q4 FY2008 Result (%)
54-01117	55	19.8	[b]
54-01117	73	20.0	[b]
54-01117	82	20.2	[b]
54-01117	85	20.4	[b]
54-01117	20	[b]	21.0
54-01117	42.5	[b]	21.0
54-01117	67.5	[b]	21.8
54-01117	82	[b]	21.0
54-01117	97.5	[b]	21.0
54-01117	132.5	[b]	21.2
54-01117	150	[b]	21.5
54-01117	159.5	[b]	21.5
54-01117	179.8	[b]	21.0
54-01121	20	17.4	18.4
54-01121	26	17.3	18.4
54-01121	61.5	17.4	15.5
54-01121	70	17.4	18.5
54-01121	76	17.4	18.5
54-01121	98	17.9	19.2
54-01121	121	18.2	19.3
54-01126	7.5 [15]	—[c]	—
54-01126	17.5 [35]	—	—
54-01126	28.5 [57]	—	—
54-01126	35 [70]	—	—
54-01126	42.5 [85]	—	—
54-01126	49.5 [99]	—	—
54-01128	7.5 [15]	19.5	20.4
54-01128	15 [30]	18.6	20.6
54-01128	20 [40]	17.9	18.8
54-01128	30 [60]	17.0	18.2
54-01128	39 [78]	16.6	17.8
54-02009	37	19.0	19.8
54-02009	62	18.9	19.8
54-02009	79	19.2	Blocked port[d]
54-02009	92	19.0	20.0
54-02010	30	18.0	17.9
54-02010	53	18.0	18.0
54-02010	95	17.6	18.5

Table 4.0-2 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (%)	Q4 FY2008 Result (%)
54-02032	20	20.5	20.0
54-02032	60	20.4	20.2
54-02032	100	20.5	21.0
54-02032	130	20.5	21.0
54-02032	156	20.5	20.0
54-02033	20	19.7	20.8
54-02033	60	19.1	20.7
54-02033	100	19.3	20.5
54-02033	160	19.5	20.6
54-02033	200	19.7	20.7
54-02033	220	20.0	20.7
54-02033	260	20.2	20.7
54-02033	277	20.4	20.8
54-22116	28	—	20.4
54-22116	46	—	20.4
54-22116	64	—	20.6
54-22116	82	—	20.0
54-22116	100	—	19.8
54-22116	118	—	19.7
54-22116	136	—	17.8
54-22116	154	—	19.1
54-22116	172	—	20.1
54-22116	190	—	17.9
54-22116	208	—	na[e]
54-22116	226	—	na
54-22116	244	—	na
54-22116	262	—	na
54-22116	280	—	na
54-24370	40	5.4	8.6
54-24370	72.5	5.1	8.1
54-24370	120	8.0	9.1
54-24370	174.7	12.8	14.0
54-24370	200	13.5	14.7
54-24370	243.7	17.2	21.0
54-24386	40	—	11.1
54-24386	83	—	14.2
54-24386	117	—	15.4
54-24386	135	—	16.0

Table 4.0-2 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (%)	Q4 FY2008 Result (%)
54-24386	195	—	20.7
54-24394	50	18.3	19.0
54-24394	100	18.6	19.0
54-24394	150	18.7	19.2
54-24394	192	19.0	19.4
54-24394	245	19.7	19.9
54-24394	300	21.6	21.5
54-24397	50	20.3	20.9
54-24397	90	20.3	21.0
54-24397	130	20.5	21.1
54-24397	165	20.6	21.0
54-24397	188	20.5	21.1
54-24397	240	21.0	21.1
54-25105	485	—	21.4
54-27436	45	19.8	21.2
54-27436	70	19.9	20.5
54-27436	115	20.2	20.5
54-27436	163	20.3	20.2
54-27436	185	20.9	21.1

Note: For angled boreholes, the depth below surface borehole length is given in brackets.

[a] Borehole or port not available for pore-gas sampling.

[b] Boreholes redrilled and new ports added, ports differ from first quarter to fourth quarter.

[c] — = Monitoring not conducted.

[d] Borehole port not functioning for pore-gas sample collection.

[e] na = Landtec not available for field measurements.

Table 4.0-3
TCA Screening Results Using a B&K Multigas Instrument

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-01107	20	–54 [a]	20.2
54-01107	44.5	–49 [a]	17.6
54-01107	56.5	–45 [a]	23.4
54-01107	74	–45 [a]	25.1
54-01107	91	–39 [a]	13.1
54-01107	100	–42 [a]	25.1
54-01110	20	–9.3 [a]	0.302
54-01110	48	–11 [a]	2.01
54-01110	60	–11 [a]	1.92
54-01110	70	–11 [a]	2.91
54-01110	85	–11 [a]	4.19
54-01110	90	–11 [a]	4.18
54-01111	20	–9.6 [a]	0.304
54-01111	39.5	–6.0 [a]	0.388
54-01111	50	–3.4 [a]	6.30
54-01111	70	–2.2 [a]	8.60
54-01111	78	–0.370	8.45
54-01111	100	–0.141	8.15
54-01111	139	–1.9 [a]	6.78
54-01115	7.9 [15]	–17 [a]	0.578
54-01115	26.5 [50]	–36 [a]	9.87
54-01115	40.8 [77]	–40 [a]	13.3
54-01115	53 [100]	–41 [a]	18.0
54-01115	63.6 [120]	–39 [a]	18.8
54-01115	68.9 [130]	–38 [a]	23.9
54-01116	22.5	[b]	257
54-01116	42.5	[b]	276
54-01116	67.5	[b]	251
54-01116	82.5	[b]	222
54-01116	97.5	[b]	203
54-01116	132.5	[b]	130
54-01116	151.5	[b]	102
54-01116	165	[b]	75
54-01116	187.8	[b]	–0.965
54-01117	20	65.6	[c]
54-01117	31.5	63.6	[c]

Table 4.0-3 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-01117	55	58.6	[c]
54-01117	73	54.4	[c]
54-01117	82	37.6	[c]
54-01117	85	22.1	[c]
54-01117	20	[c]	31.3
54-01117	42.5	[c]	51.6
54-01117	67.5	[c]	59.7
54-01117	82	[c]	68.4
54-01117	97.5	[c]	80.3
54-01117	132.5	[c]	78.9
54-01117	150	[c]	40.9
54-01117	159.5	[c]	41.4
54-01117	179.8	[c]	0.641
54-01121	20	10.7	70.5
54-01121	26	10.4	71.0
54-01121	61.5	8.49	62.2
54-01121	70	4.96	60.2
54-01121	76	3.36	57.8
54-01121	98	–5.9 [a]	38.3
54-01121	121	–5.2 [a]	36.8
54-01126	7.5 [15]	—[d]	—
54-01126	17.5 [35]	—	—
54-01126	28.5 [57]	—	—
54-01126	35 [70]	—	—
54-01126	42.5 [85]	—	—
54-01126	49.5 [99]	—	—
54-01128	7.5 [15]	–12 [a]	8.98
54-01128	15 [30]	–17 [a]	23.2
54-01128	20 [40]	–17 [a]	37.4
54-01128	30 [60]	Blocked port[e]	10.3
54-01128	39 [78]	–5.5 [a]	67.1
54-02009	37	1.70	22.6
54-02009	62	8.64	29.2
54-02009	79	Blocked port	Blocked port
54-02009	92	14.1	34.4
54-02010	30	7.04	41.9
54-02010	53	Blocked port	5.17
54-02010	95	14.4	39.2

Table 4.0-3 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-02032	20	–3.6 [a]	8.54
54-02032	60	–0.938	10.7
54-02032	100	0.159	6.55
54-02032	130	1.88	12.7
54-02032	156	2.30	13.2
54-02033	20	–7.9 [a]	–1.5
54-02033	60	–8.3 [a]	–1.3
54-02033	100	–8.3 [a]	–0.755
54-02033	160	–7.2 [a]	0.172
54-02033	200	–6.2 [a]	1.15
54-02033	220	–5.4 [a]	0.504
54-02033	260	–4.4 [a]	0.408
54-02033	277	–3.9 [a]	0.310
54-22116	28	—	9.85
54-22116	46	—	14.1
54-22116	64	—	12.7
54-22116	82	—	19.7
54-22116	100	—	25.5
54-22116	118	—	32.3
54-22116	136	—	58.9
54-22116	154	—	46.6
54-22116	172	—	34.8
54-22116	190	—	88.9
54-22116	208	—	38.8
54-22116	226	—	71.9
54-22116	244	—	73.2
54-22116	262	—	76.0
54-22116	280	—	57.0
54-24370	40	100	158
54-24370	72.5	92.0	182
54-24370	120	54.1	128
54-24370	174.7	26.4	91.2
54-24370	200	21.9	84.7
54-24370	243.7	–8.0 [a]	–0.06
54-24386	40	—	206
54-24386	83	—	161
54-24386	117	—	134
54-24386	135	—	124

Table 4.0-3 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-24386	195	—	5.86
54-24394	50	–4.4 [a]	16.0
54-24394	100	–3.3 [a]	18.6
54-24394	150	–4.6 [a]	17.6
54-24394	192	–5.6 [a]	15.0
54-24394	245	–6.8 [a]	11.1
54-24394	300	–4.2 [a]	–0.213
54-24397	50	–15 [a]	1.85
54-24397	90	–15 [a]	3.01
54-24397	130	–13 [a]	3.87
54-24397	165	–14 [a]	4.23
54-24397	188	Blocked port	Blocked port
54-24397	240	–3.9 [a]	1.64
54-25105	485	—	0.267
54-27436	45	–17 [a]	–0.794
54-27436	70	–15 [a]	–0.407
54-27436	115	–13 [a]	2.82
54-27436	163	–13 [a]	3.42
54-27436	185	–5.5 [a]	–0.319

Note: For angled boreholes, the depth below surface borehole length is given in brackets.

[a] Interference observed in field measurement.

[b] Borehole or port not available for pore-gas sampling.

[c] Boreholes redrilled and new ports added, ports differ from first quarter to fourth quarter.

[d] — = Monitoring not conducted.

[e] Borehole port not functioning for pore-gas sample collection.

