Los Alamos
NATIONAL LABORATORY
EST. 1943
Environmental Programs
P.O. Box 1663, MS M991
Los Alamos, New Mexico 87545
(505) 606-2337/FAX (505) 665-1812

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NMED Hazardous
Waste Bureau

National Nuclear Security Administration
Los Alamos Site Office, MS A316
Environmental Restoration Program
Los Alamos, New Mexico 87544
(505) 667-4255/FAX (505) 606-2132

Date: February 14, 2009
Refer To: EP2009-0077

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 T, Consolidated Unit 21-016(a)-99, Technical Area 21

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 (MDA) T, Consolidated Unit 21-016(a)-99, Technical Area 21.

As stated in the Phase II Investigation Work Plan, dated February 15, 2007, the original rationale for the proposed vapor monitoring was to provide initial data on the distribution of vapor-phase contaminants within the subsurface. LANL's moving of boreholes 21-25262 and 21-25263 outside the fence for administrative purposes did not alter the ability of those boreholes to perform this function. As described in the TA-21 Subsurface Vapor Moisture Monitoring Plan for Tritium dated July 16, 2008 and our letter to you dated December 5, 2008, we are in the process of drilling and installing a deep well to define the extent of contaminants at MDA T and support the corrective measures evaluation process.

If you have any questions, please contact Bruce Wedgeworth at (505) 231-0108 (brucew@lanl.gov) or George Henckel at (505) 606-0960 (ghenckel@doeal.gov).

Sincerely,

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

Sincerely,

Nancy Werdel

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

MG/DG/AC/BW:sm

Enclosures: 1) Two hard copies with electronic files - Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area T, Consolidated Unit 21-016(a)-99, Technical Area 21 (LA-UR-09-0791)

Cy: (w/enc.)
George Henckel, DOE-LASO, MS A316
Bruce Wedgeworth, EP-TA-21, MS C349
RPF, MS M707 (with two CDs)
Public Reading Room, MS M992

Cy: (Letter and CD only)
Laurie King, EPA Region 6, Dallas, TX
Steve Yanicak, NMED-OB, White Rock, NM
Kevin Reid, TerranearPMC, Los Alamos, NM
Kristine Smeltz, WES-DO, MS M992
EP-TA-21 File, MS C349

Cy: (w/o enc.)
Tom Skibitski, NMED-OB, Santa Fe, NM
Keyana DeAguero, DOE-LASO (date-stamped letter emailed)
Allan Chaloupka, EP-TA-21, MS C349
Michael J. Graham, ADEP, MS M991
Alison M. Dorries, WES-DO, MS M992
IRM-RMMSO, MS A150 (date-stamped letter emailed)

LA-UR-09-0791
February 2009
EP2009-0077

Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area T, Consolidated Unit 21-016(a)-99, Technical Area 21, Fiscal Year 2008

Los Alamos
NATIONAL LABORATORY
EST. 1943

Prepared by the Environmental Programs Directorate

LA-UR-09-0791
EP2009-0077

Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area T, Consolidated Unit 21-016(a)-99, Technical Area 21, Fiscal Year 2008

February 2009

Responsible project leader:

Bruce Wedgeworth		Project Leader	Environmental Programs	2/11/09
Printed Name	Signature	Title	Organization	Date

Responsible LANS representative:

Michael J. Graham		Associate Director	Environmental Programs	2/12/09
Printed Name	Signature	Title	Organization	Date

Responsible DOE representative:

David R. Gregory	Nancy Weidel	Project Director	DOE-LASO	2/13/09
Printed Name	Signature	Title	Organization	Date

EXECUTIVE SUMMARY

This periodic monitoring report summarizes the results of the quarterly pore-gas monitoring activities conducted at Material Disposal Area (MDA) T, Consolidated Unit 21-016(a)-99, within Technical Area 21 at Los Alamos National Laboratory (the Laboratory) during 2007–2008. The objectives of the pore-gas monitoring activities were to (1) confirm previously detected volatile organic compound (VOC) concentrations and tritium activities beneath MDA T and (2) collect additional vapor samples from the total depths of previously sampled boreholes at MDA T.

Three vapor-monitoring wells were sampled (21-603058, 21-603059, and 21-25264) for four quarters from October 2007 to September 2008. Two of these wells (21-603058 and 21-603059) were drilled just outside the MDA T nuclear facility boundary, approximately 35–40 ft away from borehole locations 21-25263 and 21-25262. Location 21-25264 is also located just outside the MDA T nuclear facility boundary, approximately 225 ft southeast of borehole 21-603058. The three vapor-monitoring wells were completed in October 2007 and four quarters of monitoring have been completed to date. Pore-gas data collected from these three wells are presented and evaluated in this report.

Based on the 2007–2008 quarterly monitoring activities at MDA T, a total of 36 VOCs plus tritium were detected in MDA T pore gas. Throughout the 2007–2008 monitoring period, methylene chloride, chloroform, carbon tetrachloride, and trichloroethene pore-gas concentrations were observed to increase with depth in wells 21-603058, 21-603059, and 21-25264. All other VOC concentrations either decreased with depth or remained consistently low. Tritium activities also decreased with depth or remained consistently low throughout the well column during the 2007–2008 monitoring period.

Based the 2007–2008 data at MDA T, the Laboratory is in the process of drilling and installing a deep well to define nature and extent of contaminants (hazardous and radioactive) at MDA T, which will support the corrective measures evaluation process.

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Acronyms and Abbreviations

%R	percent recovery
%RSD	percent relative standard deviation
AOC	area of concern
bgs	below ground surface
CCV	continuing calibration verification
COC	chain of custody
COPC	chemical of potential concern
DER	duplicate error ratio
DP	Delta Prime
EPA	Environmental Protection Agency (U.S.)
EQL	estimated quantitation limit
FB	field blank
FD	field duplicate
H′	Henry’s law constant
ICV	initial calibration verification
LANL	Los Alamos National Laboratory
LCS	laboratory control sample
MCL	maximum contaminant level
MDA	material disposal area
MDC	minimum detectable concentration
MS	matrix spike
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
PB	preparation blank
PCE	tetrachloroethene
QA	quality assurance
QC	quality control
RCL	regional screening level (EPA)
RFI	Resource Conservation and Recovery Act facility investigation
SCL	sample collection log
SL	screening level
SOW	statement of work
SWMU	solid waste management unit

TA	technical area
TCE	trichloroethene
TD	total depth
VOC	volatile organic compound

1.0 INTRODUCTION

This report presents the results of pore-gas monitoring activities conducted during 2007–2008 at Material Disposal Area (MDA) T, Consolidated Unit 21-016(a)-99, in Technical Area 21 (TA-21) at Los Alamos National Laboratory (LANL or the Laboratory). The objectives of the MDA T pore-gas monitoring activities were to (1) confirm previously detected volatile organic compounds (VOCs) concentrations and tritium activities beneath MDA T and (2) collect additional vapor samples from the total depths (TDs) of previously sampled boreholes at MDA T. In addition, this report also presents the results of the VOC vapor-phase partitioning to water screening analysis. This analysis was conducted for 2007–2008 VOC results to evaluate the potential for contamination of groundwater by VOCs in pore gas using groundwater cleanup levels provided in the March 1, 2005, Compliance Order on Consent (the Consent Order).

Between October 2007 and September 2008, four rounds of pore-gas sampling were completed at MDA T well locations 21-25264, 21-603058, and 21-603059. All pore-gas samples collected were submitted for off-site analysis of VOCs and tritium. First quarter analytical results (October 2007) were originally presented and evaluated in the MDA T Phase II investigation report (LANL 2008, 102182) but are represented in this report for completeness.

Completion of the pore-gas sampling activities fulfills the requirements outlined in the New Mexico Environment Department (NMED) MDA T Phase II investigation work plan approval with modifications letter, the MDA T vapor-monitoring plan, and the NMED MDA T vapor-monitoring plan approval with modifications letter, and all approved deviations (Goering 2007, 098861; LANL 2007, 098944; NMED 2007, 098946). Deviations from the MDA T vapor-monitoring plan and associated NMED correspondence are summarized in the MDA T Phase II investigation report and in section 4.2 of this report (LANL 2008, 102182; NMED 2008, 103430). Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to the NMED in accordance with U.S. Department of Energy policy.

1.1 Site Location and Description

MDA T is located within TA-21 on Delta Prime (DP) Mesa (Figure 1.1-1) and contains the following nuclear environmental site features: (1) four absorption beds (subsurface), (2) multiple buried shafts (subsurface), and (3) a former retrievable waste storage area (subsurface) (Figure 1.1-2). Current vegetation at MDA T includes grasses, chamisa bushes, and two young ponderosa pines. The top of the regional aquifer occurs approximately 1300 ft below MDA T, based on water-level information from regional well R-6 (Kleinfelder 2005, 091693). Refer to the MDA T investigation report (LANL 2006, 094151) for further details regarding MDA T features, operations, and historical investigation activities.

2.0 SCOPE OF ACTIVITIES

As directed by the approved MDA T vapor-monitoring plan (LANL 2007, 098944; NMED 2007, 098946), four rounds of pore-gas field-screening and sampling activities have been completed to date at MDA T. Monitoring was completed at well locations 21-603058, 21-603059, and 21-25264 in October 2007 (round 1); February 2008 (round 2); May 2008 (round 3); and September 2008 (round 4) (Figure 1.1-2). For each sampling round, pore-gas characterization samples were collected at each well from five separate sample ports installed at the following intervals: (1) borehole TD (sampling port 5), (2) base elevation of the nearby disposal unit (69–81 ft) (sampling port 1), and (3) depths correlated to the 2005–2006 sample port depths at locations 21-25262 and 21-25263 (sampling ports 2–4); field duplicate samples were collected at either sample port 1 or 5.

All samples were collected in accordance with the current version of the Environment and Remediation Support Services Standard Operating Procedure (SOP) 06.31, Sampling Sub-Atmospheric Air, and submitted to off-site analytical laboratories for the analysis of VOC using U.S. Environmental Protection Agency Method (EPA) TO-15 and for tritium analysis using EPA Method 906.0. Further discussion of the field methods used for pore-gas field screening and sample collection is presented in Appendix A. Evaluation of the analytical results from the 2007–2008 samples is presented in section 5 of this report.

3.0 REGULATORY CRITERIA

The Consent Order does not identify any cleanup standards, risk-based screening levels, risk-based cleanup goals, or other regulatory criteria for pore gas at MDA T. Therefore, an analysis was conducted to evaluate the potential for contamination of groundwater by VOCs in pore gas using groundwater cleanup levels provided in the Consent Order. The analysis evaluated the water concentration that would be in equilibrium with the maximum concentrations of VOCs detected at MDA T during the last four quarters of monitoring.

If the predicted groundwater concentration of a particular VOC in equilibrium with pore gas is less than the groundwater cleanup level, groundwater cleanup levels would not be exceeded. The results of the screening-level analysis for MDA T is presented in the subsection below.

3.1 VOC Vapor-Phase Partitioning to Water

VOC results obtained from MDA T pore-gas samples were screened to evaluate whether vapor-phase contamination beneath MDA T would exceed screening levels based on equilibrium partitioning with groundwater cleanup levels. The screening evaluation is based on groundwater cleanup levels contained in the Consent Order and on Henry's law constants (H′). If available, NMED's soil-screening level technical background document (2006, 092513) was the primary source for obtaining Henry's law constants for the MDA T evaluation. If Henry's law constants were not available through NMED, they were obtained from EPA's Superfund preliminary remediation goals website (http://www.epa.gov/region09/superfund/prg/). If a Henry's law constant was not available from either of these two sources, the Pennsylvania Department of Environmental Protection chemical and physical properties database (http://www.dep.state.pa.us/physicalproperties/Default.htm) was used to search additional Internet sources for an applicable value.

For each MDA T monitoring well (21-603058, 21-603059, and 21-25264), the maximum concentration reported for each VOC detected was compared with a pore-gas screening level based on the applicable groundwater cleanup level. All VOCs detected in pore gas that have available groundwater screening levels and Henry's law constants were screened in the evaluation.

Screening results for the 2007–2008 quarterly sampling (as presented in Tables 3.1-1, 3.1-2, and 3.1-3) indicate that 22 detected concentrations of methylene chloride exceeded the pore-gas screening level. A screening level could not be calculated for ethanol, ethyltoluene[4-], hexanone[2-], propanol[2-], or propylene because groundwater screening levels were not available for these chemicals. Although, there is also not a groundwater screening level available for n-heptane, the groundwater screening level for n-hexane was used as a surrogate based on structural similarity.

The maximum concentrations of methylene chloride in pore gas were 2000 $\mu g/m^3$ (well 21-603058), 920 $\mu g/m^3$ (well 21-603059), and 2500 $\mu g/m^3$ (well 21-25264). These maximum concentrations occurred in samples collected at the bottom depths (approximately 350–370 ft below ground surface [bgs]) in all three wells; the bottom depths are approximately 800 ft above the regional groundwater table. Seven samples (860 µg/m^3 to 2000 µg/m^3) exceeded the pore-gas screening level in well 21-603058, 4 samples (680 µg/m^3 to 920 µg/m^3) exceeded the pore-gas screening level in well 21-603059, and 11 samples (590 µg/m^3 to 2500 µg/m^3) exceeded the pore-gas screening level in well 21-25264.

The closest regional and perched aquifer monitoring wells to MDA T are the regional well R-6 and the intermediate well R-6i. These wells are located downgradient of MDA T, approximately 1 mi east on the south rim of DP Canyon. The regional aquifer (within R-6) is approximately 1158 ft bgs and occurs in a fanglomerate unit; the intermediate perched water (within R-6i) is approximately 600 ft bgs and occurs in the Puye Formation.

4.0 MONITORING RESULTS

During the 2007–2008 MDA T pore-gas monitoring activities, a total of 74 pore-gas samples (58 characterization and 16 quality assurance/quality control [QA/QC]) were collected for VOC analysis, and 68 samples (58 characterization and 10 QA/QC) were collected for tritium analysis. A summary of all 2007–2008 pore-gas sampling depths and sample collection dates by well location is presented in Table 4.0-1. A summary of all 2007–2008 samples collected at MDA T monitoring wells 21-603058, 21-603059, and 21-25264, and their respective analyses is presented in Table 4.0-2. Field chain-of-custody forms and sample collection logs are provided in Appendix B. No investigation-derived waste was generated during execution of pore-gas monitoring activities at MDA T.

Evaluation of the 2007–2008 pore-gas analytical results is presented in section 5 of this report. The 2007–2008 pore-gas field-screening results and any deviations to the scope of activities as presented in the approved MDA T vapor-monitoring plan and associated NMED correspondence (LANL 2007, 098944; NMED 2007, 098946; NMED 2007, 095411; NMED 2008, 103430) are presented in the subsections below.

4.1 Field-Screening Results

Before each sampling event, field screening was performed in each well and targeted sampling interval to ensure percent carbon dioxide (%CO_2) and oxygen (%O_2) levels at each sample port had stabilized at values representative of subsurface pore-gas conditions. Table 4.1-1 presents a summary of all field-screening results collected during the four sample events at MDA T monitoring wells 21-603058, 21-603059, and 21-25264 by sample port and sampling round.

4.2 Deviations

Several deviations from the original scope of activities outlined in the approved MDA T vapor-monitoring plan and associated NMED correspondence occurred during the implementation of the 2007–2008 monitoring program at MDA T (LANL 2007, 098944; NMED 2007, 095411; NMED 2007, 098946; NMED 2008, 103430). Deviations included changes in the (1) proposed sampling locations, (2) sample depths, and (3) number of samples collected.

Based on 2005–2006 pore-gas results, NMED requested continued collection of pore-gas samples from open borehole locations 21-26262, 21-25263, and 21-25264 for four quarters to assess the potential impact the absorption bed complex has on subsurface vapor contamination beneath MDA T (NMED 2007, 095411). Two of these open boreholes (locations 21-26262 and 21-25263) are located within the nuclear facility boundary (Figure 1.1-2). Because of time constraints imposed by drilling inside the nuclear facility boundary, the Laboratory sought and received approval from NMED to move two of the requested pore-gas monitoring locations (21-26262 and 21-25263) (Goering 2007, 098861). As a result, borehole locations 21-603058 and 21-603059 were drilled adjacent to borehole locations 21-26262 and 21-25263 but immediately outside the nuclear facility boundary, developed as permanent vapor-monitoring wells, and sampled for four quarters. The analytical results obtained from these wells effectively replace any additional data originally requested by NMED for borehole locations 21-26262 and 21-25263.

Pore-gas sampling port #2, installed at depth 112.5–117.5 ft bgs in monitoring well 21-603059, did not produce pore-gas vapor upon installation. Therefore, no analytical data could be collected at this depth during any sampling round. Because the Tshirege Member of the Bandelier Tuff is known for its high degree of welding variability in individual units, this failure is most likely caused by massive welded tuff localized at that depth interval, which does not allow for the extraction of subsurface vapor.

Pore-gas sampling port #2, installed at depth 160.5–165.5 ft bgs in monitoring well 21-603058, stopped producing pore-gas vapor after two quarters of monitoring had been completed. Therefore, no analytical data could be collected at this depth during the last two sampling rounds. It is possible that the failure of monitoring well 21-603058 port #2 is mechanical; however, several attempts have been made to physically clear the tubing (by vacuum and pressure surging) of any potential obstructions with no success. Another possibility is that the presence of massive welded tuff also occurs at the depth interval where monitoring well 21-603058 port #2 was installed, thus preventing extraction of subsurface vapor from the unit. Samples were successfully collected during the first two rounds from this port possibly because the bentonite seal for the port #2 sand interval may not have fully hydrated at the time of installation and only fully sealed at some time after completion of the second round of monitoring.

5.0 ANALYTICAL DATA RESULTS

Analytical results for VOCs in pore gas were produced from laboratory analyses of vapor collected in SUMMA canisters and analyzed for VOCs using EPA Method TO-15. Analytical results for tritium were produced from laboratory analysis of moisture extracted from silica gel columns and analyzed for tritium using EPA Method 906.0. All analytical data were subject to extensive QA, QC, and data validation reviews in accordance with Laboratory guidance and procedures (LANL 1996, 054609; LANL 2000, 071233). The QA/QC and data validation review for the 2007–2008 MDA T pore-gas data are presented in Appendix C. All validated analytical results from the 2007–2008 pore-gas sampling are presented on CD in Appendix B. A discussion of the 2007–2008 pore-gas analytical results is presented in the subsections below.

5.1 VOC Pore-Gas Results

Results of the 2007–2008 pore-gas sampling are summarized in Table 5.1-1. Pore-gas vertical trend plots for VOC results from samples collected during rounds 1–4 are presented, in order of collection date, in Figures 5.1-1 through 5.1-12.

As illustrated by Figures 5.1-1 through 5.1-12, the 2007–2008 MDA T pore-gas VOC concentrations show the following general trends.

- Chloroform, carbon tetrachloride, methylene chloride, and trichloroethene (TCE) concentrations generally increased with depth.
- Tetrachloroethene (PCE) concentrations decreased with depth.
- Propylene concentrations increased at intermediate depths and decreased to TD in wells 21-603058 and 21-603059. In well 21-25264, propylene concentrations showed no change in concentration with depth.

- Acetone, benzene, bromodichloromethane, bromoform, butanol[1-], butanone[2-], carbon disulfide, chlorodibromomethane, cyclohexane, dichlorobenzene[1,4-], dichlorodifluoromethane, dichloroethane[1,2-], dichloroethene[1,1-], dichloroethene[cis-1,2-], ethanol, ethylbenzene, ethyltoluene[4-], hexane, hexanone[2-], heptane[n-], methyl-2-pentanone[4-], propanol[2-], tetrahydrofuran, toluene, trichloro-1,2,2-trifluoroethane[1,1,2-], trichloroethane[1,1,1-], trichloroethane[1,1,2-], trimethylbenzene[1,3,5-], xylene[1,2-], and xylene[1,3-]+xylene[1,4-] showed no indicative trends. These VOCs were either detected at low concentrations (concentrations at or near the estimated quantitation limit [EQL]) and showed little to no change in concentrations with depth or were anomalous in their detections throughout the sampling column and/or sampling rounds.

Methylene chloride showed an increase in concentrations with depth in all three monitoring wells throughout the monitoring period as illustrated by Figure 5.1-13. Methylene chloride concentrations ranged from (well top to TD) 5 µg/m^3 to 2000 µg/m^3 (~350 ft bgs) in well 21-603058; 3 µg/m^3 to 920 µg/m^3 (~380 ft bgs) in well 21-603059; and 19 µg/m^3 to 2500 µg/m^3 (~350 ft bgs) in well 21-25264. Only the first quarter sampling results from well 21-603058 showed a partial decrease in methylene chloride concentrations: from 250 ft bgs to TD (~350 ft bgs). In the 2005–2006 tuff samples collected at TD from borehole locations 21-25263 (adjacent to well 21-603058) and 21-25264, methylene chloride was detected at low concentrations (range: 2.5 µg/kg at ~215 ft bgs to 2.7 µg/kg at ~340 ft bgs in borehole location 21-25263, and 2.8 µg/kg at ~325 ft bgs to 3.7 µg/kg at ~350 ft bgs in borehole location 21-25264) but was not detected in tuff at shallower depths (LANL 2008, 102182). Methylene chloride was not detected in any of the 2005–2006 tuff samples collected from borehole location 21-25262 (adjacent to well 21-603059).

Chloroform and carbon tetrachloride concentrations also showed a general increase with depth in well 21-25264 throughout the monitoring period as illustrated by Figures 5.1-14 and 5.1-15. For both chemicals, maximum reported concentrations for the monitoring period (1100 µg/m^3 for chloroform and 500 µg/m^3 for carbon tetrachloride) occurred in round 4 in samples collected at TD (350 ft bgs).

In wells 21-603058 and 21-603059, however, chloroform and carbon tetrachloride concentrations showed an overall decrease with depth. In well 21-603058, chloroform and carbon tetrachloride concentrations generally decreased from 250 ft bgs to TD (350 ft bgs) in rounds 1–3 but increased in round 4. In well 21-603059, carbon tetrachloride concentrations showed a decrease from 250 ft bgs to TD (380 ft bgs) in all sampling rounds. Chloroform concentrations in well 21-603059 decreased from 300 ft bgs to TD in rounds 1 and 4 but increased in rounds 2 and 3.

TCE concentrations in all three wells also showed similar trends with depth as chloroform and carbon tetrachloride; however, the concentrations are much more inconsistent (Figure 5.1-16). In wells 21-25264 and 21-603059, TCE concentrations increased only slightly with depth throughout the monitoring period, with TD concentrations only slightly higher than concentrations reported at top depth. TCE concentrations at the intermediate depths, however, are highly variable. In well 21-603058, TCE concentrations showed a general increase with depth to ~250 ft bgs followed by a general decrease to TD.

PCE is the only VOC that shows an overall decrease in concentrations with depth in all three wells throughout the monitoring period as illustrated by Figure 5.1-17. PCE concentrations ranged from (well top to TD) 650 to 60 µg/m^3 in well 21-603058, 1700 µg/m^3 to nondetect in well 21-603059, and 2700 to 31 µg/m^3 in well 21-25264.

5.2 Pore-Gas Tritium Results

Results of the 2007–2008 pore-gas sampling for tritium are summarized in Table 5.2-1 and presented in Figure 5.2-1.

Pore-gas tritium activities were substantially higher in the 2007–2008 samples collected from well 21-25264 than in the 2007–2008 samples collected from wells 21-603058 and 21-603059. The maximum tritium activity in samples from well 21-25264 (128,043 pCi/L) was from a sample collected at 150 ft bgs in May 2008. For all four sampling rounds, tritium activities from samples in well 21-25264 showed an increase to maximum values at approximately 150 ft bgs followed by a decrease to TD (Figure 5.2-1). During the 2005–2006 investigation, maximum tritium activities were reported in tuff samples collected at/near 150 ft bgs in Qbt 2. Neutron probe results obtained during the 2005–2006 investigation do not show a significant increase in moisture/porosity at this depth and there was no apparent positive correlation between soil moisture content and elevated tritium activities (LANL 2006, 094151, p. 54).

The maximum tritium activity detected in samples from well 21-603058 (16,975 pCi/L) was from a sample collected at 225 ft bgs during round 3. The activities of samples collected during the other sampling rounds were below 1100 pCi/L (Figure 5.2-1). The maximum tritium activity (at 225 ft bgs) was detected in a sample extracted from Qbt 1v (just above the Qbt 1v/Qbt 1g contact). Like for well 21-25264, maximum tritium activities observed during the 2005–2006 investigation were also reported in tuff samples collected at/near 225 ft bgs from borehole 21-25263. However, unlike well 21-25264, 2005–2006 neutron probe results showed an increase in moisture at this depth (just above the Qbt 1v/Qbt 1g contact) (LANL 2006, 094151, p. 53). Historically, the Qbt 1v/Qbt 1g contact has reported the most consistent and highest porosity values and increasing soil moisture content of all the lithologic intervals investigated at MDA T (LANL 2006, 094151).

Tritium pore-gas trends observed in well 21-603059 were similar to well 21-603058; however, the maximum tritium activity detected in samples from well 21-603059 (4278 pCi/L) was from a sample collected at TD (370 ft bgs) during round 3 (Figure 5.2-1). The activities of samples collected during the other sampling rounds were below 2100 pCi/L. The maximum tritium activity (at 370 ft bgs) in well 21-603058 correlates to the Cerro Toledo interval (Qct). As with well 21-603058, the maximum tritium activities reported in tuff samples collected during the 2005–2006 investigation were in samples collected in the Cerro Toledo at approximately 370 ft from borehole 21-25262 (LANL 2006, 094151).

6.0 SUMMARY

The objectives of the MDA T pore-gas monitoring activities were to (1) confirm previously detected VOC concentrations and tritium activities beneath MDA T and (2) collect additional vapor samples from the TDs of previously sampled boreholes at MDA T. Three wells were sampled (21-603058, 21-603059, and 21-25264) for four quarters in October 2007 (round 1), February 2008 (round 2), May 2008 (round 3), and September 2008 (round 4). Wells 21-603058 and 21-603059 were drilled just outside the nuclear facility boundary, approximately 35–40 ft away from borehole locations 21-25263 and 21-25262, respectively. Well 21-25264 is also located just outside the MDA T nuclear facility boundary, approximately 225 ft southeast of borehole 21-603058.

Results of the 2007–2008 monitoring activities identified a total of 37 chemicals of potential concern (36 VOCs plus tritium) in the pore gas beneath MDA T (Tables 5.1-1 and 5.2-1). Concentrations for 32 of the 36 VOCs detected in MDA T pore gas either decreased with depth, were consistently detected at or near the EQL, or their detections were anomalous throughout the sample column/rounds.

The four VOCs concentrations in MDA T pore gas—methylene chloride, chloroform, carbon tetrachloride, and TCE—generally increased with depth in wells 21-603058, 21-603059, and 21-25264. Methylene chloride showed an increase in concentrations to TD in all three wells. The concentrations for chloroform, carbon tetrachloride, and TCE are not as consistent as those for methylene chloride and were highly variable at intermediate depths; however concentrations were generally higher at TD than top depth.

Pore-gas tritium activities were substantially higher in samples collected from well 21-25264 than in samples collected from wells 21-603058 and 21-603059. Results of samples collected from well 21-25264 showed an increase to maximum values at approximately 150 ft bgs followed by a decrease to TD in all four sampling rounds. The maximum tritium activity detected in samples from well 21-603058 was from a sample collected at 225 ft bgs during round 2. The activities of samples collected during rounds 1, 3, and 4 were substantially lower. The maximum tritium activity detected in samples from well 21-603059 was from a sample collected at TD (~370 ft bgs) during round 3. Tritium activities in pore-gas samples collected during rounds 1, 2, and 4 were substantially lower. For all wells, the pore-gas tritium activities showed similar trends to tritium activities observed in tuff samples collected from borehole locations 21-25262, 21-25263, and 21-25264 during the 2005–2006 investigation.

VOCs in pore gas were also screened against screening levels, based on equilibrium partitioning of vapor with groundwater cleanup levels, to evaluate whether they could potentially contaminate groundwater. Methylene chloride was the only VOC detected at MDA T that exceeded the calculated pore-gas screening level.

Results of the 2007–2008 monitoring activities at MDA T indicate that VOC and tritium concentrations at wells 21-603058, 21-603059, and 21-25264 should continue to be monitored for an additional two quarters to assess whether chemical trends illustrate additional changes over a longer monitoring period. In addition, because of the general increasing trends observed at TD for several VOC pore-gas constituents (methylene chloride, chloroform, carbon tetrachloride, and TCE), the Laboratory proposes that a deeper pore-gas monitoring well be installed at MDA T to ascertain the extent of these constituents beneath MDA T. The Laboratory is in the process of drilling and installing a deep well to define nature and extent of contaminants (hazardous and radioactive) at MDA T, which will support the corrective measures evaluation process.

7.0 REFERENCES AND MAP DATA SOURCES

7.1 References

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

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

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NMED (New Mexico Environment Department), October 31, 2007. “Approval with Modifications, Subsurface Vapor-Monitoring Plan for MDA T,” New Mexico Environment Department letter to D. Gregory (DOE LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED HWB), Santa Fe, New Mexico. (NMED 2007, 098946)

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7.2 Map Data Sources

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

Legend Item	Data Source
Disposal pit/impoundment	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 15 October 2008.
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 15 October 2008.
Structure	Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 October 2008.
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 15 October 2008.
Vapor monitoring well	Point Feature Locations of the Environmental Restoration Project Database; Los Alamos National Laboratory, Waste and Environmental Services Division; ER2008-0109; as published 9 October 2008.

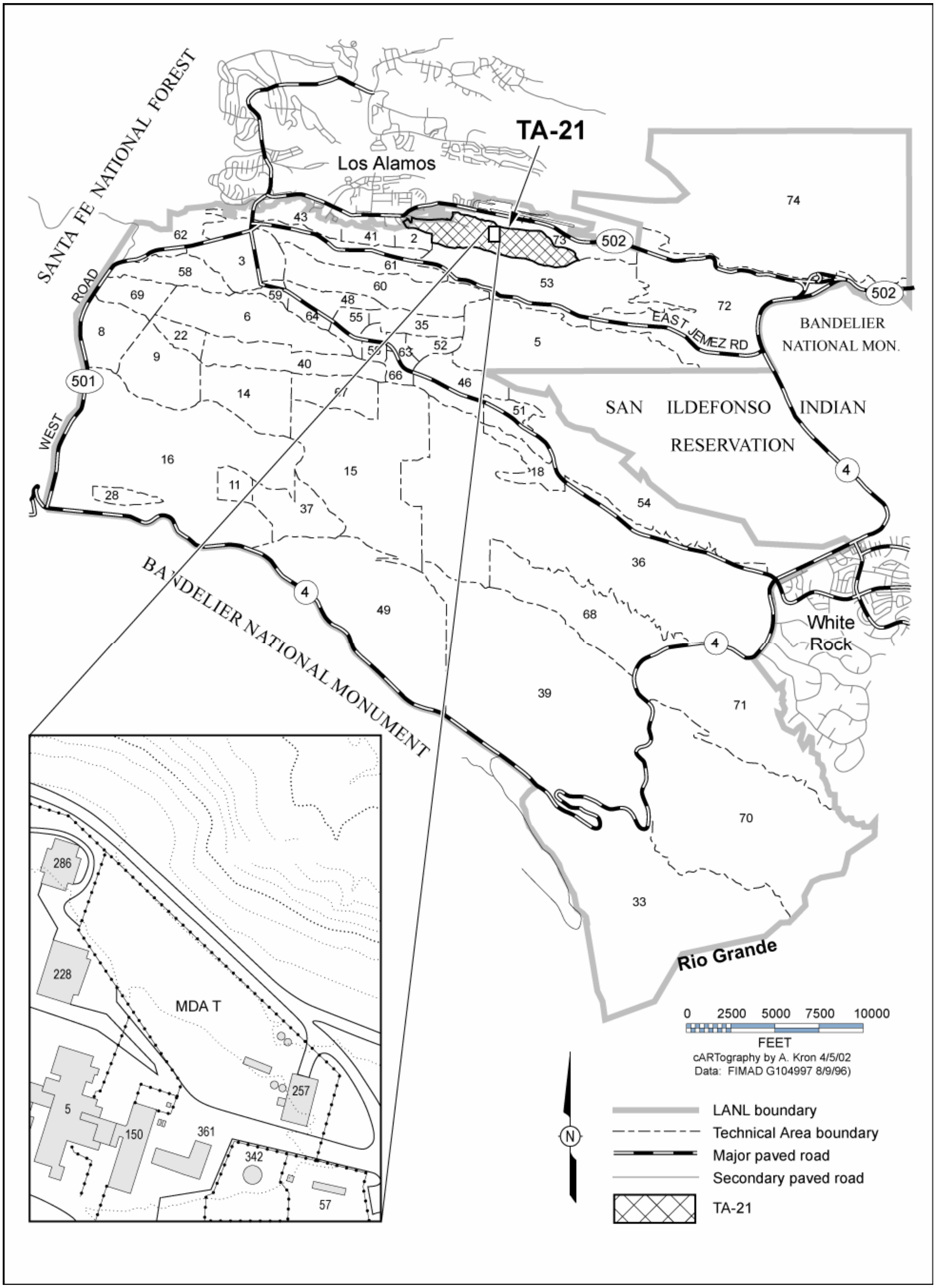

Figure 1.1-1 MDA T at TA-21

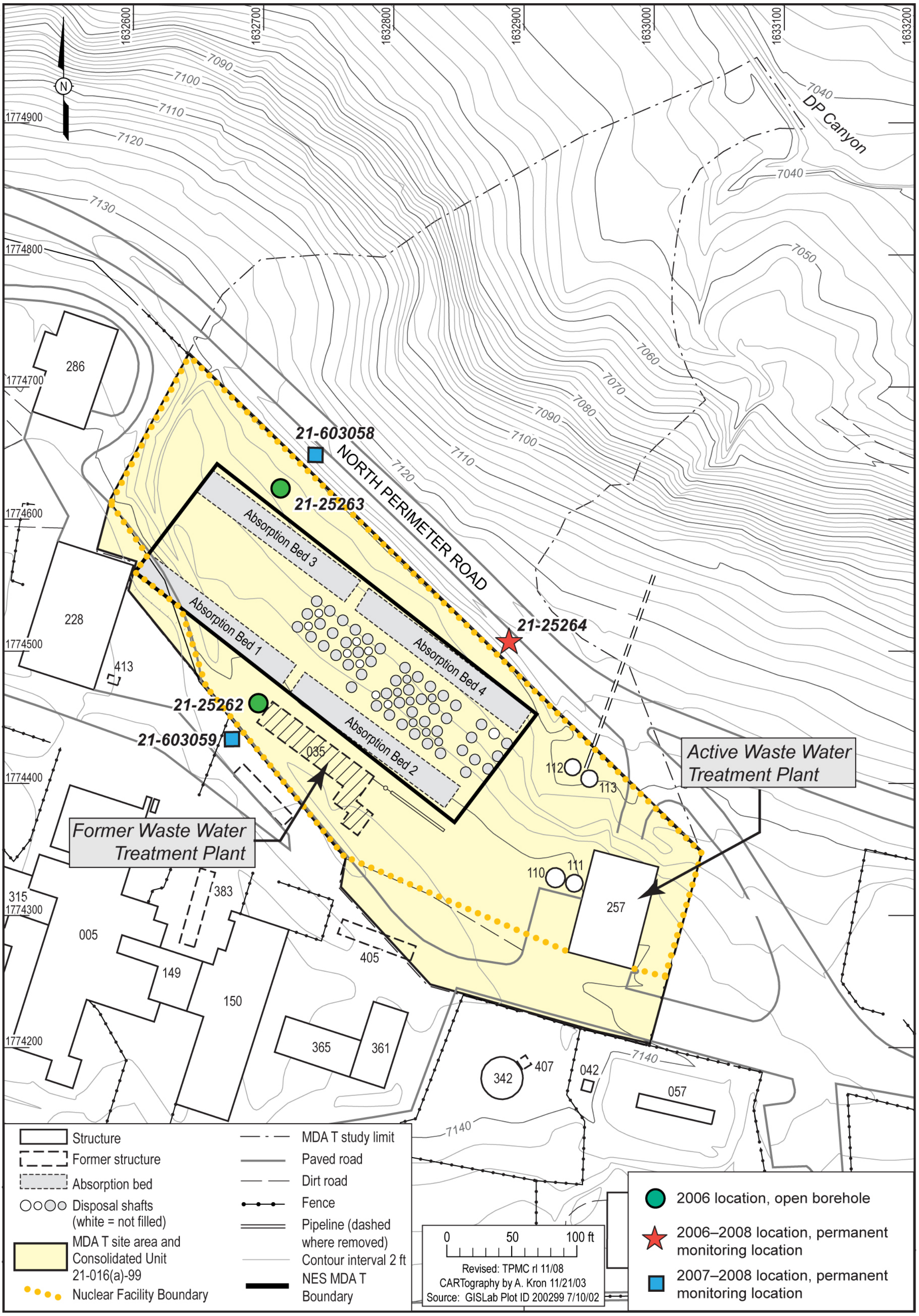

Figure 1.1-2 **MDA T features, associated structures, and 2006–2008 pore-gas sampling locations**