Table 4.0-4
PCE Screening Results Using a B&K Multigas Instrument

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-01107	20	2.75	1.32
54-01107	44.5	2.59	1.20
54-01107	56.5	2.41	1.56
54-01107	74	2.76	1.44
54-01107	91	2.09	0.862
54-01107	100	2.57	1.41
54-01110	20	0.562	0.442
54-01110	48	0.811	0.482
54-01110	60	0.984	0.473
54-01110	70	0.924	0.855
54-01110	85	0.951	0.194
54-01110	90	1.0	0.607
54-01111	20	1.37	0.964
54-01111	39.5	1.91	1.22
54-01111	50	1.95	1.87
54-01111	70	2.37	2.22
54-01111	78	2.95	2.53
54-01111	100	2.63	2.46
54-01111	139	2.31	1.89
54-01115	7.9 [15]	0.671	0.138
54-01115	26.5 [50]	1.40	1.59
54-01115	40.8 [77]	2.20	1.75
54-01115	53 [100]	2.76	1.61
54-01115	63.6 [120]	3.06	1.62
54-01115	68.9 [130]	3.12	1.96
54-01116	22.5	[a]	8.28
54-01116	42.5	[a]	9.98
54-01116	67.5	[a]	11.3
54-01116	82.5	[a]	10.7
54-01116	97.5	[a]	10.2
54-01116	132.5	[a]	6.39
54-01116	151.5	[a]	4.94
54-01116	165	[a]	3.66
54-01116	187.8	[a]	–0.0293
54-01117	20	4.03	[b]
54-01117	31.5	3.79	[b]

Table 4.0-4 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-01117	55	3.52	[b]
54-01117	73	3.29	[b]
54-01117	82	2.73	[b]
54-01117	85	2.03	[b]
54-01117	20	[b]	1.79
54-01117	42.5	[b]	2.42
54-01117	67.5	[b]	2.96
54-01117	82	[b]	3.72
54-01117	97.5	[b]	3.89
54-01117	132.5	[b]	3.80
54-01117	150	[b]	1.95
54-01117	159.5	[b]	2.35
54-01117	179.8	[b]	–0.349
54-01121	20	5.21	4.64
54-01121	26	4.93	4.41
54-01121	61.5	4.68	3.38
54-01121	70	4.19	3.19
54-01121	76	4.08	3.02
54-01121	98	2.52	1.61
54-01121	121	2.45	1.85
54-01126	7.5 [15]	—[c]	—
54-01126	17.5 [35]	—	—
54-01126	28.5 [57]	—	—
54-01126	35 [70]	—	—
54-01126	42.5 [85]	—	—
54-01126	49.5 [99]	—	—
54-01128	7.5 [15]	1.07	0.229
54-01128	15 [30]	1.60	0.758
54-01128	20 [40]	1.80	1.11
54-01128	30 [60]	Blocked port[d]	0.332
54-01128	39 [78]	2.59	1.67
54-02009	37	2.05	1.62
54-02009	62	2.34	1.64
54-02009	79	Blocked port	Blocked port
54-02009	92	2.44	1.50
54-02010	30	1.36	0.779
54-02010	53	Blocked port	0.273
54-02010	95	2.63	1.60

Table 4.0-4 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-02032	20	0.666	0.453
54-02032	60	0.984	0.648
54-02032	100	1.02	0.398
54-02032	130	1.26	0.650
54-02032	156	1.47	1.12
54-02033	20	0.719	–0.154
54-02033	60	0.712	0.489
54-02033	100	0.586	1.0
54-02033	160	0.360	0.308
54-02033	200	0.194	0.172
54-02033	220	0.311	0.167
54-02033	260	0.304	–0.404
54-02033	277	0.268	–0.170
54-22116	28	—	0.818
54-22116	46	—	1.14
54-22116	64	—	1.32
54-22116	82	—	1.23
54-22116	100	—	1.71
54-22116	118	—	1.94
54-22116	136	—	2.96
54-22116	154	—	2.49
54-22116	172	—	1.96
54-22116	190	—	4.40
54-22116	208	—	2.01
54-22116	226	—	3.20
54-22116	244	—	3.32
54-22116	262	—	3.15
54-22116	280	—	2.85
54-24370	40	14.4	13.6
54-24370	72.5	18.8	18.1
54-24370	120	17.3	16.0
54-24370	174.7	15.4	14.0
54-24370	200	14.3	13.1
54-24370	243.7	6.86	0.205
54-24386	40	—	5.07
54-24386	83	—	6.65
54-24386	117	—	6.73
54-24386	135	—	6.67

Table 4.0-4 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-24386	195	—	0.569
54-24394	50	22.6	21.6
54-24394	100	12.8	6.58
54-24394	150	5.87	6.63
54-24394	192	3.89	3.83
54-24394	245	1.96	1.93
54-24394	300	0.419	–0.165
54-24397	50	1.23	0.713
54-24397	90	1.18	0.654
54-24397	130	1.17	0.719
54-24397	165	1.24	0.917
54-24397	188	Blocked port	Blocked port
54-24397	240	0.540	0.0932
54-25105	485	—	–0.178
54-27436	45	3.30	2.19
54-27436	70	2.74	0.114
54-27436	115	2.01	1.30
54-27436	163	1.39	0.612
54-27436	185	0.686	0.503

Note: For angled boreholes, the depth below surface borehole length is given in brackets.

[a] Borehole or port not available for pore-gas sampling.

[b] Boreholes redrilled and new ports added, ports differ from first quarter to fourth quarter.

[c] — = Monitoring not conducted.

[d] Borehole port not functioning for pore-gas sample collection.

Table 4.0-5
TCE Screening Results Using a B&K Multigas Instrument

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-01107	20	0.716	17.1
54-01107	44.5	0.616	1.98
54-01107	56.5	0.715	2.02
54-01107	74	0.451	1.91
54-01107	91	0.948	1.41
54-01107	100	0.476	1.92
54-01110	20	0.364	0.372
54-01110	48	0.503	0.609
54-01110	60	0.152	0.833
54-01110	70	0.464	0.073
54-01110	85	0.492	0.627
54-01110	90	0.482	0.520
54-01111	20	0.474	0.421
54-01111	39.5	0.222	0.256
54-01111	50	0.411	0.161
54-01111	70	0.230	0.190
54-01111	78	0.0779	0.0689
54-01111	100	0.0202	0.0212
54-01111	139	0.161	0.370
54-01115	7.9 [15]	0.432	1.24
54-01115	26.5 [50]	0.997	1.58
54-01115	40.8 [77]	10.9	1.28
54-01115	53 [100]	0.641	2.11
54-01115	63.6 [120]	0.794	1.82
54-01115	68.9 [130]	0.728	1.85
54-01116	22.5	[a]	3.13
54-01116	42.5	[a]	3.06
54-01116	67.5	[a]	2.82
54-01116	82.5	[a]	2.71
54-01116	97.5	[a]	2.48
54-01116	132.5	[a]	1.89
54-01116	151.5	[a]	1.69
54-01116	165	[a]	1.45
54-01116	187.8	[a]	–0.294
54-01117	20	1.70	[b]
54-01117	31.5	1.80	[b]

Table 4.0-5 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-01117	55	1.75	[b]
54-01117	73	1.75	[b]
54-01117	82	1.64	[b]
54-01117	85	1.41	[b]
54-01117	20	[b]	1.48
54-01117	42.5	[b]	1.51
54-01117	67.5	[b]	1.47
54-01117	82	[b]	1.32
54-01117	97.5	[b]	1.58
54-01117	132.5	[b]	1.58
54-01117	150	[b]	0.948
54-01117	159.5	[b]	0.777
54-01117	179.8	[b]	0.591
54-01121	20	1.95	3.39
54-01121	26	2.21	3.25
54-01121	61.5	1.90	3.05
54-01121	70	1.79	3.01
54-01121	76	1.47	2.83
54-01121	98	1.28	2.09
54-01121	121	1.06	1.57
54-01126	7.5 [15]	—[c]	—
54-01126	17.5 [35]	—	—
54-01126	28.5 [57]	—	—
54-01126	35 [70]	—	—
54-01126	42.5 [85]	—	—
54-01126	49.5 [99]	—	—
54-01128	7.5 [15]	0.598	0.572
54-01128	15 [30]	0.538	1.36
54-01128	20 [40]	0.813	1.59
54-01128	30 [60]	Blocked port[d]	0.606
54-01128	39 [78]	1.26	2.04
54-02009	37	0.858	1.05
54-02009	62	0.859	0.965
54-02009	79	Blocked port	Blocked port
54-02009	92	0.686	1.22
54-02010	30	–1.5	2.78
54-02010	53	Blocked port	1.12
54-02010	95	–2.1	2.10

Table 4.0-5 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-02032	20	–0.161	0.863
54-02032	60	–0.391	1.03
54-02032	100	–0.110	0.680
54-02032	130	–0.303	0.942
54-02032	156	–0.407	0.782
54-02033	20	–0.117	0.699
54-02033	60	–0.164	0.825
54-02033	100	0.0824	0.599
54-02033	160	0.000893	0.028
54-02033	200	0.239	1.11
54-02033	220	0.172	0.170
54-02033	260	0.132	–0.017
54-02033	277	0.053	0.959
54-22116	28	—	2.41
54-22116	46	—	2.96
54-22116	64	—	3.14
54-22116	82	—	3.38
54-22116	100	—	4.17
54-22116	118	—	5.36
54-22116	136	—	14.4
54-22116	154	—	10.1
54-22116	172	—	7.08
54-22116	190	—	17.1
54-22116	208	—	5.57
54-22116	226	—	3.63
54-22116	244	—	3.85
54-22116	262	—	3.04
54-22116	280	—	4.01
54-24370	40	–3.1	7.92
54-24370	72.5	–2.7	10.3
54-24370	120	–2.5	8.67
54-24370	174.7	–2.8	6.94
54-24370	200	–1.9	6.98
54-24370	243.7	–0.737	–0.024
54-24386	40	—	4.75
54-24386	83	—	4.09
54-24386	117	—	3.47
54-24386	135	—	3.37

Table 4.0-5 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-24386	195	—	0.287
54-24394	50	16.0	19.2
54-24394	100	8.78	6.84
54-24394	150	2.98	6.68
54-24394	192	1.50	4.19
54-24394	245	0.413	2.63
54-24394	300	0.215	0.670
54-24397	50	0.518	0.117
54-24397	90	0.621	0.552
54-24397	130	0.556	0.526
54-24397	165	0.472	0.499
54-24397	188	Blocked port	Blocked port
54-24397	240	0.492	0.621
54-25105	485	—	0.514
54-27436	45	28.1	19.0
54-27436	70	23.6	0.447
54-27436	115	13.9	13.7
54-27436	163	6.82	7.83
54-27436	185	1.35	1.95

Note: For angled boreholes, the depth below surface borehole length is given in brackets.