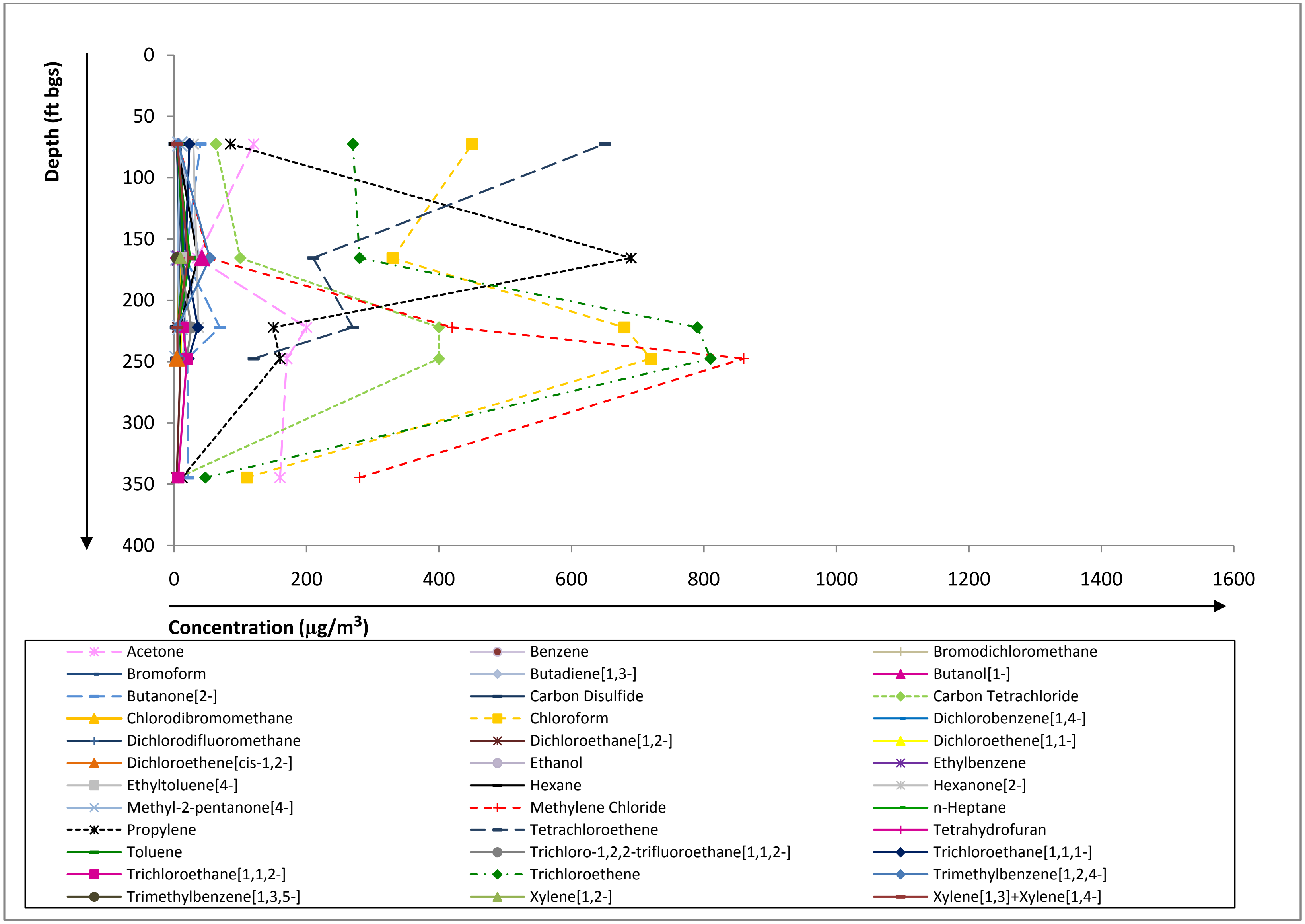

Figure 5.1-1 Vertical profile of detected VOCs in pore gas, monitoring well 21-603058, first quarter, October 2007

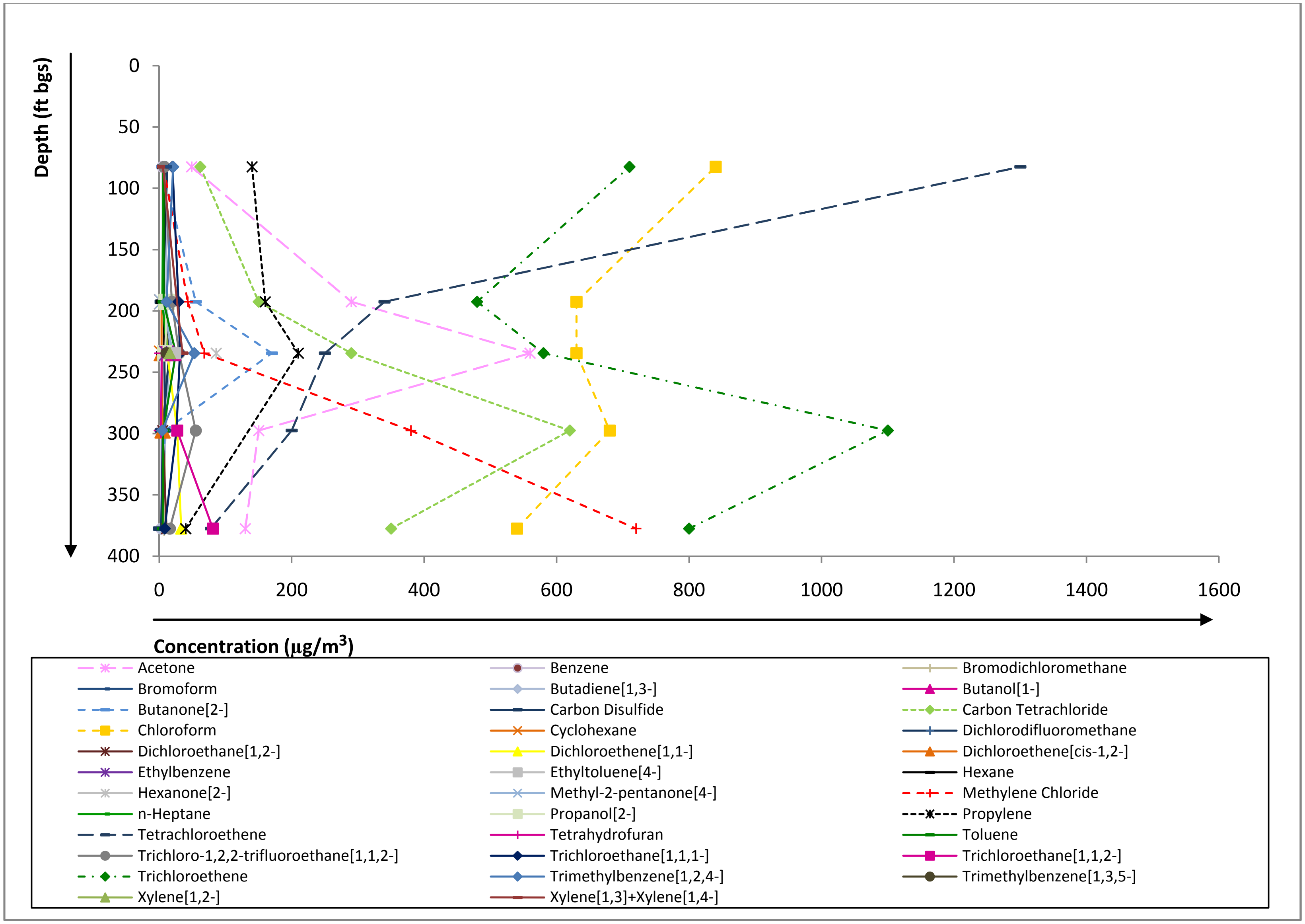

Figure 5.1-2 Vertical profile of detected VOCs in pore gas, monitoring well 21-603059, first quarter, November 2007

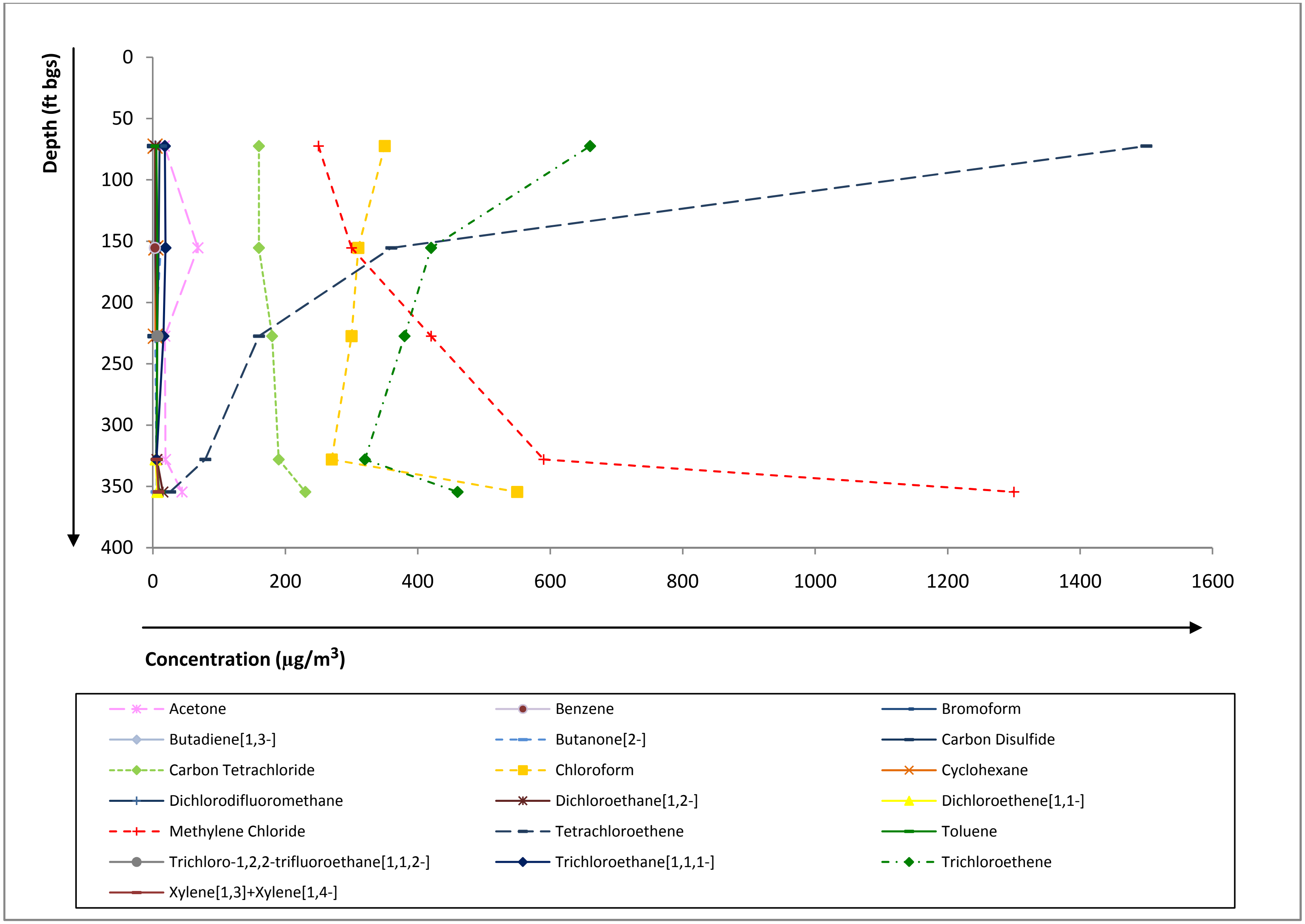

Figure 5.1-3 **Vertical profile of detected VOCs in pore gas, monitoring well 21-25264, first quarter, October 2007**

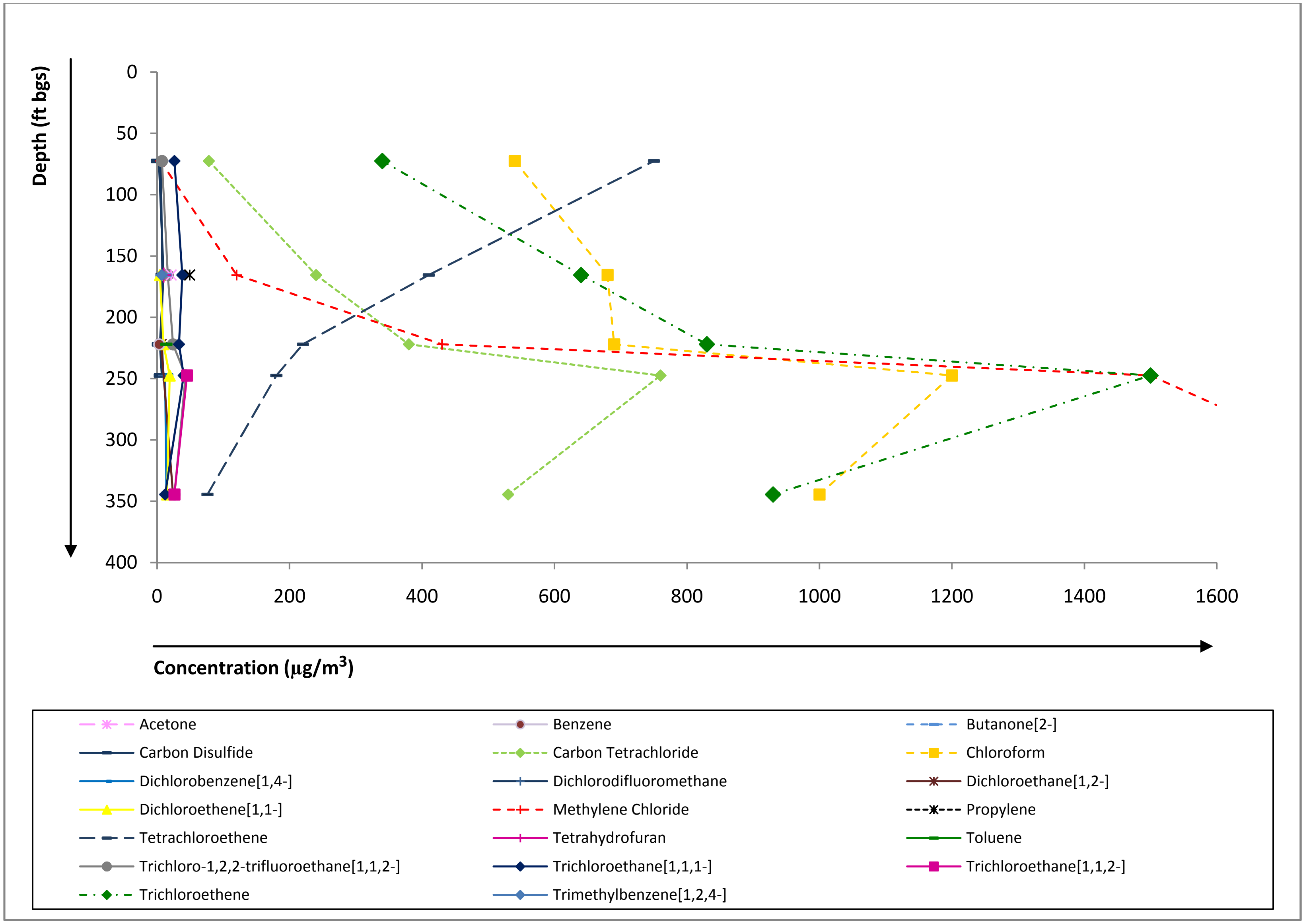

Figure 5.1-4 Vertical profile of detected VOCs in pore gas, monitoring well 21-603058, second quarter, February 2008

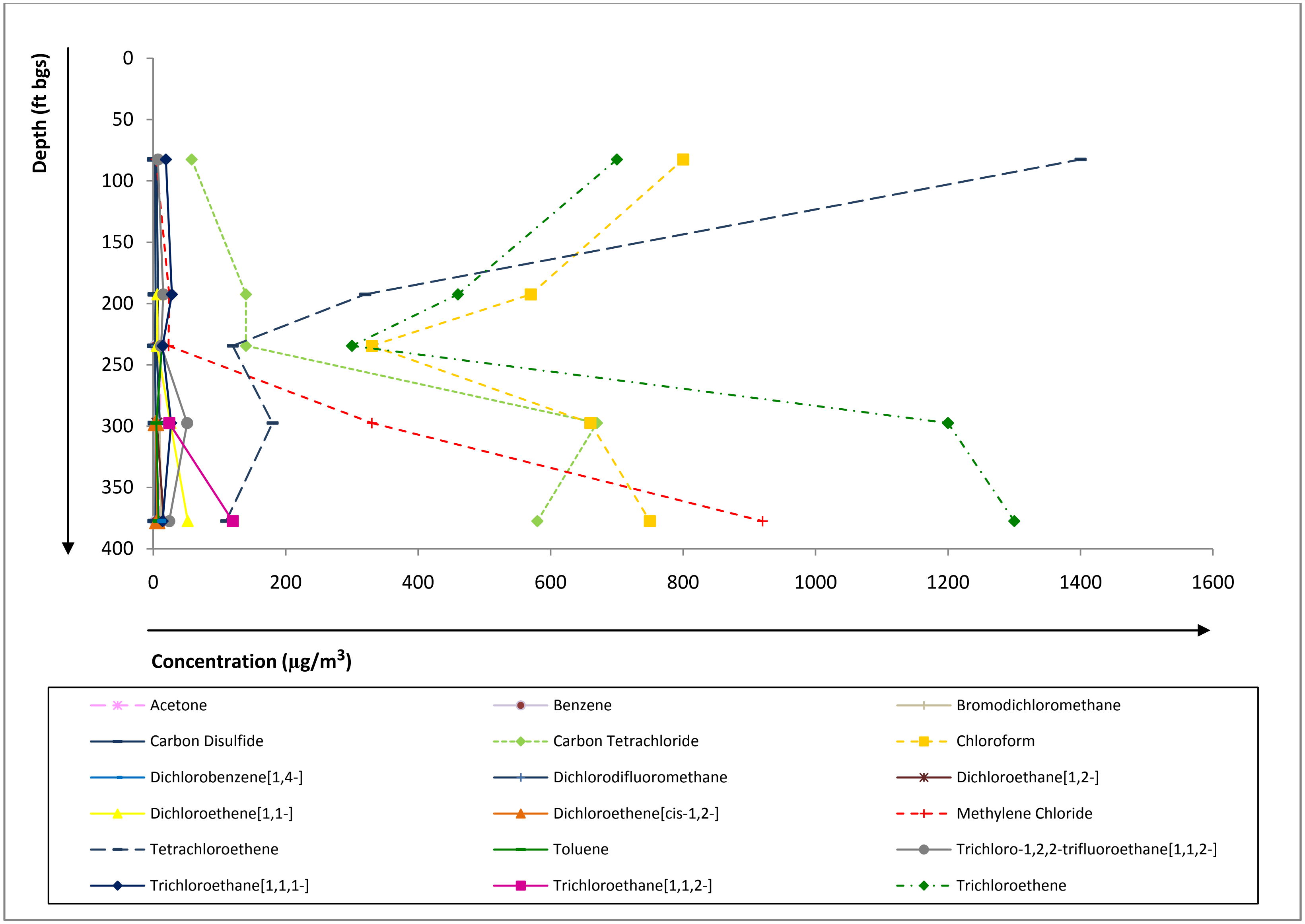

Figure 5.1-5 Vertical profile of detected VOCs in pore gas, monitoring well 21-603059, second quarter, February 2008

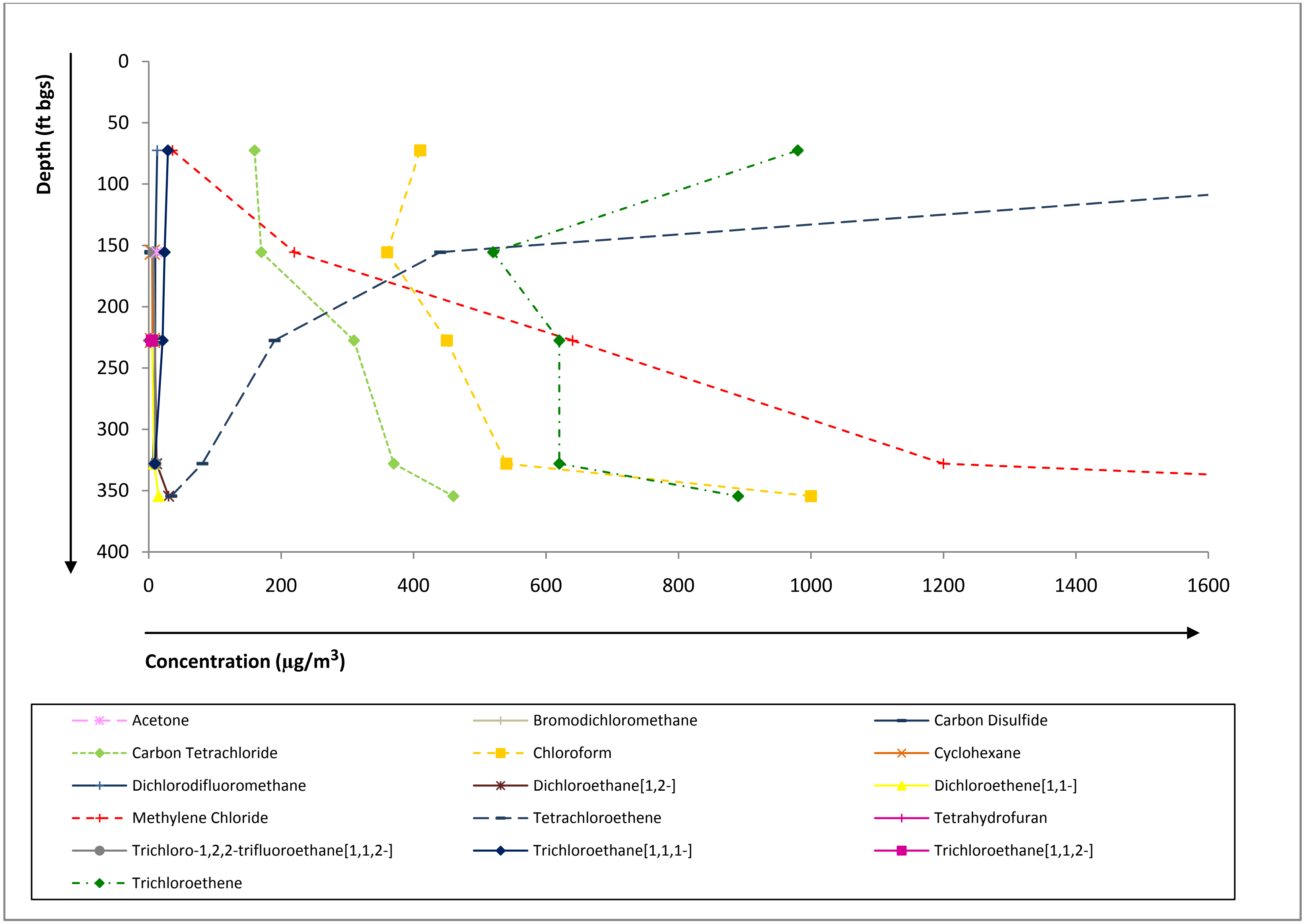

Figure 5.1-6 **Vertical profile of detected VOCs in pore gas, monitoring well 21-25264, second quarter, February 2008**

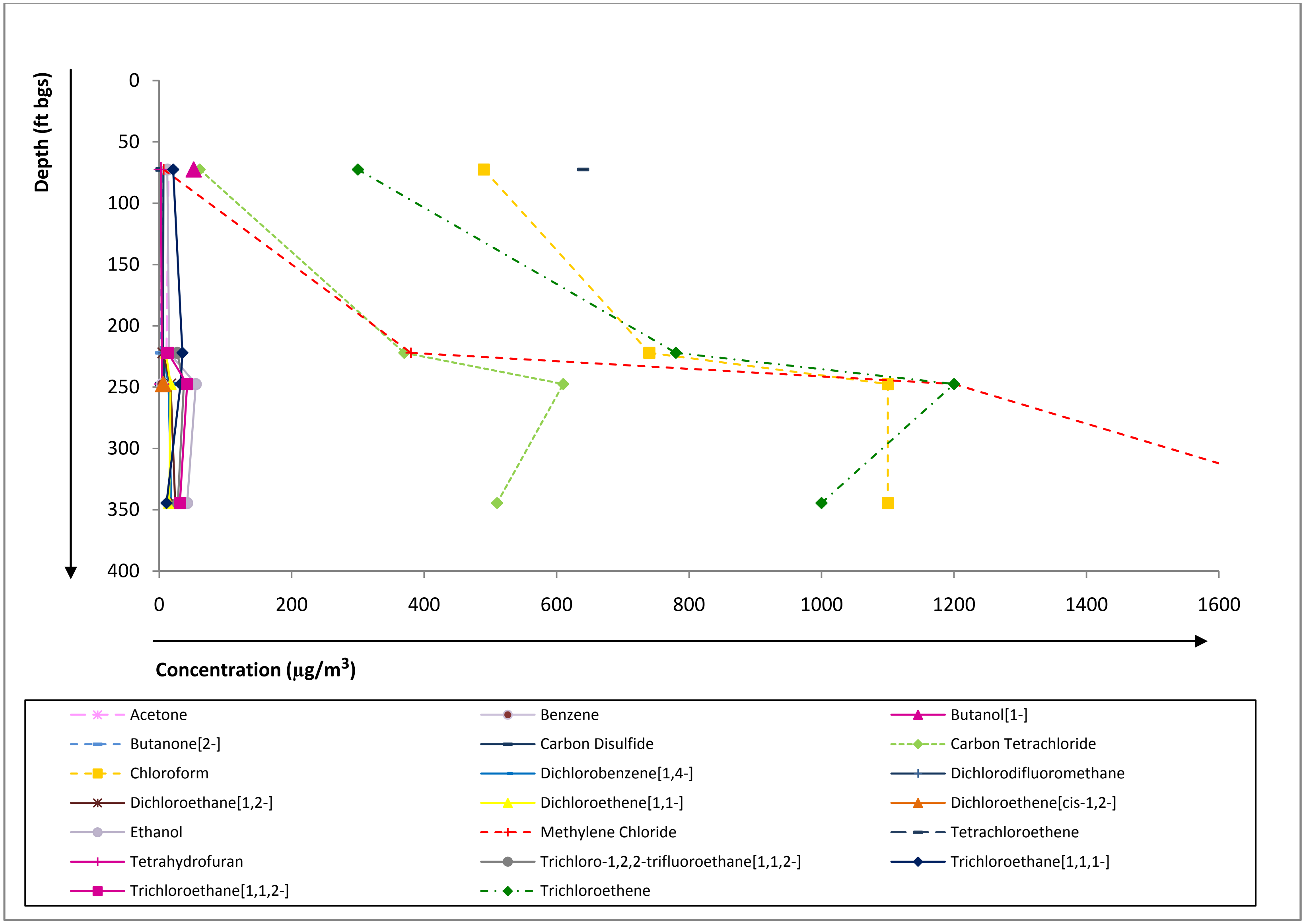

Figure 5.1-7 Vertical profile of detected VOCs in pore gas, monitoring well 21-603058, third quarter, May 2008

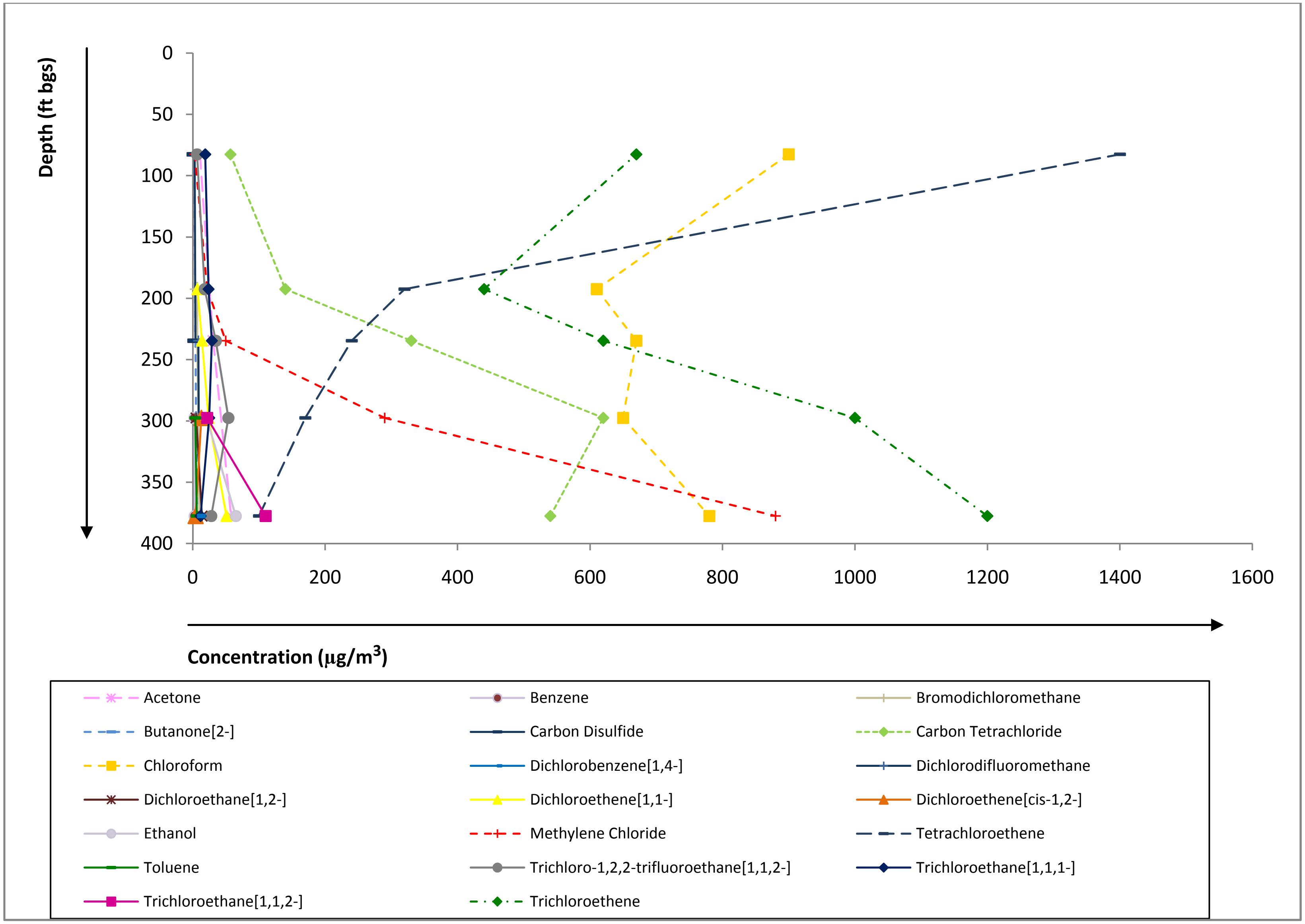

Figure 5.1-8 **Vertical profile of detected VOCs in pore gas, monitoring well 21-603059, third quarter, May 2008**

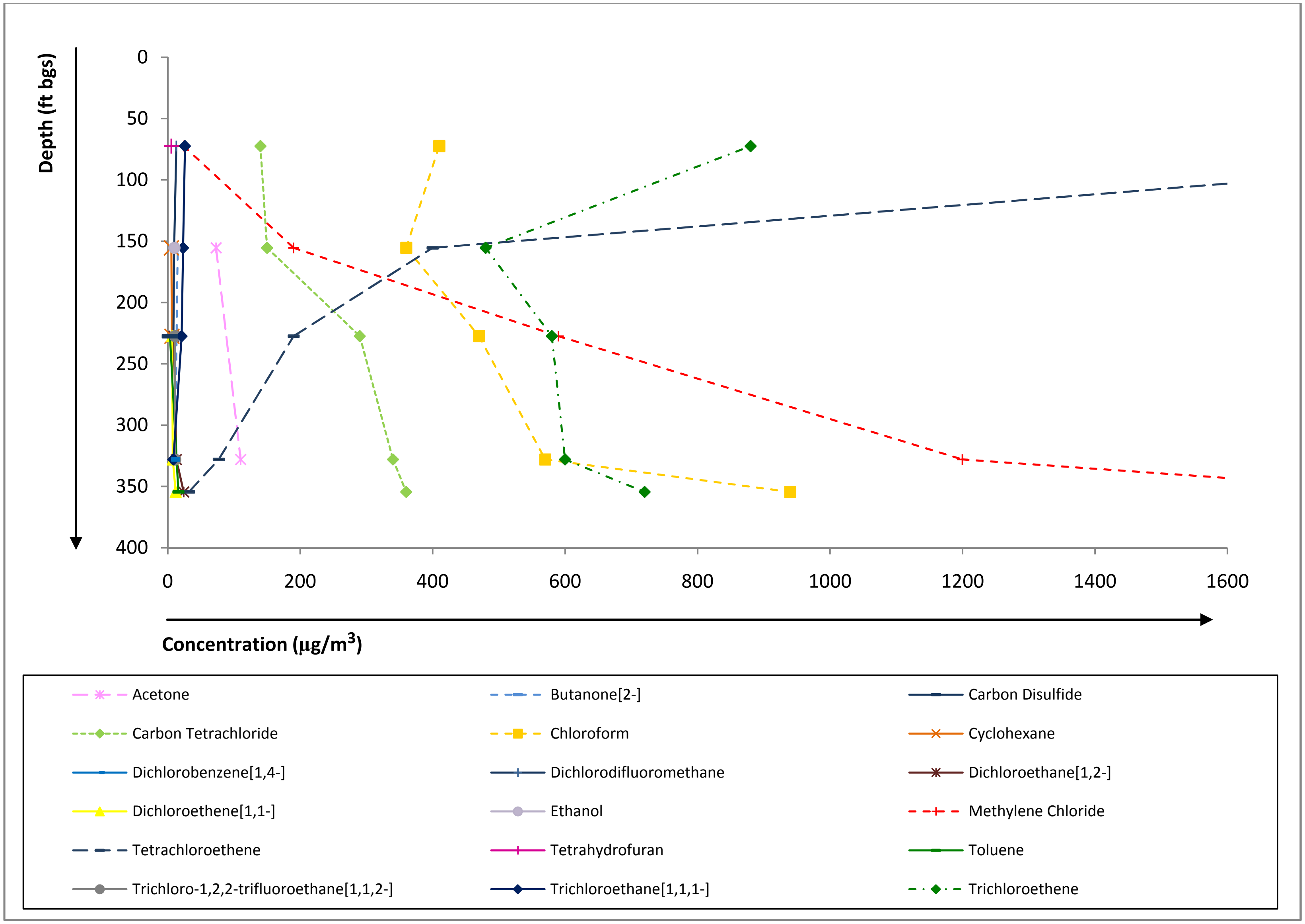

Figure 5.1-9 Vertical profile of detected VOCs in pore gas, monitoring well 21-25264, third quarter, May 2008