[a] Borehole or port not available for pore-gas sampling.

[b] Boreholes redrilled and new ports added, ports differ from first quarter to fourth quarter.

[c] — = Monitoring not conducted.

[d] Borehole port not functioning for pore-gas sample collection.

Table 4.0-6
Freon-11 Screening Results Using a B&K Multigas Instrument

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-01107	20	0.559	–0.020
54-01107	44.5	0.563	–0.136
54-01107	56.5	0.524	–0.050
54-01107	74	0.558	–0.020
54-01107	91	0.385	–0.052
54-01107	100	0.519	–0.068
54-01110	20	0.0457	0.0555
54-01110	48	0.0653	–0.025
54-01110	60	0.143	–0.030
54-01110	70	0.140	0.0923
54-01110	85	0.163	0.090
54-01110	90	0.147	0.0523
54-01111	20	0.206	0.146
54-01111	39.5	0.259	0.213
54-01111	50	0.270	0.227
54-01111	70	0.318	0.247
54-01111	78	0.436	0.307
54-01111	100	0.469	0.279
54-01111	139	0.335	0.172
54-01115	7.9 [15]	0.0695	0.0391
54-01115	26.5 [50]	0.143	0.0431
54-01115	40.8 [77]	0.293	0.0887
54-01115	53 [100]	0.475	–0.048
54-01115	63.6 [120]	0.510	–0.0088
54-01115	68.9 [130]	0.513	0.0486
54-01116	22.5	[a]	1.10
54-01116	42.5	[a]	1.43
54-01116	67.5	[a]	1.60
54-01116	82.5	[a]	1.52
54-01116	97.5	[a]	1.51
54-01116	132.5	[a]	1.09
54-01116	151.5	[a]	0.869
54-01116	165	[a]	–0.643
54-01116	187.8	[a]	–0.0396
54-01117	20	0.830	[b]
54-01117	31.5	0.763	[b]

Table 4.0-6 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-01117	55	0.691	[b]
54-01117	73	0.627	[b]
54-01117	82	0.509	[b]
54-01117	85	0.365	[b]
54-01117	20	[b]	0.212
54-01117	42.5	[b]	0.343
54-01117	67.5	[b]	0.509
54-01117	82	[b]	0.603
54-01117	97.5	[b]	–0.713
54-01117	132.5	[b]	0.738
54-01117	150	[b]	0.569
54-01117	159.5	[b]	0.560
54-01117	179.8	[b]	–0.045
54-01121	20	1.52	1.15
54-01121	26	1.37	1.05
54-01121	61.5	1.27	0.649
54-01121	70	1.04	0.558
54-01121	76	0.939	0.479
54-01121	98	0.497	0.174
54-01121	121	0.450	0.125
54-01126	7.5 [15]	—[c]	—
54-01126	17.5 [35]	—	—
54-01126	28.5 [57]	—	—
54-01126	35 [70]	—	—
54-01126	42.5 [85]	—	—
54-01126	49.5 [99]	—	—
54-01128	7.5 [15]	0.146	0.073
54-01128	15 [30]	0.253	0.076
54-01128	20 [40]	0.305	–0.005
54-01128	30 [60]	Blocked port[d]	–0.015
54-01128	39 [78]	0.418	0.0119
54-02009	37	0.367	0.185
54-02009	62	0.414	0.237
54-02009	79	Blocked port	Blocked port
54-02009	92	0.499	0.278
54-02010	30	0.499	–0.116
54-02010	53	Blocked port	0.0126
54-02010	95	0.901	0.151

Table 4.0-6 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-02032	20	0.097	–0.077
54-02032	60	0.259	0.290
54-02032	100	0.248	0.092
54-02032	130	0.373	0.163
54-02032	156	0.398	0.130
54-02033	20	–0.060	–0.056
54-02033	60	0.0883	0.0374
54-02033	100	0.046	0.155
54-02033	160	0.149	0.165
54-02033	200	0.0719	–0.074
54-02033	220	0.0447	–0.053
54-02033	260	0.0845	0.162
54-02033	277	0.0695	–0.116
54-22116	28	—	0.0554
54-22116	46	—	0.0456
54-22116	64	—	0.556
54-22116	82	—	0.837
54-22116	100	—	0.456
54-22116	118	—	0.07530
54-22116	136	—	0.090
54-22116	154	—	–0.0012
54-22116	172	—	–0.038
54-22116	190	—	–0.064
54-22116	208	—	–0.052
54-22116	226	—	0.0069
54-22116	244	—	–0.036
54-22116	262	—	0.209
54-22116	280	—	0.073
54-24370	40	5.17	2.33
54-24370	72.5	5.55	2.6
54-24370	120	4.63	1.96
54-24370	174.7	4.12	1.76
54-24370	200	3.62	1.48
54-24370	243.7	1.81	0.223
54-24386	40	—	0.490
54-24386	83	—	1.35
54-24386	117	—	1.71
54-24386	135	—	1.70

Table 4.0-6 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-24386	195	—	0.199
54-24394	50	4.72	2.76
54-24394	100	2.84	0.945
54-24394	150	1.66	0.935
54-24394	192	1.22	0.601
54-24394	245	0.760	0.309
54-24394	300	0.0721	0.006
54-24397	50	0.152	–0.0967
54-24397	90	0.117	0.0836
54-24397	130	0.149	0.125
54-24397	165	0.208	0.0445
54-24397	188	Blocked port	Blocked port
54-24397	240	0.00876	0.0281
54-25105	485	—	–0.113
54-27436	45	0.277	–0.015
54-27436	70	0.247	–0.013
54-27436	115	0.181	–0.039
54-27436	163	0.132	0.0018
54-27436	185	0.0460	0.0219

Note: For angled boreholes, the depth below surface borehole length is given in brackets.

[a] Borehole or port not available for pore-gas sampling.

[b] Boreholes redrilled and new ports added, ports differ from first quarter to fourth quarter.

[c] — = Monitoring not conducted.

[d] Borehole port not functioning for pore-gas sample collection.

Table 4.0-7
Carbon Dioxide Screening Results Using a B&K Multigas Instrument

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-01107	20	23,300	17,400
54-01107	44.5	23,400	16,100
54-01107	56.5	23,500	17,600
54-01107	74	24,100	18,000
54-01107	91	20,000	12,500
54-01107	100	21,200	17,200
54-01110	20	4080	2920
54-01110	48	5870	3700
54-01110	60	6310	4100
54-01110	70	6610	4280
54-01110	85	6870	4640
54-01110	90	7000	4670
54-01111	20	6000	4070
54-01111	39.5	5510	3710
54-01111	50	5020	3430
54-01111	70	5060	3430
54-01111	78	4870	3350
54-01111	100	4600	3350
54-01111	139	3770	3490
54-01115	7.9 [15]	8120	8570
54-01115	26.5 [50]	20,800	1540
54-01115	40.8 [77]	25,400	1640
54-01115	53 [100]	27,700	1740
54-01115	63.6 [120]	28,300	1670
54-01115	68.9 [130]	28,500	1780
54-01116	22.5	[a]	6250
54-01116	42.5	[a]	7250
54-01116	67.5	[a]	7660
54-01116	82.5	[a]	7640
54-01116	97.5	[a]	7650
54-01116	132.5	[a]	7160
54-01116	151.5	[a]	6500
54-01116	165	[a]	5580
54-01116	187.8	[a]	1640
54-01117	20	9290	[b]
54-01117	31.5	9170	[b]

Table 4.0-7 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-01117	55	8950	[b]
54-01117	73	8600	[b]
54-01117	82	7440	[b]
54-01117	85	5620	[b]
54-01117	20	[b]	4520
54-01117	42.5	[b]	5106
54-01117	67.5	[b]	5300
54-01117	82	[b]	5460
54-01117	97.5	[b]	6060
54-01117	132.5	[b]	5960
54-01117	150	[b]	3530
54-01117	159.5	[b]	3570
54-01117	179.8	[b]	1530
54-01121	20	26,100	18,500
54-01121	26	26,000	18,500
54-01121	61.5	25,600	17,400
54-01121	70	24,800	17,200
54-01121	76	24,400	16,800
54-01121	98	20,700	13,800
54-01121	121	19,700	13,300
54-01126	7.5 [15]	—[c]	—
54-01126	17.5 [35]	—	—
54-01126	28.5 [57]	—	—
54-01126	35 [70]	—	—
54-01126	42.5 [85]	—	—
54-01126	49.5 [99]	—	—
54-01128	7.5 [15]	10,200	7520
54-01128	15 [30]	18,600	1240
54-01128	20 [40]	24,700	1590
54-01128	30 [60]	Blocked port[d]	5390
54-01128	39 [78]	31,000	20,100
54-02009	37	15,300	9560
54-02009	62	14,500	9540
54-02009	79	Blocked port	Blocked port
54-02009	92	13,100	9000
54-02010	30	24,100	22,900
54-02010	53	Blocked port	6610
54-02010	95	26,300	20,000