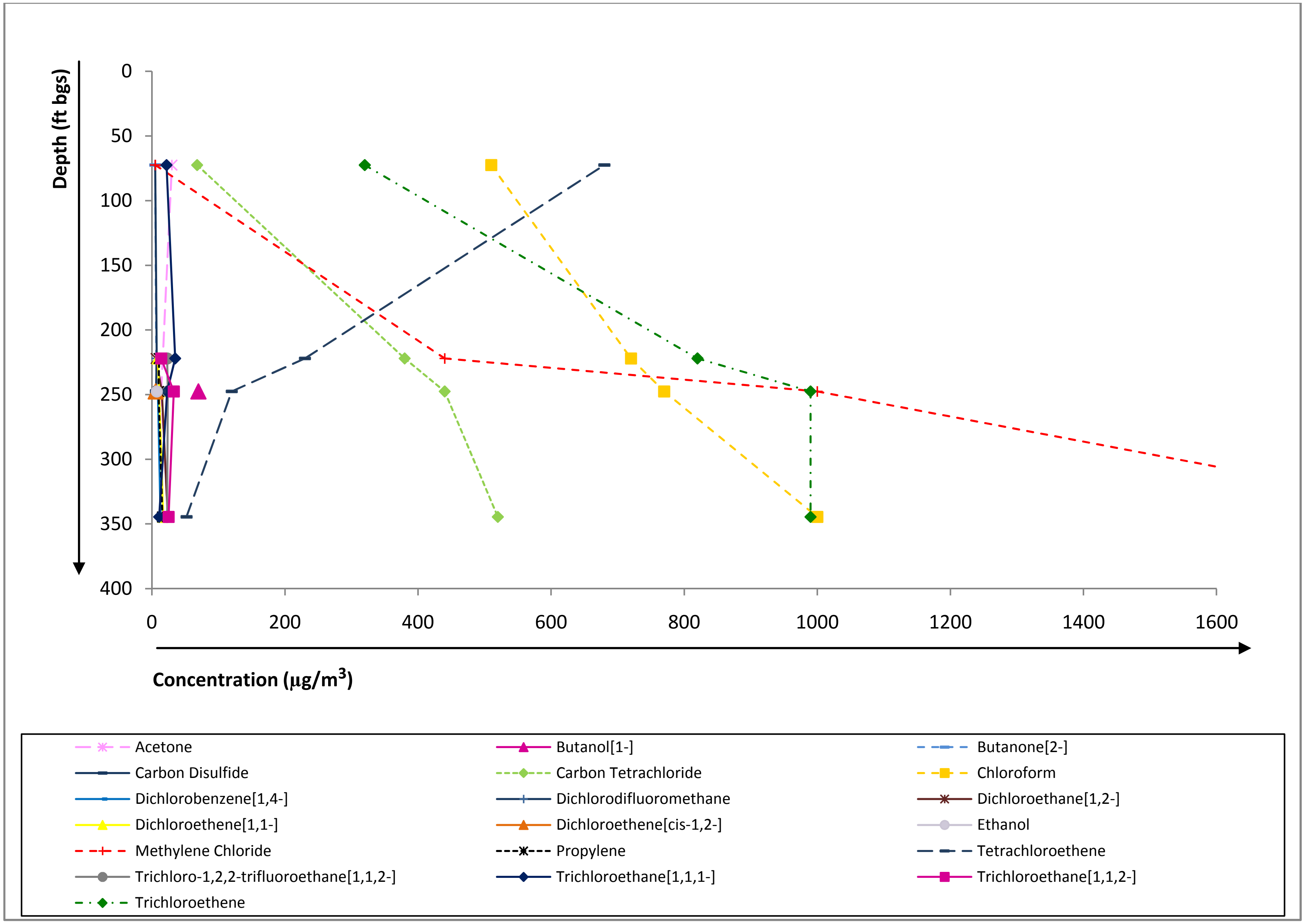

Figure 5.1-10 Vertical profile of detected VOCs in pore gas, monitoring well 21-603058, fourth quarter, September 2008

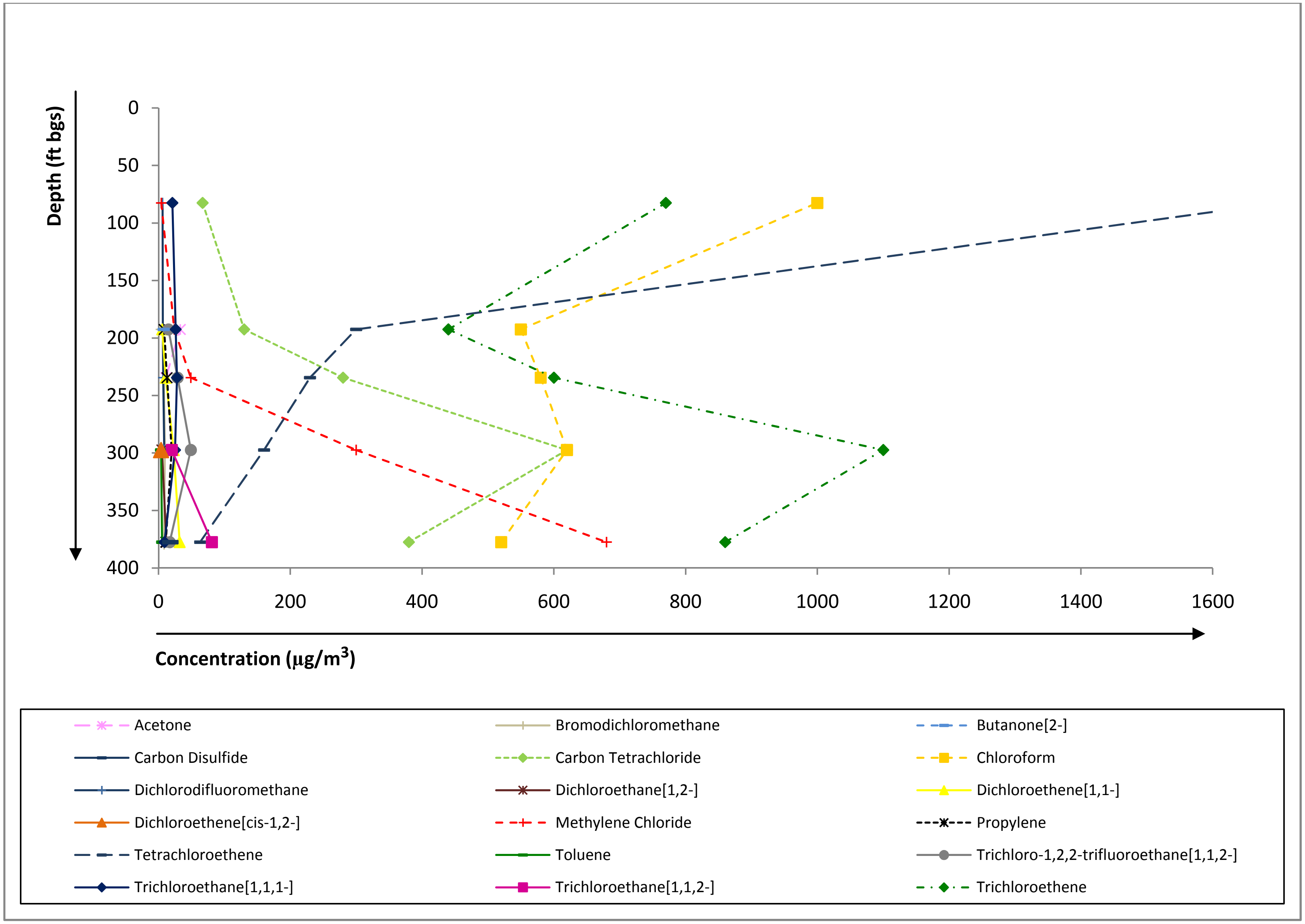

Figure 5.1-11 Vertical profile of detected VOCs in pore gas, monitoring well 21-603059, fourth quarter, September 2008

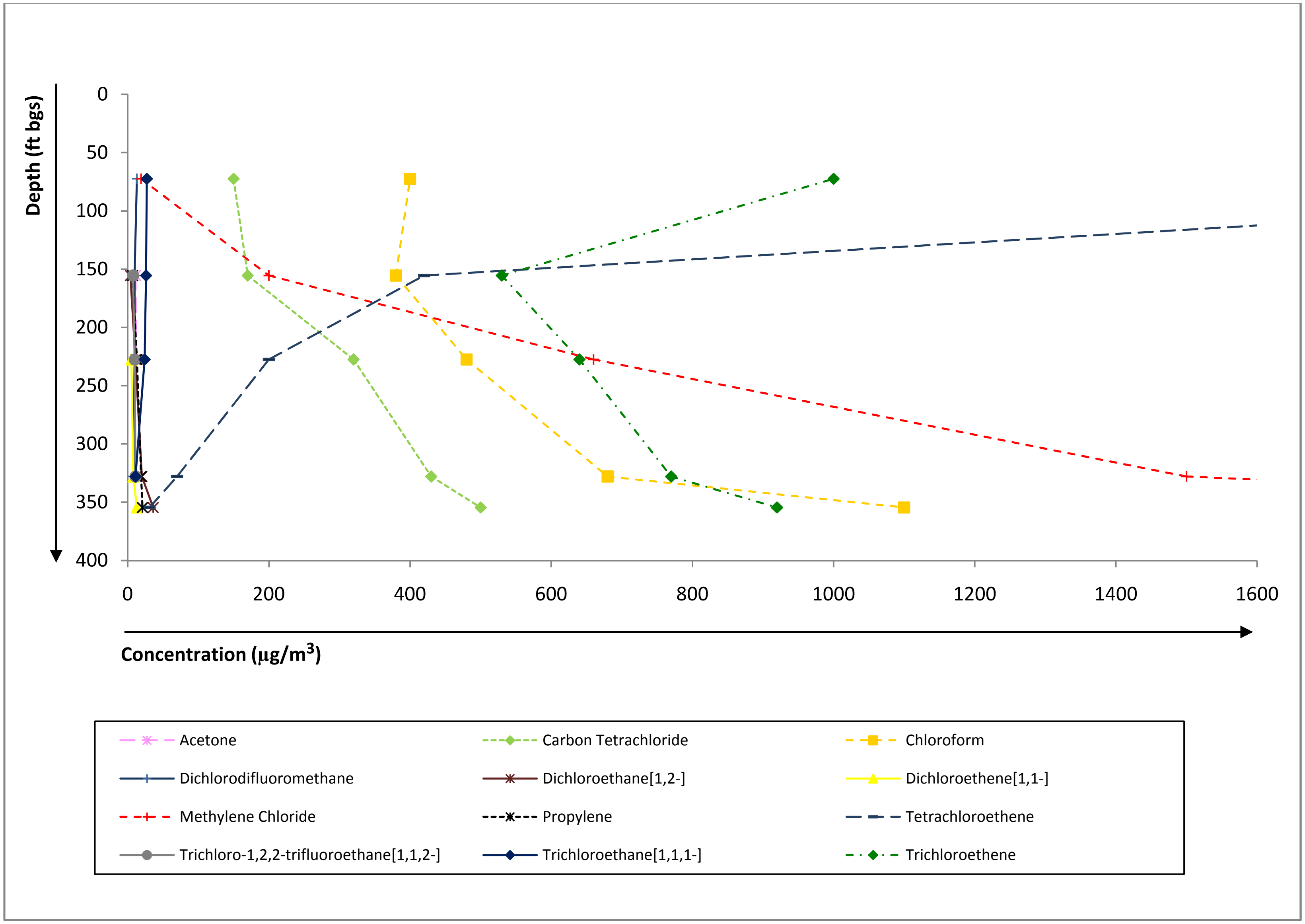

Figure 5.1-12 Vertical profile of detected VOCs in pore gas, monitoring well 21-25264, fourth quarter, September 2008

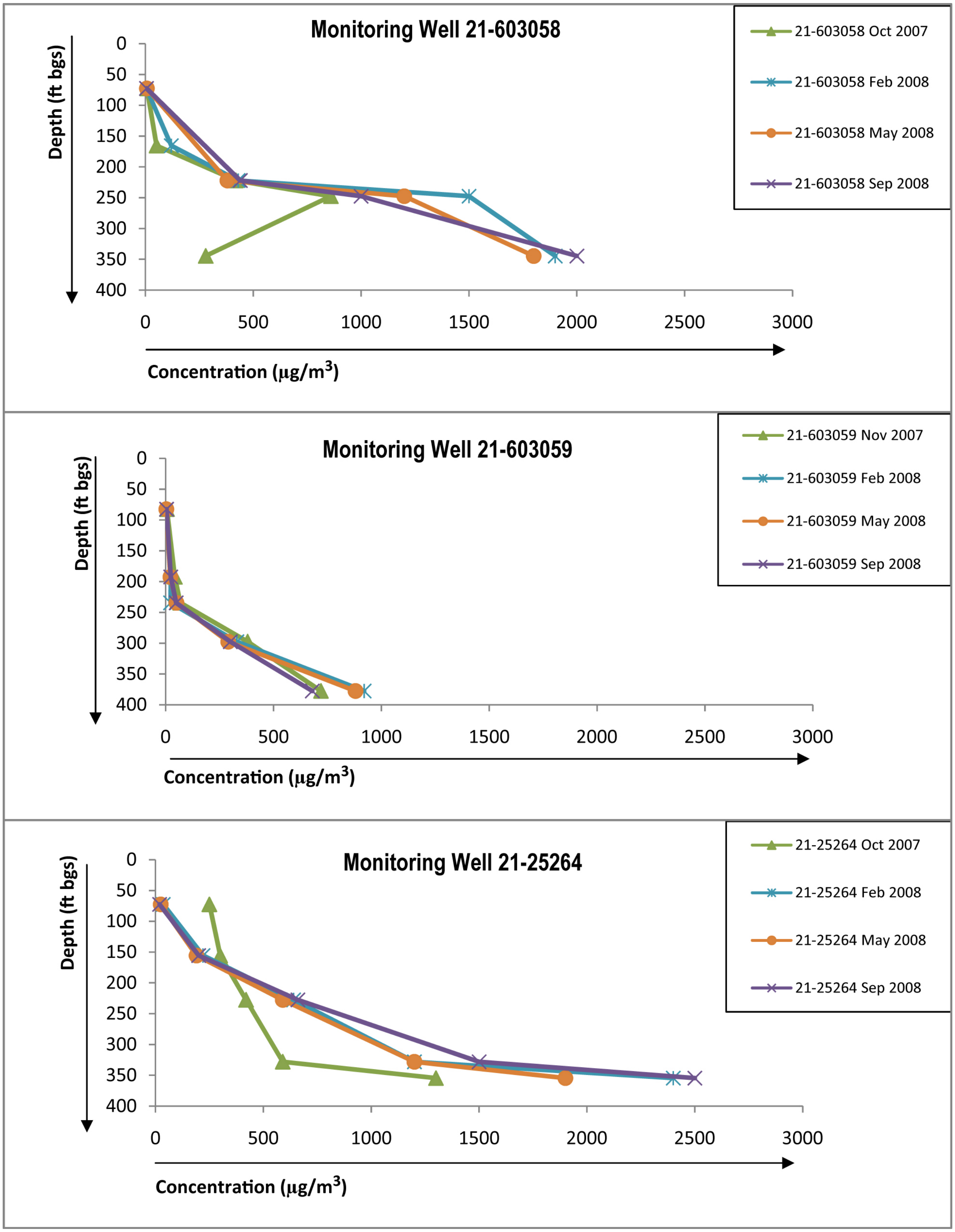

Figure 5.1-13 Vertical profile of methylene chloride in pore gas, monitoring wells 21-603058, 21-603059, and 21-25264, first through fourth quarters, October 2007–September 2008

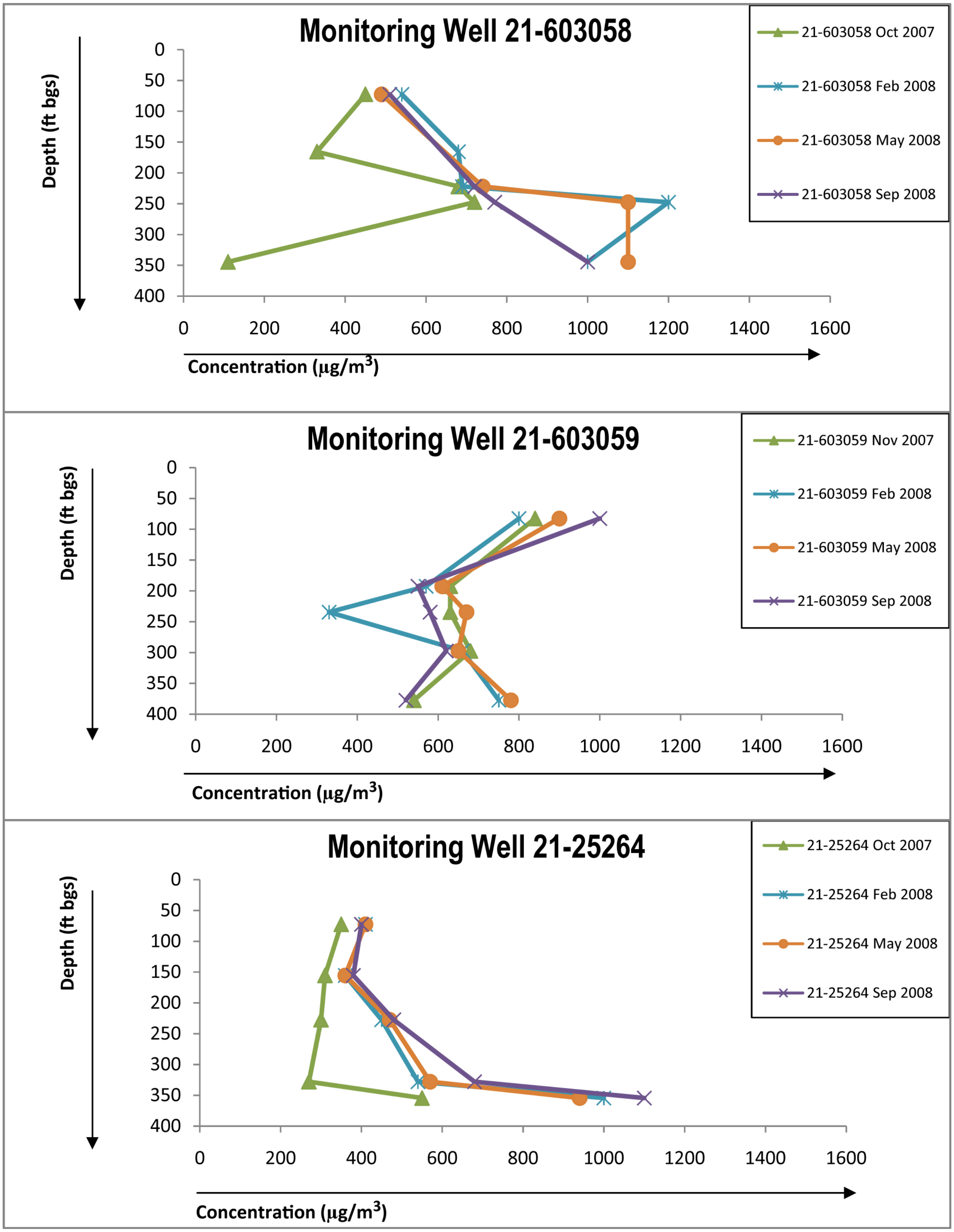

Figure 5.1-14 Vertical profile of chloroform in pore gas, monitoring wells 21-603058, 21-603059, and 21-25264, first through fourth quarters, October 2007–September 2008

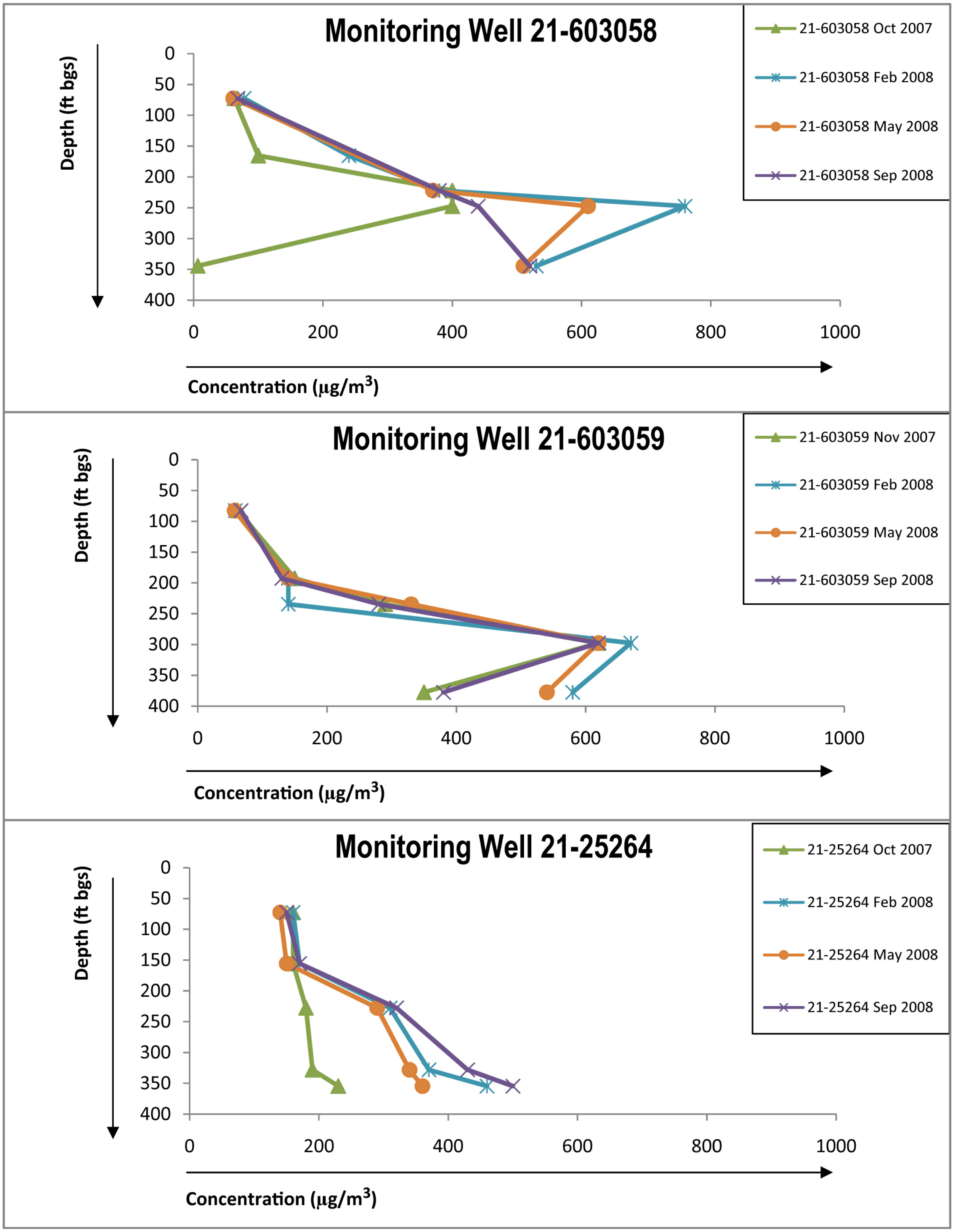

Figure 5.1-15 **Vertical profile of carbon tetrachloride in pore gas, monitoring wells 21-603058, 21-603059, and 21-25264, first through fourth quarter, October 2007–September 2008**

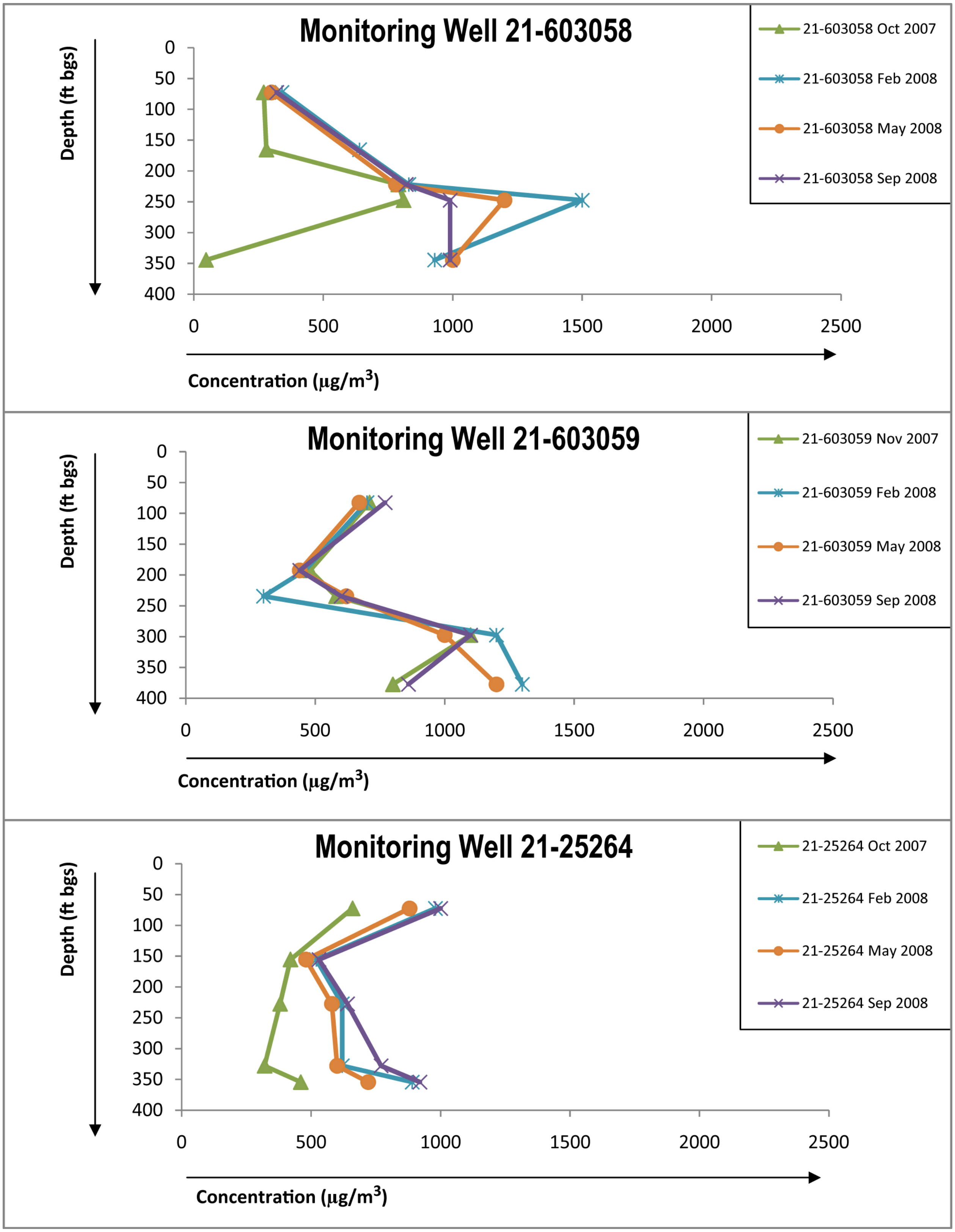

Figure 5.1-16 **Vertical profile of TCE in pore gas, monitoring wells 21-603058, 21-603059, and 21-25264, first through fourth quarter, October 2007–September 2008**

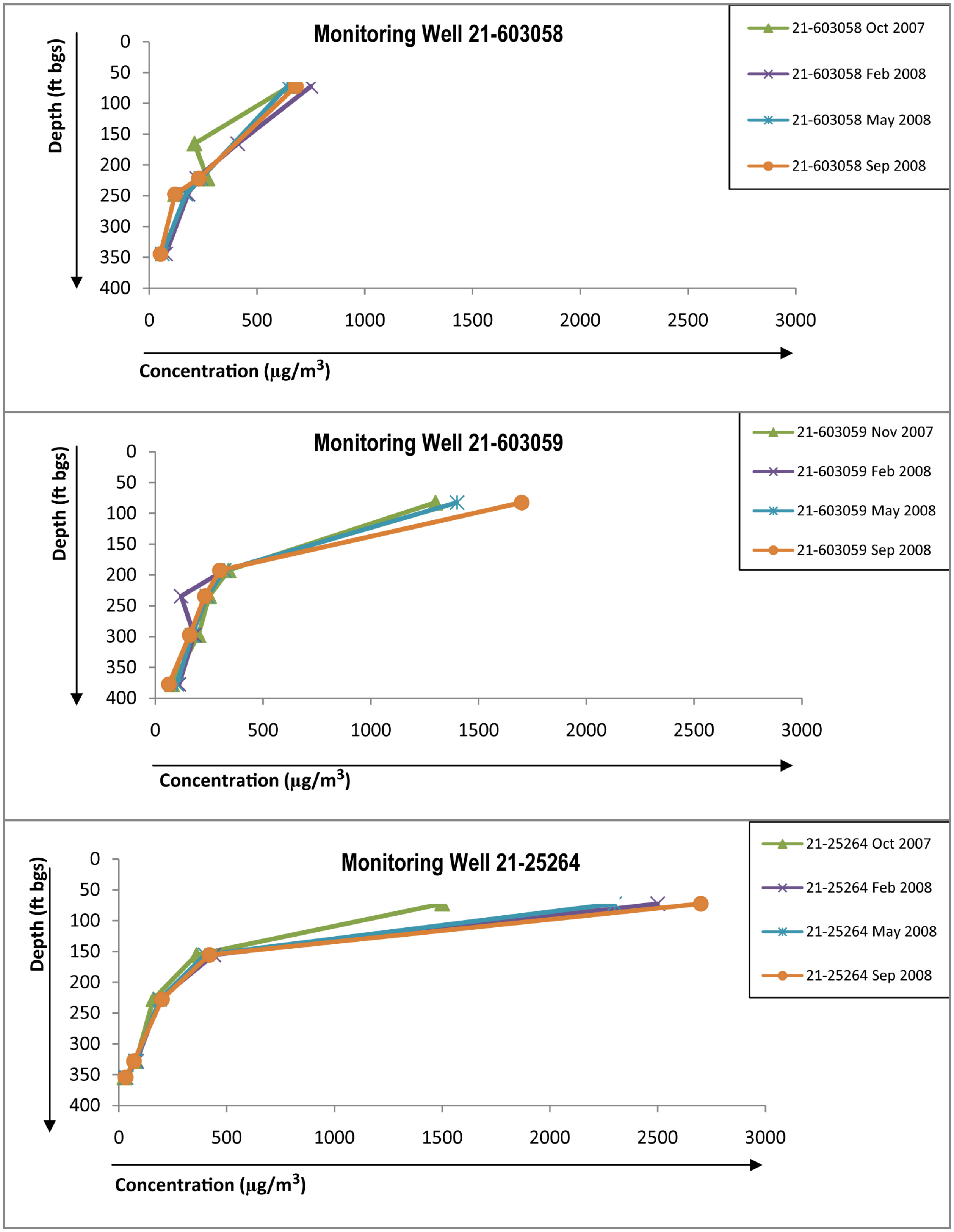

Figure 5.1-17 **Vertical profile of PCE in pore gas, monitoring wells 21-603058, 21-603059, and 21-25264, first through fourth quarter, October 2007–September 2008**

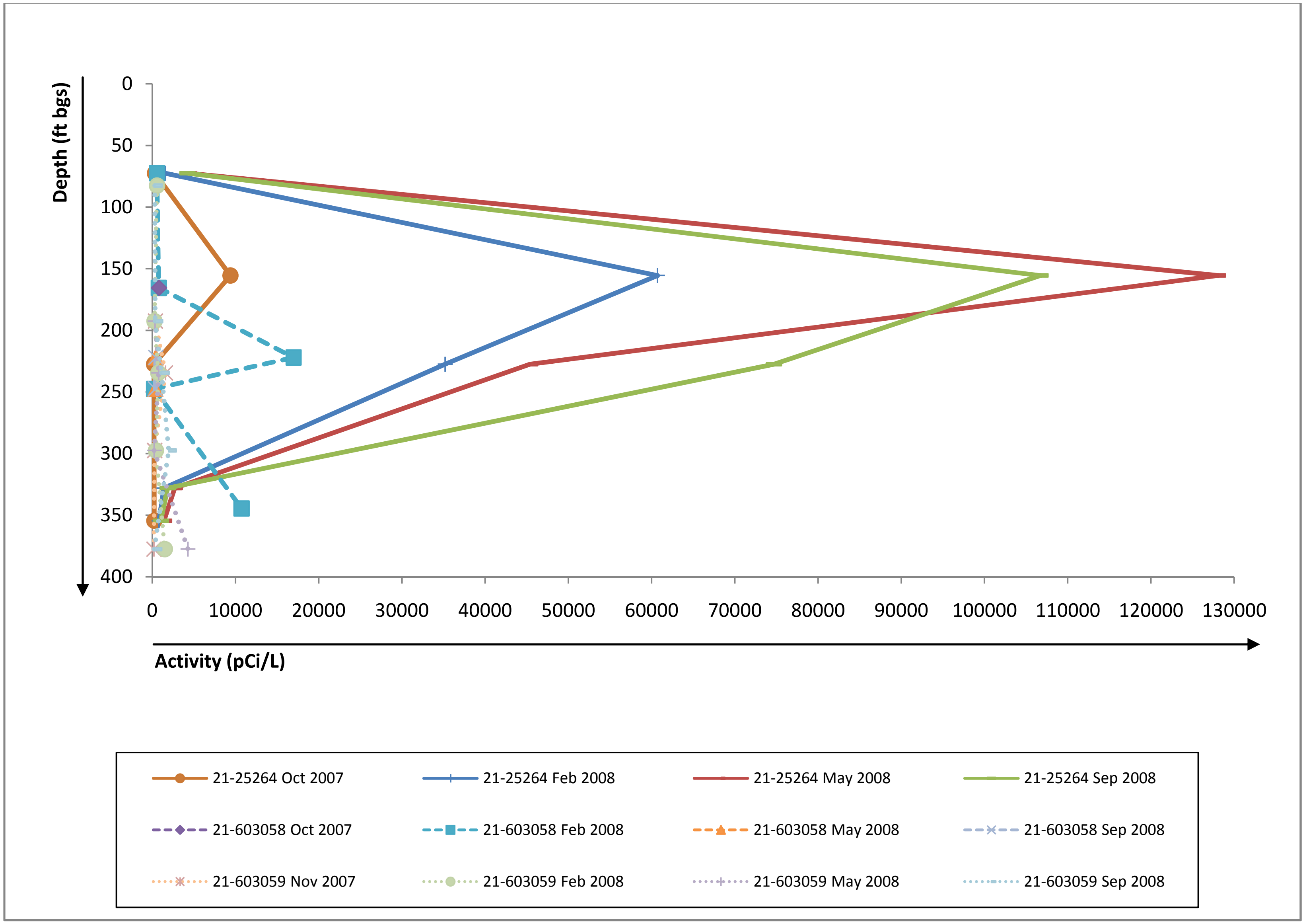

Figure 5.2-1 Vertical profile of tritium in pore gas, monitoring wells 21-603058, 21-603059, and 21-25264, first through fourth quarter, October 2007–September 2008

Table 3.1-1
Pore-Gas Screening for Well 21-603058 Based on Maximum Detected Concentrations

VOC	Maximum Detected Concentration (µg/m^3)	*H'*[a] (dimensionless)	Groundwater Screening Level[b] (µg/L)	Pore-Gas Screening Level[c] (µg/m^3)	Depth (ft bgs)
Acetone	200	0.0016	22000	35200	222
Benzene	8.4	0.228	5[d]	1140	165.5
Bromodichloromethane	6.6	0.0656	11	720	165.5
Bromoform	16	0.027	85	2300	247.5
Butanol[1-]	12	0.00036[e]	3700	1330	247.5
Butanone[2-]	69	0.0011	7100	7810	222
Carbon disulfide	12	1.2	1000	1200000	165.5
Carbon tetrachloride	12	1.25	5[d]	6250	344.5
Chlorodibromomethane	9.7	0.035	8	280	165.5
Chloroform	1200	0.15	100[f]	15000	247.5
Dichlorobenzene[1,4-]	18	0.0996	75[d]	7470	344.5
Dichlorodifluoromethane	9.4	4.1	390	1600000	247.5
Dichloroethane[1,2-]	24	0.04	5[d]	200	344.5
Dichloroethene[1,1-]	19	1.1	5[f]	5500	247.5
Dichloroethene[cis-1,2-]	6	0.167	70[d]	11700	247.5
Ethylbenzene	7.5	0.323	700[d]	226000	165.5
Heptane[n-]	24	88[g]	880[h]	77440000	165.5
Hexane	36	5	880	4400000	165.5
Methyl-2-pentanone[4-]	8.9	0.0057	2000	11400	222
Methylene chloride	200	0.09	5[d]	**450**[i]	344.5
Tetrachloroethene	750	0.754	5[d]	3770	72.5
Tetrahydrofuran	4.9	0.0099[j]	16[k]	160	165.5
Toluene	14	0.272	750[f]	204000	222
Trichloro-1,2,2-trifluoroethane[1,1,2-]	43	21.4	59000	1.26×10^9	247.5
Trichloroethane[1,1,1-]	40	0.705	60[f]	42300	247.5
Trichloroethane[1,1,2-]	45	0.0374	5[c]	187	247.5
Trichloroethene	1500	0.422	5[d]	2110	247.5

Table 3.1-1 (continued)

VOC	Maximum Detected Concentration (µg/m³)	H′ [a] (dimensionless)	Groundwater Screening Level[b] (µg/L)	Pore-Gas Screening Level[c] (µg/m³)	Depth (ft bgs)
Xylene[1,2-]	9.9	0.213	620[f]	132000	165.5
Xylene[1,3-]+Xylene[1,4-]	21	0.3	620[f]	186000	165.5

Notes: Bolded values indicate pore-gas concentrations greater than the pore-gas screening level. Groundwater screening levels were not available for the following VOCs detected in MDA T pore gas at well 21-603058: ethanol, hexanone[2-], and propylene.