Table 4.0-7 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-02032	20	7580	6950
54-02032	60	9010	7090
54-02032	100	6670	4340
54-02032	130	8550	6980
54-02032	156	8340	6740
54-02033	20	5350	5000
54-02033	60	6840	5220
54-02033	100	7170	5640
54-02033	160	6130	4800
54-02033	200	5200	4210
54-02033	220	4840	3920
54-02033	260	3860	3310
54-02033	277	3540	3200
54-22116	28	—	4950
54-22116	46	—	5940
54-22116	64	—	3460
54-22116	82	—	7190
54-22116	100	—	8720
54-22116	118	—	9690
54-22116	136	—	1520
54-22116	154	—	12,400
54-22116	172	—	9630
54-22116	190	—	20,500
54-22116	208	—	10,900
54-22116	226	—	17,500
54-22116	244	—	17,300
54-22116	262	—	18,900
54-22116	280	—	14,400
54-24370	40	62,900	57,900
54-24370	72.5	62,500	54,600
54-24370	120	52,000	95,000
54-24370	174.7	42,800	36,900
54-24370	200	39,800	34,300
54-24370	243.7	17,900	3000
54-24386	40	—	40,500
54-24386	83	—	32,100
54-24386	117	—	27,300
54-24386	135	—	25,000

Table 4.0-7 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-24386	195	—	3980
54-24394	50	20,900	15,800
54-24394	100	19,900	16,500
54-24394	150	18,500	15,000
54-24394	192	16,500	13,400
54-24394	245	13,300	10,800
54-24394	300	2690	1810
54-24397	50	6600	4480
54-24397	90	6770	4320
54-24397	130	6670	5450
54-24397	165	7130	5730
54-24397	188	Blocked port	Blocked port
54-24397	240	2300	2770
54-25105	485	—	371
54-27436	45	12,200	74,000
54-27436	70	11,600	427
54-27436	115	11,100	7960
54-27436	163	10,400	7570
54-27436	185	3800	3720

Note: For angled boreholes, the depth below surface borehole length is given in brackets.

[a] Borehole or port not available for pore-gas sampling.

[b] Boreholes redrilled and new ports added, ports differ from first quarter to fourth quarter.

[c] — = Monitoring not conducted.

[d] Borehole port not functioning for pore-gas sample collection.

Table 4.0-8
Moisture (H_2O) Screening Results Using a B&K Multigas Instrument

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-01107	20	10,600	19,000
54-01107	44.5	10,900	18,600
54-01107	56.5	10,600	18,700
54-01107	74	10,200	18,800
54-01107	91	10,800	18,200
54-01107	100	10,100	18,500
54-01110	20	8380	20,400
54-01110	48	8420	18,600
54-01110	60	8630	18,800
54-01110	70	8740	18,800
54-01110	85	8760	18,900
54-01110	90	8900	18,400
54-01111	20	9890	19,800
54-01111	39.5	9860	19,600
54-01111	50	9870	19,000
54-01111	70	9720	19,000
54-01111	78	9650	18,600
54-01111	100	9510	18,300
54-01111	139	9710	17,700
54-01115	7.9 [15]	6790	23,000
54-01115	26.5 [50]	7170	19,700
54-01115	40.8 [77]	7540	25,800
54-01115	53 [100]	7550	20,600
54-01115	63.6 [120]	7540	20,500
54-01115	68.9 [130]	7740	20,800
54-01116	22.5	[a]	18,200
54-01116	42.5	[a]	17,900
54-01116	67.5	[a]	17,100
54-01116	82.5	[a]	16,900
54-01116	97.5	[a]	17,300
54-01116	132.5	[a]	17,000
54-01116	151.5	[a]	16,900
54-01116	165	[a]	16,800
54-01116	187.8	[a]	17,000
54-01117	20	12,300	[b]
54-01117	31.5	10,600	[b]

Table 4.0-8 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-01117	55	10,500	[b]
54-01117	73	10,600	[b]
54-01117	82	10,600	[b]
54-01117	85	10,300	[b]
54-01117	20	[b]	16,400
54-01117	42.5	[b]	16,300
54-01117	67.5	[b]	16,200
54-01117	82	[b]	15,700
54-01117	97.5	[b]	15,500
54-01117	132.5	[b]	15,800
54-01117	150	[b]	14,700
54-01117	159.5	[b]	15,700
54-01117	179.8	[b]	15,800
54-01121	20	11,100	20,400
54-01121	26	10,000	20,000
54-01121	61.5	9720	20,100
54-01121	70	9610	19,800
54-01121	76	9440	19,800
54-01121	98	9030	19,400
54-01121	121	8790	19,700
54-01126	7.5 [15]	—[c]	—
54-01126	17.5 [35]	—	—
54-01126	28.5 [57]	—	—
54-01126	35 [70]	—	—
54-01126	42.5 [85]	—	—
54-01126	49.5 [99]	—	—
54-01128	7.5 [15]	9710	21,800
54-01128	15 [30]	9770	18,900
54-01128	20 [40]	9200	18,800
54-01128	30 [60]	Blocked port[d]	18,900
54-01128	39 [78]	9290	18,800
54-02009	37	11,600	19,800
54-02009	62	11,300	19,600
54-02009	79	Blocked port	Blocked port
54-02009	92	11,100	18,700
54-02010	30	9370	21,100
54-02010	53	Blocked port	17,900
54-02010	95	9010	22,000

Table 4.0-8 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-02032	20	7750	17,200
54-02032	60	7590	17,300
54-02032	100	7550	15,900
54-02032	130	7370	17,300
54-02032	156	7270	16,800
54-02033	20	11,100	18,400
54-02033	60	12,300	18,800
54-02033	100	13,000	18,500
54-02033	160	11,700	18,800
54-02033	200	11,800	18,700
54-02033	220	11,300	18,300
54-02033	260	10,400	19,500
54-02033	277	10,100	18,100
54-22116	28	—	19,300
54-22116	46	—	18,400
54-22116	64	—	20,400
54-22116	82	—	21,800
54-22116	100	—	19,400
54-22116	118	—	19,000
54-22116	136	—	29,200
54-22116	154	—	18,700
54-22116	172	—	16,700
54-22116	190	—	18,000
54-22116	208	—	17,300
54-22116	226	—	17,500
54-22116	244	—	16,200
54-22116	262	—	47,200
54-22116	280	—	17,800
54-24370	40	12,100	24,600
54-24370	72.5	11,000	22,900
54-24370	120	11,600	21,000
54-24370	174.7	11,500	19,600
54-24370	200	10,900	19,200
54-24370	243.7	10,700	18,900
54-24386	40	—	27,300
54-24386	83	—	25,100
54-24386	117	—	24,400
54-24386	135	—	25,500

Table 4.0-8 (continued)

Location ID	Port Depth (ft bgs) [Length (ft)]	Q1 FY2008 Result (ppm)	Q4 FY2008 Result (ppm)
54-24386	195	—	20,800
54-24394	50	14,100	19,100
54-24394	100	13,400	18,000
54-24394	150	13,700	18,100
54-24394	192	13,000	18,100
54-24394	245	12,300	18,900
54-24394	300	11,500	19,300
54-24397	50	9430	20,100
54-24397	90	9340	21,100
54-24397	130	9280	20,400
54-24397	165	9560	20,200
54-24397	188	Blocked port	Blocked port
54-24397	240	9360	19,500
54-25105	485	—	11,300
54-27436	45	11,600	19,500
54-27436	70	11,500	19,100
54-27436	115	11,600	19,400
54-27436	163	11,500	18,700
54-27436	185	11,200	17,800

Note: For angled boreholes, the depth below surface borehole length is given in brackets.

[a] Borehole or port not available for pore-gas sampling.

[b] Boreholes redrilled and new ports added, ports differ from first quarter to fourth quarter.

[c] — = Monitoring not conducted.

[d] Borehole port not functioning for pore-gas sample collection.

Table 5.0-1
VOCs Detected in Pore-Gas Samples Collected During Monitoring Activities at MDA G

Location ID	Depth Interval (ft bgs)	Analyte	Result (µg/m^3)	Collection Date
54-01107	56.5	Chlorodifluoromethane	200	7/23/2008
54-01107	56.5	Dichlorodifluoromethane	610	7/23/2008
54-01107	56.5	DCA	250	7/23/2008
54-01107	56.5	DCE	760	7/23/2008
54-01107	56.5	PCE	3000	7/23/2008
54-01107	56.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	4600	7/23/2008
54-01107	56.5	TCA	16,000	7/23/2008
54-01107	56.5	TCE	330	7/23/2008
54-01107	56.5	Freon-11	1200	7/23/2008
54-01107	100	Chlorodifluoromethane	200	7/23/2008
54-01107	100	Chloroform	51	7/23/2008
54-01107	100	Dichlorodifluoromethane	630	7/23/2008
54-01107	100	DCA	220	7/23/2008
54-01107	100	DCE	820	7/23/2008
54-01107	100	Methylene Chloride	37	7/23/2008
54-01107	100	PCE	3100	7/23/2008
54-01107	100	Trichloro-1,2,2-trifluoroethane[1,1,2-]	4400	7/23/2008
54-01107	100	TCA	15,000	7/23/2008
54-01107	100	TCE	310	7/23/2008
54-01107	100	Freon-11	1100	7/23/2008
54-01110	60	Dichlorodifluoromethane	150	7/23/2008
54-01110	60	DCA	410	7/23/2008
54-01110	60	DCE	600	7/23/2008
54-01110	60	PCE	320	7/23/2008
54-01110	60	Trichloro-1,2,2-trifluoroethane[1,1,2-]	1900	7/23/2008
54-01110	60	TCA	18,000	7/23/2008
54-01110	60	TCE	580	7/23/2008
54-01110	60	Freon-11	110	7/23/2008
54-01110	90	Chloroform	56	7/23/2008
54-01110	90	Dichlorodifluoromethane	230	7/23/2008
54-01110	90	DCA	490	7/23/2008
54-01110	90	DCE	960	7/23/2008
54-01110	90	PCE	460	7/23/2008
54-01110	90	Trichloro-1,2,2-trifluoroethane[1,1,2-]	2400	7/23/2008
54-01110	90	TCA	20,000	7/23/2008
54-01110	90	TCE	860	7/23/2008
54-01110	90	Freon-11	150	7/23/2008

Table 5.0-1 (continued)

Location ID	Port Depth or Depth Interval (ft bgs)	Analyte	Result (µg/m³)	Collection Date
54-01111	20	Dichlorodifluoromethane	330	7/16/2008
54-01111	20	DCA	160	7/16/2008
54-01111	20	DCE	900	7/16/2008
54-01111	20	Methylene Chloride	110 (J)*	7/16/2008
54-01111	20	PCE	210	7/16/2008
54-01111	20	Trichloro-1,2,2-trifluoroethane[1,1,2-]	3900	7/16/2008
54-01111	20	TCA	14,000	7/16/2008
54-01111	20	TCE	270	7/16/2008
54-01111	20	Freon-11	140	7/16/2008
54-01111	139	Carbon Disulfide	74	7/16/2008
54-01111	139	DCA	160	7/16/2008
54-01111	139	DCE	350	7/16/2008
54-01111	139	Methylene Chloride	160 (J)	7/16/2008
54-01111	139	Trichloro-1,2,2-trifluoroethane[1,1,2-]	7400	7/16/2008
54-01111	139	TCA	24,000	7/16/2008
54-01115	40.8	Chloroform	270	7/17/2008
54-01115	40.8	Dichlorodifluoromethane	1700	7/17/2008
54-01115	40.8	DCA	500	7/17/2008
54-01115	40.8	DCE	1100	7/17/2008
54-01115	40.8	PCE	1200	7/17/2008
54-01115	40.8	Trichloro-1,2,2-trifluoroethane[1,1,2-]	3100	7/17/2008
54-01115	40.8	TCA	18,000	7/17/2008
54-01115	40.8	TCE	380	7/17/2008
54-01115	40.8	Freon-11	800	7/17/2008
54-01115	68.9	Chloroform	260	7/17/2008
54-01115	68.9	Dichlorodifluoromethane	2000	7/17/2008
54-01115	68.9	DCA	830	7/17/2008
54-01115	68.9	DCE	1800	7/17/2008
54-01115	68.9	PCE	1300	7/17/2008
54-01115	68.9	Trichloro-1,2,2-trifluoroethane[1,1,2-]	4400	7/17/2008
54-01115	68.9	TCA	27,000	7/17/2008
54-01115	68.9	TCE	550	7/17/2008
54-01115	68.9	Freon-11	820	7/17/2008
54-01116	22.5	Cyclohexane	32,000	7/8/2008
54-01116	22.5	DCA	21,000	7/8/2008
54-01116	22.5	DCE	43,000	7/8/2008
54-01116	22.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	34,000	7/8/2008

Table 5.0-1 (continued)

Location ID	Port Depth or Depth Interval (ft bgs)	Analyte	Result (µg/m³)	Collection Date
54-01116	22.5	TCA	1,400,000	7/8/2008
54-01116	22.5	TCE	14,000	7/8/2008
54-01116	187.8	Cyclohexane	94	7/8/2008
54-01116	187.8	Dichlorodifluoromethane	24	7/8/2008
54-01116	187.8	DCA	150	7/8/2008
54-01116	187.8	DCE	460	7/8/2008
54-01116	187.8	PCE	51	7/8/2008
54-01116	187.8	Trichloro-1,2,2-trifluoroethane[1,1,2-]	200	7/8/2008
54-01116	187.8	TCA	4700	7/8/2008
54-01116	187.8	TCE	100	7/8/2008
54-01117	20	Cyclohexane	2600	7/8/2008
54-01117	20	DCA	3000	7/8/2008
54-01117	20	DCE	6700	7/8/2008
54-01117	20	PCE	1400	7/8/2008
54-01117	20	Trichloro-1,2,2-trifluoroethane[1,1,2-]	4700	7/8/2008
54-01117	20	TCA	130,000	7/8/2008
54-01117	20	TCE	4200	7/8/2008
54-01117	179.8	Chloroform	5.7	7/8/2008
54-01117	179.8	Cyclohexane	34	7/8/2008
54-01117	179.8	Dichlorodifluoromethane	21	7/8/2008
54-01117	179.8	DCA	90	7/8/2008
54-01117	179.8	DCE	260	7/8/2008
54-01117	179.8	PCE	41	7/8/2008
54-01117	179.8	Trichloro-1,2,2-trifluoroethane[1,1,2-]	82	7/8/2008
54-01117	179.8	TCA	1700	7/8/2008
54-01117	179.8	TCE	62	7/8/2008
54-01117	179.8	Freon-11	15	7/8/2008
54-01121	20	DCA	10,000	7/14/2008
54-01121	20	DCE	31,000	7/14/2008
54-01121	20	PCE	4100	7/14/2008
54-01121	20	Trichloro-1,2,2-trifluoroethane[1,1,2-]	1400	7/14/2008
54-01121	20	TCA	160,000	7/14/2008
54-01121	20	TCE	6200	7/14/2008
54-01121	121	DCA	5800	7/14/2008
54-01121	121	DCE	15,000	7/14/2008
54-01121	121	PCE	4100	7/14/2008
54-01121	121	TCA	120,000	7/14/2008

Table 5.0-1 (continued)

Location ID	Port Depth or Depth Interval (ft bgs)	Analyte	Result (µg/m³)	Collection Date
54-01121	121	TCE	3300	7/14/2008
54-01128	20	Chloroform	340	7/11/2008
54-01128	20	DCA	4900	7/11/2008
54-01128	20	DCE	11,000	7/11/2008
54-01128	20	PCE	3300	7/11/2008
54-01128	20	TCA	130,000	7/11/2008
54-01128	20	TCE	670	7/11/2008
54-01128	39	Chloroform	730	7/11/2008
54-01128	39	DCA	9000	7/11/2008
54-01128	39	DCE	20,000	7/11/2008
54-01128	39	PCE	5400	7/11/2008
54-01128	39	TCA	230,000	7/11/2008
54-01128	39	TCE	1500	7/11/2008
54-02009	37	DCA	6100	7/11/2008
54-02009	37	DCE	14,000	7/11/2008
54-02009	37	PCE	3200	7/11/2008
54-02009	37	TCA	140,000	7/11/2008
54-02009	37	TCE	1300	7/11/2008
54-02009	92	DCA	6400	7/11/2008
54-02009	92	DCE	18,000	7/11/2008
54-02009	92	PCE	3700	7/11/2008
54-02009	92	TCA	170,000	7/11/2008
54-02009	92	TCE	1500	7/11/2008
54-02010	30	Dichlorodifluoromethane	390	7/9/2008
54-02010	30	DCA	1400	7/9/2008
54-02010	30	DCE	1600	7/9/2008
54-02010	30	PCE	780	7/9/2008
54-02010	30	Trichloro-1,2,2-trifluoroethane[1,1,2-]	4300	7/9/2008
54-02010	30	TCA	43,000	7/9/2008
54-02010	30	TCE	1400	7/9/2008
54-02010	30	Freon-11	1700	7/9/2008
54-02010	95	Dichlorodifluoromethane	650	7/9/2008
54-02010	95	DCA	2000	7/9/2008
54-02010	95	DCE	3700	7/9/2008
54-02010	95	PCE	1100	7/9/2008
54-02010	95	Trichloro-1,2,2-trifluoroethane[1,1,2-]	7600	7/9/2008
54-02010	95	TCA	56,000	7/9/2008

Table 5.0-1 (continued)

Location ID	Port Depth or Depth Interval (ft bgs)	Analyte	Result (µg/m³)	Collection Date
54-02010	95	TCE	1200	7/9/2008
54-02010	95	Freon-11	1800	7/9/2008
54-02032	20	DCA	1400	7/10/2008
54-02032	20	DCE	3300	7/10/2008
54-02032	20	PCE	1600	7/10/2008
54-02032	20	Trichloro-1,2,2-trifluoroethane[1,1,2-]	200	7/10/2008
54-02032	20	TCA	22,000	7/10/2008
54-02032	20	TCE	430	7/10/2008
54-02032	156	DCA	3300	7/10/2008
54-02032	156	DCE	10,000	7/10/2008
54-02032	156	PCE	3000	7/10/2008
54-02032	156	Trichloro-1,2,2-trifluoroethane[1,1,2-]	440	7/10/2008
54-02032	156	TCA	43,000	7/10/2008
54-02032	156	TCE	1000	7/10/2008
54-02033	60	Chlorodifluoromethane	46	7/9/2008
54-02033	60	Chloroform	6.7	7/9/2008
54-02033	60	Dichlorodifluoromethane	170	7/9/2008
54-02033	60	DCE	5.6	7/9/2008
54-02033	60	PCE	210	7/9/2008
54-02033	60	Trichloro-1,2,2-trifluoroethane[1,1,2-]	260	7/9/2008
54-02033	60	TCA	190	7/9/2008
54-02033	60	Freon-11	300	7/9/2008
54-22116	172	Carbon Tetrachloride	740	7/31/2008
54-22116	172	DCA	8800	7/31/2008
54-22116	172	DCE	7500	7/31/2008
54-22116	172	PCE	9000	7/31/2008
54-22116	172	TCA	140,000	7/31/2008
54-22116	172	TCE	31,000	7/31/2008
54-22116	190	Carbon Tetrachloride	1300	7/31/2008
54-22116	190	DCA	19,000	7/31/2008
54-22116	190	DCE	14,000	7/31/2008
54-22116	190	PCE	21,000	7/31/2008
54-22116	190	TCA	310,000	7/31/2008
54-22116	190	TCE	78,000	7/31/2008
54-22116	280	DCA	33,000	7/31/2008
54-22116	280	DCE	26,000	7/31/2008
54-22116	280	PCE	36,000	7/31/2008

Table 5.0-1 (continued)