[a] Derived from NMED's soil-screening level technical background document unless otherwise footnoted (NMED 2006, 092513).

[b] EPA regional screening level (RSL) unless otherwise footnoted (http://www.epa.gov/region09/superfund/prg/).

[c] Pore-gas screening level is equal to product of *H'*, groundwater screening level, and 100 L/m³ conversion factor.

[d] EPA MCL.

[e] EPA preliminary remediation goal parameter value (http://www.epa.gov/region09/superfund/prg/).

[f] NMWQCC groundwater standard.

[g] Oak Ridge National Laboratory Risk Assessment Information System value for 25°C (http://www.dep.state.pa.us/physicalproperties/Default.htm).

[h] Hexane used as a surrogate, based on structural similarity.

[i] Seven samples between 860 and 2000 µg/m³ exceeded the pore-gas screening level.

[j] EPA Superfund Chemical Data Matrix value for 25°C (http://www.dep.state.pa.us/physicalproperties/Default.htm).

[k] EPA RSL not available. Former EPA Region 6 tap water screening level used (EPA 2007, 099314).

Table 3.1-2
Pore-Gas Screening for Well 21-603059 Based on Maximum Detected Concentrations

VOC	Maximum Detected Concentration (µg/m^3)	*H'*[a] (dimensionless)	Groundwater Screening Level[b] (µg/L)	Pore-Gas Screening Level[c] (µg/m^3)	Depth (ft bgs)
Acetone	560	0.0016	22000	35200	229.5
Benzene	8.2	0.228	5[d]	1140	229.5
Bromodichloromethane	12	0.0656	11	720	377
Bromoform	10	0.027	85	2300	82.5
Butanol[1-]	21	0.00036[e]	3700	1330	234.5
Butanone[2-]	170	0.0011	7100	7810	234.5
Carbon disulfide	18	1.2	1000	1200000	377.5
Carbon tetrachloride	670	1.25	5[d]	6250	297.5
Chloroform	1000	0.15	100[f]	15000	82.5
Cyclohexane	3.4	6.1[e]	13000	79300000	234.5
Dichlorobenzene[1,4-]	7.6	0.0996	75[d]	7470	377.5
Dichlorodifluoromethane	9.8	4.1	390	1600000	297.5
Dichloroethane[1,2-]	16	0.04	5[d]	200	377.5
Dichloroethene[1,1-]	52	1.1	5[f]	5500	377.5
Dichloroethene[cis-1,2-]	13	0.167	70[d]	11700	297.5
Ethylbenzene	11	0.323	700[d]	226000	234.5
Heptane[n-]	12	88[g]	880[h]	77440000	82.5
Hexane	8.5	5	880	4400000	82.5
Methyl-2-pentanone[4-]	21	0.0057	2000	11400	234.5
Methylene chloride	920	0.09	5[d]	**450**[i]	377.5
Tetrachloroethene	1700	0.754	5[d]	3770	82.5
Tetrahydrofuran	3.7	0.0099[j]	16[k]	160	234.5
Toluene	25	0.272	750[f]	204000	234.5
Trichloro-1,2,2-trifluoroethane[1,1,2-]	55	21.4	59000	1.26×10^9	297.5
Trichloroethane[1,1,1-]	31	0.705	6[f]	42300	234.5
Trichloroethane[1,1,2-]	120	0.0374	5[e]	187	377.5
Trichloroethene	1300	0.422	5[d]	2110	377.5
Trimethylbenzene[1,3,5-]	11	0.32	12	3840	234.5

Table 3.1-2 (continued)

VOC	Maximum Detected Concentration ($\mu g/m^3$)	H'[a] (dimensionless)	Groundwater Screening Level[b] ($\mu g/L$)	Pore-Gas Screening Level[c] ($\mu g/m^3$)	Depth (ft bgs)
Xylene[1,2-]	16	0.213	620[f]	132000	234.5
Xylene[1,3-]+Xylene[1,4-]	35	0.3	620[f]	186000	234.5

Notes: Bolded values indicate pore-gas concentrations greater than the pore-gas screening level. Groundwater screening levels were not available for the following VOCs detected in MDA T pore gas at well 21-603059: ethanol, ethyltoluene[4-], hexanone[2-], propanol[2-], and propylene.

[a] Derived from NMED's soil-screening level technical background document unless otherwise footnoted (NMED 2006, 092513).

[b] EPA RSL unless otherwise footnoted (http://www.epa.gov/region09/superfund/prg/).

[c] Pore-gas screening level is equal to product of H', groundwater screening level, and 1000 L/m^3 conversion factor.

[d] EPA MCL.

[e] EPA preliminary remediation goal parameter value (http://www.epa.gov/region09/superfund/prg/).

[f] NMWQCC groundwater standard.

[g] Oak Ridge National Laboratory Risk Assessment Information System value for 25°C (http://www.dep.state.pa.us/physicalproperties/Default.htm).

[h] Hexane used as a surrogate, based on structural similarity.

[i] Four samples between 680 and 920 $\mu g/m^3$ exceeded the pore-gas screening level.

[j] EPA Superfund Chemical Data Matrix value for 25°C (http://www.dep.state.pa.us/physicalproperties/Default.htm).

[k] EPA RSL not available. Former EPA Region 6 tap water screening level used (EPA 2007, 099314).

Table 3.1-3
Pore-Gas Screening for Well 21-25264 Based on Maximum Detected Concentrations

VOC	Maximum Detected Concentration (μg/m³)	H'[a] (dimensionless)	Groundwater Screening Level[b] (μg/L)	Pore-Gas Screening Level[c] (μg/m³)	Depth (ft bgs)
Acetone	270	0.0016	22000	35200	327
Benzene	7.9	0.228	5[d]	1140	154
Bromodichloromethane	6	0.0656	11	720	225.5
Bromoform	12	0.027	85	2300	72.5
Butanone[2-]	22	0.0011	7100	7810	325
Carbon disulfide	8.4	1.2	1000	1200000	71
Carbon tetrachloride	500	1.25	5[d]	6250	349.5
Chloroform	1100	0.15	100[e]	15000	349.5
Cyclohexane	6.2	6.1[f]	13000	79300000	227.5
Dichlorobenzene[1,4-]	6	0.0996	75[d]	7470	328
Dichlorodifluoromethane	13	4.1	390	1600000	72.5
Dichloroethane[1,2-]	36	0.04	5[d]	200	349.5
Dichloroethene[1,1-]	17	1.1	5[e]	5500	327
Methylene chloride	2500	0.09	5[d]	**450**[g]	349.5
Tetrachloroethene	2700	0.754	5[d]	3770	72.5
Tetrahydrofuran	5.2	0.0099[h]	16[i]	160	72.5
Toluene	1900	0.272	750[e]	204000	154
Trichloro-1,2,2-trifluoroethane[1,1,2-]	11	21.4	59000	1.26×10^9	328
Trichloroethane[1,1,1-]	110	0.705	60[e]	42300	327
Trichloroethane[1,1,2-]	4.6	0.0374	5[e]	187	227.5
Trichloroethene	1000	0.422	5[d]	2110	72.5
Xylene[1,3-]+Xylene[1,4-]	9.5	0.3	620[e]	186000	327

Notes: Bolded values indicate pore-gas concentrations greater than the pore-gas screening level. Groundwater screening levels were not available for the following VOCs detected in MDA T pore gas at well 21-25264: ethanol and propylene.

[a] Derived from NMED's soil-screening level technical background document unless otherwise footnoted (NMED 2006, 092513).

[b] EPA RSL unless otherwise footnoted (http://www.epa.gov/region09/superfund/prg/).

[c] Pore-gas screening level is equal to product of *H'*, groundwater screening level, and 1000 L/m³ conversion factor.

[d] EPA MCL.

[e] NMWQCC groundwater standard.

[f] EPA preliminary remediation goal parameter value (http://www.epa.gov/region09/superfund/prg/).

[g] Eleven samples between 590 and 2500 μg/m³ exceeded the pore-gas screening level.

[h] EPA Superfund Chemical Data Matrix value for 25°C (http://www.dep.state.pa.us/physicalproperties/Default.htm).

[i] EPA RSL not available. Former EPA Region 6 tap water screening level used (EPA 2007, 099314).

Table 4.0-1
2007–2008 MDA T Pore-Gas Sampling Depths and Collection Dates

Location ID	Sample Interval	Sample Port	Begin Depth (ft bgs)	End Depth (ft bgs)	2007–2008 Round 1 Collection Date (Event ID 236)	2007–2008 Round 2 Collection Date (Event ID 340)	2007–2008 Round 3 Collection Date (Event ID 407)	2007–2008 Round 4 Collection Date (Event ID 487)
21-25264	1	n/a[a]	69	71	n/a	n/a	n/a	n/a
21-25264	n/a	1	67.5	72.5	10/19/2007	2/14/2008	5/7/2008	9/23/2008
21-25264	2	n/a	152	154	n/a	n/a	n/a	n/a
21-25264	n/a	2	150.5	155.5	10/19/2007	2/14/2008	5/7/2008	9/23/2008
21-25264	3	n/a	224	226	n/a	n/a	n/a	n/a
21-25264	n/a	3	222.5	227.5	10/19/2007	2/14/2008	5/7/2008	9/23/2008
21-25264	4	n/a	325	327	n/a	n/a	n/a	n/a
21-25264	n/a	4	323	328	10/19/2007	2/14/2008	5/7/2008	9/23/2008
21-25264	5	n/a	350	354	n/a	n/a	n/a	n/a
21-25264	n/a	5	349.5	354.5	10/19/2007	2/14/2008	5/7/2008	9/23/2008
21-603058	n/a	1	67.5	72.5	10/30/2007	2/13/2008	5/9/2008	9/24/2008
21-603058	n/a	2	160.5	165.5	10/30/2007	2/13/2008	—[b]	—
21-603058	n/a	3	217	222	10/30/2007	2/13/2008	5/8/2008	9/24/2008
21-603058	n/a	4	242.5	247.5	10/30/2007	2/13/2008	5/8/2008	9/24/2008
21-603058	n/a	5	339.5	344.5	10/30/2007	2/13/2008	5/8/2008	9/24/2008
21-603059	n/a	1	77.5	82.5	11/4/2007	2/6/2008	5/9/2008	9/25/2008
21-603059	n/a	2	112.5	117.5	—	—	—	—
21-603059	n/a	3	187.5	192.5	11/3/2007	2/8/2008	5/9/2008	9/25/2008
21-603059	n/a	4	229.5	234.5	11/3/2007	2/6/2008	5/9/2008	9/25/2008
21-603059	n/a	5	292.5	297.5	11/3/2007	2/6/2008	5/9/2008	9/25/2008
21-603059	n/a	6	372.5	377.5	11/3/2007	2/8/2008	5/9/2008	9/25/2008

Note: Event IDs refer to the SCL and COC packages provided in Appendix B.

[a] n/a = Not applicable.

[b] — = Sample not collected. See section 4.2 for further explanation.

Table 4.0-2
Summary of 2007–2008 Pore-Gas Samples Collected at MDA T

Sample ID	Location ID	Depth (ft)	Collection Date	Field QC Type	Tritium	VOCs
MD21-07-6813	21-25264	67.50–72.50	10/19/2007	n/a[a]	08-80	08-79
MD21-07-6814	21-25264	150.50–155.50	10/19/2007	n/a	08-80	08-79
MD21-07-6815	21-25264	222.50–227.50	10/19/2007	n/a	08-80	08-79
MD21-07-6816	21-25264	323.00–328.00	10/19/2007	n/a	08-80	08-79
MD21-07-6817	21-25264	349.50–354.50	10/19/2007	n/a	08-80	08-79
MD21-08-10517	21-25264	0.00–0.00	2/19/2008	Field Blank	—[b]	08-646
MD21-08-10511	21-25264	67.50–72.50	2/14/2008	n/a	08-631	08-630
MD21-08-10512	21-25264	150.50–155.50	2/14/2008	n/a	08-631	08-630
MD21-08-10513	21-25264	222.50–227.50	2/14/2008	n/a	08-631	08-630
MD21-08-10514	21-25264	323.00–328.00	2/14/2008	n/a	08-631	08-630
MD21-08-10515	21-25264	349.50–354.50	2/14/2008	n/a	08-631	08-630
MD21-08-10516	21-25264	349.50–354.50	2/14/2008	Field Duplicate	08-631	08-630
MD21-08-12247	21-25264	67.50–72.50	5/7/2008	n/a	08-1108	08-1107
MD21-08-12257	21-25264	67.50–72.50	5/7/2008	Field Duplicate	08-1108	—
MD21-08-12248	21-25264	150.50–155.50	5/7/2008	n/a	08-1108	08-1107
MD21-08-12249	21-25264	222.50–227.50	5/7/2008	n/a	08-1108	08-1107
MD21-08-12250	21-25264	323.00–328.00	5/7/2008	n/a	08-1108	08-1107
MD21-08-12251	21-25264	349.50–354.50	5/7/2008	n/a	08-1108	08-1107
MD21-08-14828	21-25264	67.50–72.50	9/23/2008	n/a	08-2021	08-2020
MD21-08-14829	21-25264	150.50–155.50	9/23/2008	n/a	08-2021	08-2020
MD21-08-14830	21-25264	222.50–227.50	9/23/2008	n/a	08-2021	08-2020
MD21-08-14831	21-25264	323.00–328.00	9/23/2008	n/a	08-2021	08-2020
MD21-08-14832	21-25264	349.50–354.50	9/23/2008	n/a	08-2021	08-2020
MD21-08-14833	21-25264	349.50–354.50	9/23/2008	Field Duplicate	08-2021	08-2020
MD21-07-6818	21-603058	0.00–0.00	10/30/2007	Field Blank	08-125	08-124
MD21-07-6807	21-603058	67.50–72.50	10/30/2007	n/a	08-99	08-98
MD21-07-6808	21-603058	160.50–165.50	10/30/2007	n/a	08-99	08-98
MD21-07-6809	21-603058	217.00–222.00	10/30/2007	n/a	08-99	08-98
MD21-07-6810	21-603058	242.50–247.50	10/30/2007	n/a	08-99	08-98
MD21-07-6811	21-603058	339.50–344.50	10/30/2007	n/a	08-99	08-98
MD21-07-6812	21-603058	339.50–344.50	10/30/2007	Field Duplicate	08-99	08-98
MD21-08-10504	21-603058	67.50–72.50	2/13/2008	n/a	08-624	08-623
MD21-08-10505	21-603058	160.50–165.50	2/13/2008	n/a	08-624	08-623
MD21-08-10506	21-603058	217.00–222.00	2/13/2008	n/a	08-624	08-623
MD21-08-10507	21-603058	242.50–247.50	2/13/2008	n/a	08-624	08-623
MD21-08-10508	21-603058	339.50–344.50	2/13/2008	n/a	08-624	08-623
MD21-08-12255	21-603058	0.00–0.00	5/8/2008	Field Blank	—	08-1147
MD21-08-12242	21-603058	67.50–72.50	5/9/2008	n/a	08-1114	08-1113

Table 4.0-2 (continued)

Sample ID	Location ID	Depth (ft)	Collection Date	Field QC Type	Tritium	VOCs
MD21-08-12244	21-603058	217.00–222.00	5/8/2008	n/a	08-1114	08-1113
MD21-08-12245	21-603058	242.50–247.50	5/8/2008	n/a	08-1114	08-1113
MD21-08-12246	21-603058	339.50–344.50	5/8/2008	n/a	08-1114	08-1113
MD21-08-12256	21-603058	339.50–344.50	5/8/2008	Field Duplicate	—	08-1113
MD21-08-14826	21-603058	0.00–0.00	9/24/2008	Field Blank	—	08-2020
MD21-08-14814	21-603058	217.00–222.00	9/24/2008	n/a	08-2021	08-2020
MD21-08-14815	21-603058	242.50–247.50	9/24/2008	n/a	08-2021	08-2020
MD21-08-14816	21-603058	339.50–344.50	9/24/2008	n/a	08-2021	08-2020
MD21-08-14813	21-603058	67.50–72.50	9/24/2008	n/a	08-2021	08-2020
MD21-08-8445	21-603059	0.00–0.00	11/3/2007	Field Blank	08-125	08-124
MD21-07-6804	21-603059	77.50–82.50	11/4/2007	n/a	08-125	08-124
MD21-07-6803	21-603059	187.50–192.50	11/3/2007	n/a	08-125	08-124
MD21-07-6801	21-603059	229.50–234.50	11/3/2007	n/a	08-125	08-124
MD21-07-6802	21-603059	292.50–297.50	11/3/2007	n/a	08-125	08-124
MD21-07-6800	21-603059	372.50–377.50	11/3/2007	n/a	08-125	08-124
MD21-07-6806	21-603059	372.50–377.50	11/3/2007	Field Duplicate	08-125	08-124
MD21-08-10525	21-603059	0.00–0.00	2/19/2008	Field Blank	—	08-646
MD21-08-10518	21-603059	77.50–82.50	2/6/2008	n/a	08-605	08-604
MD21-08-10524	21-603059	77.50–82.50	2/6/2008	Field Duplicate	08-605	08-604
MD21-08-10519	21-603059	187.50–192.50	2/8/2008	n/a	08-605	08-604
MD21-08-10520	21-603059	229.50–234.50	2/6/2008	n/a	08-605	08-604
MD21-08-10521	21-603059	292.50–297.50	2/6/2008	n/a	08-605	08-604
MD21-08-10522	21-603059	372.50–377.50	2/8/2008	n/a	08-605	08-604
MD21-08-12252	21-603059	0.00–0.00	5/9/2008	Field Blank	—	08-1147
MD21-08-12236	21-603059	77.50–82.50	5/9/2008	n/a	08-1114	08-1113
MD21-08-12237	21-603059	187.50–192.50	5/9/2008	n/a	08-1114	08-1113
MD21-08-12238	21-603059	229.50–234.50	5/9/2008	n/a	08-1114	08-1113
MD21-08-12239	21-603059	292.50–297.50	5/9/2008	n/a	08-1114	08-1113
MD21-08-12240	21-603059	372.50–377.50	5/9/2008	n/a	08-1114	08-1113
MD21-08-12253	21-603059	372.50–377.50	5/9/2008	Field Duplicate	08-1114	08-1113
MD21-08-14824	21-603059	0.00–0.00	9/25/2008	Field Blank	—	08-2020
MD21-08-14818	21-603059	77.50–82.50	9/25/2008	n/a	08-2021	08-2020
MD21-08-14819	21-603059	187.50–192.50	9/25/2008	n/a	08-2021	08-2020
MD21-08-14820	21-603059	229.50–234.50	9/25/2008	n/a	08-2021	08-2020
MD21-08-14821	21-603059	292.50–297.50	9/25/2008	n/a	08-2021	08-2020
MD21-08-14822	21-603059	372.50–377.50	9/25/2008	n/a	08-2021	08-2020
MD21-08-14825	21-603059	372.50–377.50	9/25/2008	Field Duplicate	08-2021	08-2020

Note: Numbers in analyte columns are request numbers.