Location ID	Port Depth or Depth Interval (ft bgs)	Analyte	Result (µg/m³)	Collection Date
54-22116	280	TCA	560,000	7/31/2008
54-22116	280	TCE	29,000	7/31/2008
54-24370	35–45	Chlorodifluoromethane	26,000	7/10/2008
54-24370	35–45	Chloroform	720	7/10/2008
54-24370	35–45	Dichlorodifluoromethane	8400	7/10/2008
54-24370	35–45	DCA	12,000	7/10/2008
54-24370	35–45	DCE	6400	7/10/2008
54-24370	35–45	PCE	1800	7/10/2008
54-24370	35–45	Trichloro-1,2,2-trifluoroethane[1,1,2-]	59,000	7/10/2008
54-24370	35–45	TCA	170,000	7/10/2008
54-24370	35–45	TCE	19,000	7/10/2008
54-24370	35–45	Freon-11	15,000	7/10/2008
54-24370	67.5–77.5	DCA	20,000	12/19/2007
54-24370	67.5–77.5	DCE	6000	12/19/2007
54-24370	67.5–77.5	Dichloroethene[cis-1,2-]	750	12/19/2007
54-24370	67.5–77.5	PCE	2500	12/19/2007
54-24370	67.5–77.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	67,000	12/19/2007
54-24370	67.5–77.5	TCA	210,000	12/19/2007
54-24370	67.5–77.5	TCE	34,000	12/19/2007
54-24370	67.5–77.5	Freon-11	16,000	12/19/2007
54-24370	237.5–249.5	Chlorodifluoromethane	44	7/10/2008
54-24370	237.5–249.5	Chloroform	8.5 (J)	7/10/2008
54-24370	237.5–249.5	Dichlorodifluoromethane	630	7/10/2008
54-24370	237.5–249.5	DCA	140	7/10/2008
54-24370	237.5–249.5	DCE	440	7/10/2008
54-24370	237.5–249.5	Dichloroethene[cis-1,2-]	8.7	7/10/2008
54-24370	237.5–249.5	Methylene Chloride	17	7/10/2008
54-24370	237.5–249.5	PCE	82	7/10/2008
54-24370	237.5–249.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	1200	7/10/2008
54-24370	237.5–249.5	TCA	2900	7/10/2008
54-24370	237.5–249.5	TCE	300	7/10/2008
54-24370	237.5–249.5	Freon-11	380	7/10/2008
54-24370	237.5–249.5	Dichlorodifluoromethane	5900	12/19/2007
54-24370	237.5–249.5	DCA	820	12/19/2007
54-24370	237.5–249.5	DCE	2100	12/19/2007
54-24370	237.5–249.5	Dichloroethene[cis-1,2-]	57	12/19/2007
54-24370	237.5–249.5	Methylene Chloride	110	12/19/2007

Table 5.0-1 (continued)

Location ID	Port Depth or Depth Interval (ft bgs)	Analyte	Result (µg/m³)	Collection Date
54-24370	237.5–249.5	PCE	310	12/19/2007
54-24370	237.5–249.5	Toluene	63	12/19/2007
54-24370	237.5–249.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	12,000	12/19/2007
54-24370	237.5–249.5	TCA	19,000	12/19/2007
54-24370	237.5–249.5	TCE	2000	12/19/2007
54-24370	237.5–249.5	Freon-11	3300	12/19/2007
54-24386	37.5–42.5	DCA	42,000	7/14/2008
54-24386	37.5–42.5	DCE	54,000	7/14/2008
54-24386	37.5–42.5	PCE	6900	7/14/2008
54-24386	37.5–42.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	7100	7/14/2008
54-24386	37.5–42.5	TCA	1,000,000	7/14/2008
54-24386	37.5–42.5	TCE	7300	7/14/2008
54-24386	191–201	DCA	3000	7/14/2008
54-24386	191–201	DCE	6600	7/14/2008
54-24386	191–201	PCE	880	7/14/2008
54-24386	191–201	Trichloro-1,2,2-trifluoroethane[1,1,2-]	450	7/14/2008
54-24386	191–201	TCA	45,000	7/14/2008
54-24386	191–201	TCE	910	7/14/2008
54-24394	45–55	Dichlorodifluoromethane	1200	7/9/2008
54-24394	45–55	DCA	2500	7/9/2008
54-24394	45–55	DCE	2000	7/9/2008
54-24394	45–55	PCE	640	7/9/2008
54-24394	45–55	Trichloro-1,2,2-trifluoroethane[1,1,2-]	110,000	7/9/2008
54-24394	45–55	TCA	38,000	7/9/2008
54-24394	45–55	TCE	100,000	7/9/2008
54-24394	45–55	Freon-11	3600	7/9/2008
54-24394	95–105	Chloroform	240	12/19/2007
54-24394	95–105	DCA	2900	12/19/2007
54-24394	95–105	DCE	1300	12/19/2007
54-24394	95–105	PCE	690	12/19/2007
54-24394	95–105	Trichloro-1,2,2-trifluoroethane[1,1,2-]	60,000	12/19/2007
54-24394	95–105	TCA	33,000	12/19/2007
54-24394	95–105	TCE	67,000	12/19/2007
54-24394	95–105	Freon-11	3400	12/19/2007
54-24394	296.5–306.5	Acetone	22	7/9/2008
54-24394	296.5–306.5	Butanone[2-]	6.1	7/9/2008
54-24394	296.5–306.5	Dichlorodifluoromethane	85	7/9/2008

Table 5.0-1 (continued)

Location ID	Port Depth or Depth Interval (ft bgs)	Analyte	Result (µg/m³)	Collection Date
54-24394	296.5–306.5	DCA	37	7/9/2008
54-24394	296.5–306.5	DCE	160	7/9/2008
54-24394	296.5–306.5	PCE	35	7/9/2008
54-24394	296.5–306.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	280	7/9/2008
54-24394	296.5–306.5	TCA	680	7/9/2008
54-24394	296.5–306.5	TCE	170	7/9/2008
54-24394	296.5–306.5	Freon-11	100	7/9/2008
54-24394	296.5–306.5	Acetone	8.6	12/19/2007
54-24394	296.5–306.5	Chloroform	4.7	12/19/2007
54-24394	296.5–306.5	DCA	49	12/19/2007
54-24394	296.5–306.5	DCE	220	12/19/2007
54-24394	296.5–306.5	Methylene Chloride	4	12/19/2007
54-24394	296.5–306.5	PCE	47	12/19/2007
54-24394	296.5–306.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	540	12/19/2007
54-24394	296.5–306.5	TCA	940	12/19/2007
54-24394	296.5–306.5	TCE	320	12/19/2007
54-24394	296.5–306.5	Freon-11	240	12/19/2007
54-24397	45–55	Dichlorodifluoromethane	300	7/14/2008
54-24397	45–55	DCA	120	7/14/2008
54-24397	45–55	DCE	550	7/14/2008
54-24397	45–55	Methylene Chloride	50	7/14/2008
54-24397	45–55	PCE	210	7/14/2008
54-24397	45–55	Trichloro-1,2,2-trifluoroethane[1,1,2-]	3100	7/14/2008
54-24397	45–55	TCA	10,000	7/14/2008
54-24397	45–55	TCE	160	7/14/2008
54-24397	45–55	Freon-11	110	7/14/2008
54-24397	232.5–244	Chloroform	9	7/14/2008
54-24397	232.5–244	Dichlorodifluoromethane	240	7/14/2008
54-24397	232.5–244	DCA	92	7/14/2008
54-24397	232.5–244	DCE	700	7/14/2008
54-24397	232.5–244	PCE	120	7/14/2008
54-24397	232.5–244	Trichloro-1,2,2-trifluoroethane[1,1,2-]	790	7/14/2008
54-24397	232.5–244	TCA	2900	7/14/2008
54-24397	232.5–244	TCE	160	7/14/2008
54-24397	232.5–244	Freon-11	100	7/14/2008
54-25105	485–701	Acetone	100	8/1/2008
54-25105	485–701	Benzene	64	8/1/2008

Table 5.0-1 (continued)

Location ID	Port Depth or Depth Interval (ft bgs)	Analyte	Result (µg/m³)	Collection Date
54-25105	485–701	Butadiene[1,3-]	6.4	8/1/2008
54-25105	485–701	Butanone[2-]	6	8/1/2008
54-25105	485–701	Cyclohexane	15	8/1/2008
54-25105	485–701	Ethylbenzene	23	8/1/2008
54-25105	485–701	Ethyltoluene[4-]	23	8/1/2008
54-25105	485–701	Hexane	49	8/1/2008
54-25105	485–701	n-Heptane	20	8/1/2008
54-25105	485–701	Propylene	28	8/1/2008
54-25105	485–701	Toluene	140	8/1/2008
54-25105	485–701	Trimethylbenzene[1,2,4-]	28	8/1/2008
54-25105	485–701	Trimethylbenzene[1,3,5-]	8.1	8/1/2008
54-25105	485–701	Xylene[1,2-]	30	8/1/2008
54-25105	485–701	Xylene[1,3-]+Xylene[1,4-]	80	8/1/2008
54-27436	40–50	Chloroform	440	7/18/2008
54-27436	40–50	DCA	1100	7/18/2008
54-27436	40–50	DCE	460	7/18/2008
54-27436	40–50	PCE	8100	7/18/2008
54-27436	40–50	Trichloro-1,2,2-trifluoroethane[1,1,2-]	1700	7/18/2008
54-27436	40–50	TCA	14,000	7/18/2008
54-27436	40–50	TCE	100,000	7/18/2008
54-27436	65–75	DCA	1200	12/20/2007
54-27436	65–75	DCE	460	12/20/2007
54-27436	65–75	PCE	6400	12/20/2007
54-27436	65–75	Trichloro-1,2,2-trifluoroethane[1,1,2-]	2000	12/20/2007
54-27436	65–75	TCA	17,000	12/20/2007
54-27436	65–75	TCE	120,000	12/20/2007
54-27436	180–191.5	Chloroform	170	7/18/2008
54-27436	180–191.5	Dichlorodifluoromethane	140	7/18/2008
54-27436	180–191.5	DCA	480	7/18/2008
54-27436	180–191.5	DCE	440	7/18/2008
54-27436	180–191.5	Methylene Chloride	37 (J)	7/18/2008
54-27436	180–191.5	PCE	590	7/18/2008
54-27436	180–191.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	260	7/18/2008
54-27436	180–191.5	TCA	4800	7/18/2008
54-27436	180–191.5	TCE	9300	7/18/2008
54-27436	180–191.5	Freon-11	50	7/18/2008
54-27436	180–191.5	Trimethylbenzene[1,2,4-]	55	7/18/2008
54-27436	180–191.5	Chloroform	260	12/20/2007

Table 5.0-1 (continued)

Location ID	Port Depth or Depth Interval (ft bgs)	Analyte	Result (µg/m^3)	Collection Date
54-27436	180–191.5	DCA	800	12/20/2007
54-27436	180–191.5	DCE	650	12/20/2007
54-27436	180–191.5	Methylene Chloride	84	12/20/2007
54-27436	180–191.5	PCE	940	12/20/2007
54-27436	180–191.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	520	12/20/2007
54-27436	180–191.5	TCA	8500	12/20/2007
54-27436	180–191.5	TCE	18,000	12/20/2007

*Data qualifiers are defined in Table B-1.0-2.

Table 5.0-2
Tritium Detected in Pore-Gas Samples
Collected During Monitoring Activities at MDA G

Location ID	Port Depth or Depth Interval (ft bgs)	Tritium (pCi/L)	Collection Date
54-01107	56.5	584,174	7/29/2008
54-01107	100	67926.9	7/29/2008
54-01110	60	87,453,400	7/25/2008
54-01110	90	20,985,200	7/25/2008
54-01111	20	269,082,000	7/18/2008
54-01111	139	8,520,801	7/18/2008
54-01115	40.8	58048.6	7/23/2008
54-01115	68.9	6949.85 (J)*	7/23/2008
54-01116	20	3,807,850	8/21/2008
54-01116	22.5	3,778,330	7/22/2008
54-01116	22.5	52,488,200	8/20/2008
54-01116	179.8	7007.52	8/21/2008
54-01116	187.8	5178.77 (J)	7/22/2008
54-01116	187.8	3806.86 (J)	8/20/2008
54-01117	20	44,481,800	7/22/2008
54-01117	179.8	52,934	7/22/2008
54-01121	20	353,621	7/17/2008
54-01121	121	13409.4	7/17/2008
54-01128	20	5542.69	7/15/2008
54-01128	39	2,048,680	7/15/2008
54-02009	37	6452.76	7/16/2008
54-02009	92	24570.8	7/16/2008
54-02010	30	8961.13	7/11/2008
54-02010	95	2273.32	7/11/2008
54-02032	20	5287.35	7/14/2008
54-02032	156	754.279	7/14/2008
54-02033	60	470.919	7/8/2008
54-22116	172	396.002	8/4/2008
54-22116	190	9596.04	8/4/2008
54-22116	280	1865.88	8/4/2008
54-24370	35–45	530.927	7/10/2008
54-24370	237.5–249.5	1330.89	7/10/2008
54-24386	37.5–42.5	10,535,100	7/17/2008
54-24386	191–201	83533.9	7/17/2008
54-24394	95–105	108,450 (J-)	12/17/2007

Table 5.0-2 (continued)

Location ID	Port Depth or Depth Interval (ft bgs)	Tritium (pCi/L)	Collection Date
54-24394	296.5–306.5	882.037	7/9/2008
54-24394	296.5–306.5	4976.06 (J-)	12/17/2007
54-24397	45–55	8,480,510	7/18/2008
54-24397	45–55	5,687,860 (J-)	12/17/2007
54-24397	84–95	755,098 (J-)	12/17/2007
54-24397	125–135	973,683 (J-)	12/17/2007
54-24397	160–168	271,824 (J-)	12/17/2007
54-24397	184–192	232,065 (J-)	12/17/2007
54-24397	232.5–244	40294.1	7/18/2008
54-24397	232.5–244	87504.8 (J-)	12/17/2007
54-25105	485–701	1498.26	8/1/2008
54-27436	40–50	28142.7	7/18/2008
54-27436	180–191.5	19474.6 (J)	7/18/2008

*Data qualifiers are defined in Table B-1.0-2.

Table 5.0-3
Screening of VOCs Detected in Pore Gas at MDA G

VOC	Maximum Pore Gas Concentration, (µg/m^3)	Dimensionless Henry's Law Constant (H')	Screening Level (µg/L)	Screen Value Maximum Concentration/ (1000 × H' × SL)
Acetone	100	0.0016	5500[a]	0.011
Benzene	64	0.228	5[b]	0.056
Butadiene[1,3-]	6.4	7.3	0.13	0.0067
Butanone[2-]	6.1	0.0011	7100[a]	0.00078
Carbon disulfide	74	1.2	1000[a]	0.000062
Carbon tetrachloride	1300	1.25	5[b]	0.21
Chlorodifluoromethane	26000	4.1	85,000[a]	0.000075
Chloroform	730	0.15	1.65	2.9
Cyclohexane	32000	8.2	13,000	0.0003
Dichlorodifluoromethane	8400	4.1	390[a]	0.0053
DCA	42000	0.23	25[c]	7.3
DCE	54000	1.1	5[c]	9.82
Dichloroethene[cis-1,2-]	750	0.167	70[b]	0.064
Ethylbenzene	23	0.323	700[b]	0.0001
Ethyltoluene[4-]	23	na[d]	na	na
Hexane	49	5	420[a]	0.000023
Methylene chloride	160	0.09	5[b]	0.36
Heptane[n-]	20	0.0012	na	na
Propylene	28	na	na	na
PCE	36000	0.754	5[b]	9.55
Toluene	140	0.272	750[c]	0.00069
Trichloro-1,2,2-trifluoroethane[1,1,2-]	110000	21.4	59,000[a]	0.000087
TCA	1400000	0.705	60[c]	33.1
TCE	120000	0.422	5[b]	56.87
Freon 11	16000	4	1300[a]	0.0031
Trimethylbenzene[1,2,4-]	55	0.23	12.3[a]	0.019
Trimethylbenzene[1,3,5-]	8.1	0.32	12.3[a]	0.0021
Xylene[1,2-]	30	0.213	10000[b]	0.000014
Xylene[1,3-]+Xylene[1,4-]	80	0.3	620[c]	0.00043

[a] EPA Region 6 tap water screening level.

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

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

[d] na = Not available.

Table 5.0-4
Screening of VOCs Detected in Borehole Location 54-25105 (485 to 700 ft bgs)

Chemical	Detected Pore Gas Concentration (µg/m³)	Dimensionless Henry's Law Constant (H')	Screening Level (µg/L)	Screen Value Detected Concentration/ (1000 × H' × SL)
Acetone	100	0.0016	5500[a]	0.011
Benzene	64	0.228	5[b]	0.056
Butadiene[1,3-]	6.4	7.3	0.13	0.0067
Butanone[2-]	6	0.0011	7100[a]	0.00077
Cyclohexane	15	na[c]	na	na
Ethylbenzene	23	0.323	700[b]	0.0001
Ethyltoluene[4-]	23	na	na	na
Hexane	49	5	420[a]	0.000023
Heptane[n-]	20	0.0012	na	na
Propylene	28	na	na	na
Toluene	140	0.272	750[d]	0.00069
Trimethylbenzene[1,2,4-]	28	0.23	12.3[a]	0.0099
Trimethylbenzene[1,3,5-]	8.1	0.32	12.3[a]	0.0021
Xylene[1,2-]	30	0.213	10000[b]	0.000014
Xylene[1,3-]+Xylene[1,4-]	80	0.3	620[b]	0.00043

[a] EPA Region 6 tap water screening level.

[b] EPA MCL (40 CFR 141.61).

[c] na = Not available.

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

Appendix A

Acronyms and Abbreviations and Metric Conversion Table

A-1.0 ACRONYMS AND ABBREVIATIONS

B&K	Brüel and Kræjer
bgs	below ground surface
CAS	Chemical Abstracts Service
CFR	Code of Federal Regulations (U.S.)
COC	chain of custody
DCA	1,1-dichloroethane
DCE	1,1-dichloroethene
DER	duplicate error ratio
EPA	Environmental Protection Agency (U.S.)
FLUTe	flexible liner underground technology
Freon-11	trichlorofluoromethane
FY	fiscal year
LANL	Los Alamos National Laboratory
LCS	laboratory control sample
MCL	maximum contaminant level
MDA	material disposal area
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
PCE	tetrachloroethene
PID	photoionization detector
ppm	parts per million
QA	quality assurance
QC	quality control
RPD	relative percent difference
RPF	Records Processing Facility
SL	screening level
SOP	standard operating procedure
SV	screening value
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)

Appendix B

Quality Assurance/Quality Control Program

B-1.0 INTRODUCTION

This appendix discusses analytical methods and data quality review of the pore gas data for fiscal year (FY) 2008. Additionally, this appendix summarizes the effects of data quality exceptions on the acceptability of the analytical data as they impact the investigation and site status.

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 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, surrogates, were used to assess laboratory accuracy and bias.

The type and frequency of QC analyses are described in the analytical services contract. Other QC factors, such as sample preservation and holding times, were also assessed. The requirements for sample preservation and holding times are given in the Environmental Programs Directorate Standard Operating Procedure EP-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 on all the data packages (identified by request number). The procedures used for data validation are given in Table B-1.0-1. The focused validation followed the same procedure discussed above and included a more detailed review of the raw data results generated by the analytical laboratory. Copies of the analytical data, laboratory logbooks, and instrument printouts used during focused validation are provided in data packages as part of Appendix C (on CD included with this document).

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 1999, 066649). Data have also been assessed using guidelines established in EPA Method SW-846 (EPA 1997, 057589). As a result of the data validation and assessment efforts, qualifiers have been assigned to the analytical records, if appropriate. Definitions for the data qualifiers used in data validation are given in Table B-1.0-2. Data validators and reviewers made judgments about the industry-accepted QA/QC analytical quality functions.

B-1.1 Maintenance of Chain of Custody

To maintain chain of custody (COC) is to document or demonstrate the possession of an item by only authorized individuals. The COC process, described in EP-ERSS-SOP-5058, 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 COC forms are provided in Appendix C.

B-1.2 Sample Documentation

Establishing sample documentation acceptability, described in EP-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.

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 preservation is mandatory for hazardous site investigations because the integrity of a sample may decrease 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 unacceptable changes in analyte concentrations, is described in EP-ERSS-SOP-5056. Holding times apply under prescribed conditions; deviations from these conditions may affect the sample integrity. Extraction holding time refers to the time between sample collection and sample preparation; analytical holding time refers to the time 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 as well as 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.

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

Radionuclide results reported with values less than the minimum detectable activity are considered to be not detected (U). Each radiochemical result is also compared to 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.

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 that are 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 $\geq$50% to $\leq$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 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

Field blanks are collected and analyzed to establish whether concentrations assigned to an analyte or compound are attributable to contamination of the analytical system or to the presence of the analyte in the samples collected. These samples of analyte-free medium are 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.

B-2.0 LABORATORY ANALYSIS SUMMARY

During FY2008, 44 pore-gas samples, 2 field blank samples, and 11 field duplicate samples were collected at Material Disposal Area (MDA) G. Analysis of pore gas was conducted for volatile organic compounds (VOCs) using EPA Method TO-15 or for tritium using EPA Method 906.0. Tables 2.0-1 and 2.0-2 of this periodic monitoring report show samples were analyzed for VOC and tritium. All QC procedures were followed as required by the analytical services contract. Table B-2.0-1 lists the analytical methods used for VOC and tritium analyses.

Sampling locations, sampling ports, and validated analytical results are given in Appendix C. The data, including the qualified data, are usable for evaluation and interpretive purposes. The entire data set meets the standards set for use in this report.

The analytical methods used for VOCs and tritium are summarized in the following sections. The required estimated quantitation limit (EQL) for each analyte is defined in the analytical services contract.

B-3.0 ORGANIC CHEMICAL ANALYSES

All QC procedures were followed as required by the analytical services contract. No data were rejected.

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 Times

The holding times were met for all samples.

B-3.5 Initial and Continuing Calibration Verification

Initial or continuing calibration differences were greater than the method requirements affecting EPA Method TO-15 analyses of 72 VOC results. Affected records were qualified as being an estimate (J) of their sample-specific quantitation limit or detection limit.

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

Analyte identification criteria were met for all but 12 sample analyses. The mass spectrum that did not meet method specifications and associated records was qualified as not detected (U).

B-3.7 Method Blank

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

B-3.8 Surrogate Recoveries

All surrogate recoveries for VOC analysis were within acceptable limits.

B-3.9 Internal Standard Responses

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

B-3.10 LCS Recoveries

The LCS recoveries were within acceptable limits for all EPA Method TO-15 analytical records.

B-3.11 Laboratory and Field Duplicates

The laboratory duplicate analyses indicate acceptable precision for all VOCs. Six field duplicates were collected for this sampling event.

Field duplicates collected for VOC analysis indicate acceptable precision. During FY2008, the field duplicate precision was less than 35% for VOC analysis conducted on pore-gas samples. The sample results are not qualified based on field duplicate precision.

B-3.12 Field Blanks

The VOC analysis was nondetect in field blank results.

B-4.0 RADIONUCLIDE ANALYSES

No data were rejected.

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 each tritium analysis.

B-4.5 Initial and Continuing Calibration Verification

Initial and continuing calibrations are acceptable for each tritium analysis.

B-4.6 Analyte Identification

Analyte identification criteria were met for each tritium analysis.

B-4.7 Analyte Quantitation

Analyte quantitation criteria were met for each tritium analysis.

B-4.8 Method Blanks

Method blank results for tritium analysis were within acceptable limits for all but four samples. The affected results are considered estimated (J) because tritium was identified in the method blank but was more than 5 times the concentration of the related analyte in the method blank.

B-4.9 LCS Recoveries

The LCS recoveries were within acceptable limits for all analyses.

Eight samples were flagged J- as a result of a missing matrix spike; however, matrix spikes are not required for tritium analysis. Because these samples have good LCS recoveries, the results are good but are flagged as estimated low.

B-4.10 Laboratory and Field Duplicates

Laboratory duplicate analyses indicate acceptable precision. Five field duplicates were collected and all DERs were below 3.

B-5.0 FIELD-MONITORING SUMMARY

Field-monitoring data are less costly to generate than 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 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 at MDA G is conducted using EP-ERSS-SOP-5074, Sampling for Sub-Atmospheric Air. This procedure covers the use of the Brüel and Kræjer (B&K) Type 1302 multigas analyzer and the Landtec GEM-500 photoionization detector (PID).

The B&K is calibrated annually by a certified calibration laboratory. The B&K is adjusted before each day's use to compensate for ambient pressure and temperature. Calibration is confirmed before each day's use by analyzing triplicate readings of ambient air and duplicate readings of known quantities of mixed organic analytes in nitrogen. These calibration verification check analyses confirm analytical stability, confirm the instrument zero point for each analyte is correctly set, and confirm the stored calibration curve remains applicable to current instrument response to the presence of organic analytes. Concentrations of calibration standards analyzed before each day's use are expected be within ±20% of their known values. Additionally, during each sample analysis, a low sample flow condition triggers an alarm on the B&K. The VOC measurement is not completed when the alarm is triggered. Daily calibration verifications conducted before each day's sampling activities were within the ±20% variation requirement four out of five times during first quarter sampling (one time for TCE). TCE was verified outside of the ±20%. During fourth quarter of the sampling activities, the daily calibration verifications conducted before each day's sampling activities were within the ±20% variation requirement 8 out of 13 field calibration checks for all three analytes.

The presence of nontarget organic chemicals bias B&K target analyte results if they have an acoustic response to infrared light that is similar to the target analyte. Trichlorofluoromethane (Freon-11) generates a measurable acoustic signal in response to light with a wavelength of 11.6 µm that is proportional to its concentration. Other VOCs generating an acoustic signal to light at this wavelength include Freon-114 (Chemical Abstracts Service [CAS] 76-14-2; 1,2-dichloro-1,1,2,2-tetrafluoroethane) and Freon-21 (CAS 75-43-4), which is not 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 (CAS 100-42-5); Freon-113 (CAS 76-13-1), which is not reported by EPA Method TO-15; Freon-12 (CAS 75-71-8, dichlorodifluoromethane); ethanol (CAS 64-17-5); and 1,1-dichloroethene (CAS 75-35-4). EPA Method TO-15 analytical results indicate 1,1-dichloroethene and Freon-113 are present in most samples at MDA G at detected concentrations, which would be included in the signal interpreted as PCE. Table B-4.0-1 presents VOCs that interfere with each of the four B&K target analytes.

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

- The B&K with serial number 1692083 was calibrated on May 13, 2008. The zero point was set for 1,1,1-trichloroethane (TCA), TCE, Freon-11, PCE, carbon dioxide (CO_2), and water vapor (H_2O). Span concentrations of TCA at 13.5 parts per million (ppm), TCE at 10.7 ppm, Freon-11 at 106 ppm, PCE at 31.5 ppm, and CO_2 at 1250 ppm were used to generate the calibration response curves.

- The B&K with serial number 1732805 was calibrated on May 13, 2008. The zero point was set for TCA, TCE, Freon-11, PCE, CO_2, and H_2O. Span concentrations of TCA at 13.1 ppm, TCE at 10.7 ppm, Freon-11 at 106 ppm, PCE at 31.5 ppm, and CO_2 at 1250 ppm were used to generate calibration response curves.

The Landtec GEM 500 PID is calibrated annually 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 give correct readings provided no other hydrocarbon gasses are present within the sample (e.g., ethane, propane, butane, etc.). 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 on the concentration of CH_4 in the sample and the concentration of the other hydrocarbons. The effect of other hydrocarbons is nonlinear and is 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 is not affected by CO_2, hydrogen sulfide, nitrate, sulfide, or hydrogen.

Calibration is confirmed before each day's use by analyzing multiple readings of ambient air. Zero readings of CH_4 and CO_2 are expected. Oxygen is expected to read 20.9%, and O_2 readings within ± 25% of 20.9% are considered acceptable.

Analytical data generated using the Landtec GEM-500 PID are supported by annual calibration records that bracket the periods of analyses. Calibration is performed by Geotech's Colorado Service Center in Denver, CO. Calibration information is reported below for the four Landtec PIDs used to generate results presented in this periodic monitoring report.

- Unit 279 was calibrated on June, 3, 2008. The zero point was set for CH_4, CO_2, and O_2. Calibration was performed so 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 600 cc per min.
- Unit 1138 was calibrated on December 7, 2007. The zero point was set for CH_4, CO_2, and O_2. Calibration was performed so 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 525 cc/min.
- Unit 1062 was calibrated on December 6, 2007. The zero point was set for CH_4, CO_2, and O_2. Calibration was performed so 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 500 cc/min.
- Unit 915 was calibrated on October 3, 2007. The zero point was set for CH_4, CO_2, and O_2. Calibration was performed so 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 500 cc/min.

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 number. This information is also included in text citations. ER ID numbers 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; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; 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), 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," EPA 540/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)

LANL (Los Alamos National Laboratory), December 2000. "University of California, Los Alamos National Laboratory (LANL), I8980SOW0-8S, Statement of Work for Analytical Laboratories," Rev. 1, Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2000, 071233)

Table B-1.0-1
Data Analysis and Assessment Procedures

Procedure	Title	Effective Date
SOP-5161, Rev. 0	Routine Validation of Volatile Organic 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-1.0-2
Definition of Data Qualifiers Used in Data Validation

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 QA/QC parameters.

Table B-2.0-1
Analytical Methods Used

Analytical Method	Analytical Description	Target Compound List
EPA Method TO-15	VOCs in air	See analytical services statement of work (LANL 2000, 071233)
EPA Method 906.0	Tritium	See analytical services statement of work (LANL 2000, 071233)

Table B-4.0-1
B&K Target Analytes
and Potential Interfering Analytes

Target	Potential Interfering Analyte
PCE	Styrene
PCE	Freon-113
PCE	Freon-12
PCE	1,1-Dichloroethene
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
Freon-11	Phosgene

Table B-4.0-1 (continued)

Target	Potential Interfering Analyte
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	Freon 152
TCE	Diethyl ketone
TCE	Dinitrogendifluoride
TCE	2-Pentanone
TCE	2-Propanol
TCE	Sulfur hexafluoride
TCE	Vinyl chloride

Appendix C

Analytical Results, Data Packages and Chain-of-Custody Forms
(on CD included with this document)