[a] n/a = Not applicable.

[b] — = Sample not collected.

Table 4.1-1
Summary of 2007–2008 Pore Gas Field-Screening Results

Event ID	Collection Date	FY2008 Sampling Round	Location ID	Sample Port Number	Top Depth (ft bgs)	Bottom Depth (ft bgs)	%CO_2	%O_2
236	10/19/2007	1	21-25264	1	67.5	72.5	0.3	20.2
340	2/14/2008	2	21-25264	1	67.5	72.5	1.2	20.2
407	5/7/2008	3	21-25264	1	67.5	72.5	1	18.9
487	9/23/2008	4	21-25264	1	67.5	72.5	0.9	19.3
236	10/19/2007	1	21-25264	2	150.5	155.5	0.7	20.1
340	2/14/2008	2	21-25264	2	150.5	155.5	1.2	20.2
407	5/7/2008	3	21-25264	2	150.5	155.5	0.9	19
487	9/23/2008	4	21-25264	2	150.5	155.5	0.9	18.8
236	10/19/2007	1	21-25264	3	222.5	227.5	0.1	20.9
340	2/14/2008	2	21-25264	3	222.5	227.5	1.1	20.3
407	5/7/2008	3	21-25264	3	222.5	227.5	0.9	19.1
487	9/23/2008	4	21-25264	3	222.5	227.5	0.8	18.3
236	10/19/2007	1	21-25264	4	323	328	0	21.5
340	2/14/2008	2	21-25264	4	323	328	0.7	20.4
407	5/7/2008	3	21-25264	4	323	328	0.6	19.2
487	9/23/2008	4	21-25264	4	323	328	0.5	18.1
340	10/19/2007	1	21-25264	5	349.5	354.5	0.1	21.8
340	2/14/2008	2	21-25264	5	349.5	354.5	0.6	20.6
407	5/7/2008	3	21-25264	5	349.5	354.5	0.5	19.2
487	9/23/2008	4	21-25264	5	349.5	354.5	0.4	18
236	10/30/2007	1	21-603058	1	67.5	72.5	—*	—
340	2/13/2008	2	21-603058	1	67.5	72.5	1.7	19.9
407	5/8/2008	3	21-603058	1	67.5	72.5	1.4	18.7
487	9/24/2008	4	21-603058	1	67.5	72.5	1.1	19.4
236	10/30/2007	1	21-603058	2	160.5	165.5	—	—
340	2/13/2008	2	21-603058	2	160.5	165.5	0.7	20.2
236	10/30/2007	1	21-603058	3	217	222	—	—
340	2/13/2008	2	21-603058	3	217	222	1.3	20.4
407	5/8/2008	3	21-603058	3	217	222	0.2	19
487	9/24/2008	4	21-603058	3	217	222	0.7	18.1
236	10/30/2007	1	21-603058	4	242.5	247.5	—	—
340	2/13/2008	2	21-603058	4	242.5	247.5	1.3	20.5
407	5/8/2008	3	21-603058	4	242.5	247.5	0.9	18.5
487	9/24/2008	4	21-603058	4	242.5	247.5	0.3	17.9
236	10/30/2007	1	21-603058	5	339.5	344.5	—	—

Table 4.1-1 (continued)

Event ID	Collection Date	FY2008 Sampling Round	Location ID	Sample Port Number	Top Depth (ft bgs)	Bottom Depth (ft bgs)	%CO_2	%O_2
340	2/13/2008	2	21-603058	5	339.5	344.5	0.9	20.6
407	5/8/2008	3	21-603058	5	339.5	344.5	0.7	18.7
487	9/24/2008	4	21-603058	5	339.5	344.5	0.3	17.8
236	11/4/2007	1	21-603059	1	77.5	82.5	—	—
340	2/6/2008	2	21-603059	1	77.5	82.5	0.6	19.8
407	5/9/2008	3	21-603059	1	77.5	82.5	1	18.7
487	9/25/2008	4	21-603059	1	77.5	82.5	0.9	19.3
236	11/3/2007	1	21-603059	3	187.5	192.5	—	—
340	2/6/2008	2	21-603059	3	187.5	192.5	0.7	19.9
407	5/9/2008	3	21-603059	3	187.5	192.5	1	18.8
487	9/25/2008	4	21-603059	3	187.5	192.5	0.8	19.8
236	11/3/2007	1	21-603059	4	229.5	234.5	—	—
340	2/6/2008	2	21-603059	4	229.5	234.5	0.5	20.3
407	5/9/2008	3	21-603059	4	229.5	234.5	1	18.7
487	9/25/2008	4	21-603059	4	229.5	234.5	0.8	19.1
236	11/3/2007	1	21-603059	5	292.5	297.5	—	—
340	2/6/2008	2	21-603059	5	292.5	297.5	0.9	19.9
407	5/9/2008	3	21-603059	5	292.5	297.5	0.9	18.8
487	9/25/2008	4	21-603059	5	292.5	297.5	1	18.8
236	11/3/2007	1	21-603059	6	372.5	377.5	—	—
340	2/8/2008	2	21-603059	6	372.5	377.5	0.5	19.9
407	5/9/2008	3	21-603059	6	372.5	377.5	—	—
487	9/25/2008	4	21-603059	6	372.5	377.5	0.2	19.7

* — = Field-screening results not documented.

Table 5.1-1
Summary of VOCs Detected in 2007–2008 Pore-Gas Samples at MDA T

Sample ID	Location ID	Depth (ft)	Collection Date	Acetone	Benzene	Bromodichloromethane	Bromoform	Butanol[1-]	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorodibromomethane	Chloroform	Cyclohexane	Dichlorobenzene[1,4-]	Dichlorodifluoromethane	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Ethanol	Ethylbenzene	Ethyltoluene[4-]	Hexane	Hexanone[2-]	Methyl-2-pentanone[4-]	Methylene Chloride	n-Heptane	Propanol[2-]	Propylene	Tetrachloroethene	Tetrahydrofuran	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethane[1,2-]	Trichloroethene	Trimethylbenzene[1,3,5-]	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD21-07-6813	21-25264	67.50–72.50	10/19/2007	17	—*	—	12	—	—	3	160	—	350	3.2	—	10	3.8	—	—	—	—	—	—	—	—	250	—	—	—	1500	—	5.1	—	18	—	660	—	—	—
MD21-08-10511	21-25264	67.50–72.50	2/14/2008	—	—	—	—	—	—	—	160	—	410	—	—	13	—	—	—	—	—	—	—	—	—	36	—	—	—	2500	—	—	—	29	—	980	—	—	—
MD21-08-12247	21-25264	67.50–72.50	5/7/2008	—	—	—	—	—	—	—	140	—	410	—	—	13	—	—	—	—	—	—	—	—	—	24	—	—	—	2300	5.2	—	—	26	—	880	—	—	—
MD21-08-14828	21-25264	67.50–72.50	9/23/2008	—	—	—	—	—	—	—	150	—	400	—	—	13	—	—	—	—	—	—	—	—	—	19	—	—	—	2700	—	—	—	27	—	1000	—	—	—
MD21-07-6814	21-25264	150.50–155.50	10/19/2007	68	2.9	—	—	—	12	—	160	—	310	4.5	—	8.6	4	—	—	—	—	—	—	—	—	300	—	—	—	360	—	6.8	—	19	—	420	—	—	—
MD21-08-10512	21-25264	150.50–155.50	2/14/2008	12	—	—	—	—	—	5.7	170	—	360	5.4	—	10	—	—	—	—	—	—	—	—	—	220	—	—	—	440	—	—	7	24	—	520	—	—	—
MD21-08-12248	21-25264	150.50–155.50	5/7/2008	73	—	—	—	—	15	—	150	—	360	5.4	—	9.7	—	—	—	10	—	—	—	—	—	190	—	—	—	400	—	—	—	23	—	480	—	—	—
MD21-08-14829	21-25264	150.50–155.50	9/23/2008	11	—	—	—	—	—	—	170	—	380	—	—	9.8	3.8	—	—	—	—	—	—	—	—	200	—	—	6.9	420	—	—	7.7	26	—	530	—	—	—
MD21-07-6815	21-25264	222.50–227.50	10/19/2007	18	—	—	—	—	3.4	3.8	180	—	300	3.6	—	6.6	6.3	—	—	—	—	—	—	—	—	420	—	—	—	160	—	—	6.7(J)	16	—	380	—	—	—
MD21-08-10513	21-25264	222.50–227.50	2/14/2008	—	—	6	—	—	—	6	310	—	450	5.6	—	9.9	9.3	5	—	—	—	—	—	—	—	640	—	—	—	190	—	—	9	21	4.6(J)	620	—	—	—
MD21-08-12249	21-25264	222.50–227.50	5/7/2008	—	—	—	—	—	—	3.2	290	—	470	6.2	—	8.6	9.3	6.6	—	—	—	—	—	—	—	590	—	—	—	190	—	3.4	11	21	—	580	—	—	—
MD21-08-14830	21-25264	222.50–227.50	9/23/2008	12	—	—	—	—	—	—	320	—	480	—	—	9.8	11	5.2	—	—	—	—	—	—	—	660	—	—	13	200	—	—	10	24	—	640	—	—	—
MD21-07-6816	21-25264	323.00–328.00	10/19/2007	19	—	—	—	—	—	—	190	—	270	—	—	4.9	5.9	4	—	—	—	—	—	—	—	590	—	—	—	79	—	5.8	—	5.4	—	320	—	—	5.7
MD21-08-10514	21-25264	323.00–328.00	2/14/2008	—	—	—	—	—	—	—	370	—	540	—	—	7	12	8.3	—	—	—	—	—	—	—	1200	—	—	—	81	—	—	10	9.3	—	620	—	—	—
MD21-08-12250	21-25264	323.00–328.00	5/7/2008	110	—	—	—	—	11	—	340	—	570	—	6	—	13	7.6	—	—	—	—	—	—	—	1200	—	—	—	77	—	—	11	8.6	—	600	—	—	—
MD21-08-14831	21-25264	323.00–328.00	9/23/2008	—	—	—	—	—	—	—	430	—	680	—	—	8.1	20	8	—	—	—	—	—	—	—	1500	—	—	19	70	—	—	11	11	—	770	—	—	—
MD21-07-6817	21-25264	349.50–354.50	10/19/2007	44	—	—	—	—	5.6	—	230	—	550	—	—	—	15	6.8	—	—	—	—	—	—	—	1300	—	—	—	26	—	9.4	—	—	—	460	—	—	8.4
MD21-08-10515	21-25264	349.50–354.50	2/14/2008	—	—	—	—	—	—	—	460	—	1000	—	—	—	30	15	—	—	—	—	—	—	—	2400	—	—	—	34	—	—	—	—	—	890	—	—	—
MD21-08-12251	21-25264	349.50–354.50	5/7/2008	—	—	—	—	—	—	—	360	—	940	—	—	—	24	12	—	—	—	—	—	—	—	1900	—	—	—	32	—	16	—	—	—	720	—	—	—
MD21-08-14832	21-25264	349.50–354.50	9/23/2008	—	—	—	—	—	—	—	500	—	1100	—	—	—	36	13	—	—	—	—	—	—	—	2500	—	—	21	31	—	—	—	—	—	920	—	—	—
MD21-07-6807	21-603058	67.50–72.50	10/30/2007	120	3.9	—	10	—	40	3.8	63	—	450	—	—	5.1	—	—	—	—	—	—	4.3	29	8.7	7.2	3.9	—	85	650	—	5.7	—	23	—	270	—	—	4.9
MD21-08-10504	21-603058	67.50–72.50	2/13/2008	—	—	—	—	—	—	2.7	78	—	540	—	—	5.5	—	—	—	—	—	—	—	—	—	5.1	—	—	—	750	—	—	7.2	26	—	340	—	—	—
MD21-08-12242	21-603058	67.50–72.50	5/9/2008	—	—	—	—	52	—	6.3	61	—	490	—	—	—	—	—	—	12	—	—	—	—	—	6.8	—	—	—	640	2.7	—	—	21	—	300	—	—	—
MD21-08-14813	21-603058	67.50–72.50	9/24/2008	30	—	—	—	—	5	—	68	—	510	—	—	5	—	—	—	—	—	—	—	—	—	5.3	—	—	—	680	—	—	—	22	—	320	—	—	—
MD21-07-6808	21-603058	160.50–165.50	10/30/2007	35	8.4	—	—	42	17	12	100	9.7	330	—	—	6.9	—	—	—	—	7.5	—	36	—	5.5	52	24	—	690	210	4.9	14	8.5	17	—	280	—	9.9	21
MD21-08-10505	21-603058	160.50–165.50	2/13/2008	21	—	—	—	—	13	9.7	240	—	680	—	—	7.8	—	4.1	—	—	—	—	—	—	—	120	—	—	49	410	—	—	16	38	—	640	—	—	—
MD21-07-6809	21-603058	217.00–222.00	10/30/2007	200	4.9	6.4	—	—	69	5.7	400	—	680	—	6	6.8	5	9.7	—	—	—	—	8.3	37	8.9	420	6.4	—	150	270	—	5.8	26	36	13	790	—	—	4.8
MD21-08-10506	21-603058	217.00–222.00	2/13/2008	—	—	—	—	—	—	4.1	380	—	690	—	—	7.2	6	9.5	—	—	—	—	—	—	—	430	—	—	—	220	—	14	24	33	—	830	—	—	—
MD21-08-12244	21-603058	217.00–222.00	5/8/2008	—	—	—	—	—	—	—	370	—	740	—	5.5	6.5	5.4	9.9	—	15	—	—	—	—	—	380	—	—	—	240	—	—	27	35	13	780	—	—	—
MD21-08-14814	21-603058	217.00–222.00	9/24/2008	—	—	—	—	—	—	—	380	—	720	—	—	7.3	6.3	9.1	—	—	—	—	—	—	—	440	—	—	11	230	—	—	23	35	14	820	—	—	—
MD21-07-6810	21-603058	242.50–247.50	10/30/2007	170	6.4	—	16	—	20	6.2	400	7.3	720	—	10	5.5	9.8	11	4.1	—	—	—	9.4	—	4.5	860	6.3	—	160	120	—	9.6	19	22	19	810	—	—	5
MD21-08-10507	21-603058	242.50–247.50	2/13/2008	—	—	—	—	—	—	7.1	760	—	1200	—	12	9.4	—	19	—	—	—	—	—	—	—	1500	—	—	—	180	—	—	43	40	45	1500	—	—	—
MD21-08-12245	21-603058	242.50–247.50	5/8/2008	—	4.1	—	—	—	—	5.6	610	—	1100	—	14	8	17	17	6	55	—	—	—	—	—	1200	—	—	—	170	3.8	—	37	32	42	1200	—	—	—
MD21-08-14815	21-603058	242.50–247.50	9/24/2008	14	—	—	—	70	7	9.2	440	—	770	—	9.1(J)	6.2	15	11	5.7	7.3	—	—	—	—	—	1000	—	—	10	120	—	—	24	23	33	990	—	—	—

Table 5.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Collection Date	Acetone	Benzene	Bromodichloromethane	Bromoform	Butanol[1-]	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorodibromomethane	Chloroform	Cyclohexane	Dichlorobenzene[1,4-]	Dichlorodifluoromethane	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Ethanol	Ethylbenzene	Ethyltoluene[4-]	Hexane	Hexanone[2-]	Methyl-2-pentanone[4-]	Methylene Chloride	n-Heptane	Propanol[2-]	Propylene	Tetrachloroethene	Tetrahydrofuran	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethane[1,1,2-]	Trichloroethene	Trimethylbenzene[1,3,5-]	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD21-07-6811	21-603058	339.50–344.50	10/30/2007	160	—	—	—	—	21	—	6.4	—	110	—	—	—	3.9	—	—	—	—	—	—	—	—	280	—	—	12	—	—	—	—	—	6.3	47	—	—	—
MD21-08-10508	21-603058	339.50–344.50	2/13/2008	—	—	—	—	—	—	—	530	—	1000	—	14	—	24	15	—	—	—	—	—	—	—	1900	—	—	—	76	—	—	26	12	26	930	—	—	—
MD21-08-12246	21-603058	339.50–344.50	5/8/2008	—	—	—	—	—	—	—	510	—	1100	—	18	—	24	15	—	42	—	—	—	—	—	1800	—	—	—	61	—	—	28	11	31	1000	—	—	—
MD21-08-14816	21-603058	339.50–344.50	9/24/2008	24	—	—	—	—	—	—	520	—	1000	—	13(J)	—	24	17	—	—	—	—	—	—	—	2000	—	—	16	52	—	—	23	11	25	990	—	—	—
MD21-07-6804	21-603059	77.50–82.50	11/4/2007	49	4.8	—	10	—	4.3	12	62	—	840	—	—	6	—	—	—	—	—	—	8.5	—	—	6.4	6.2	—	140	1300	—	6.6	7.2	20	—	710	—	—	5.6
MD21-08-10518	21-603059	77.50–82.50	2/6/2008	—	—	—	—	—	—	2.8	58	—	800	—	—	5.1	—	—	—	—	—	—	—	—	—	4.2	—	—	—	1400	—	—	6.9	19	—	700	—	—	—
MD21-08-12236	21-603059	77.50–82.50	5/9/2008	11	—	—	—	—	2.8	2.9	57	—	900	—	—	—	—	—	—	—	—	—	—	—	—	3.1	—	—	—	1400	—	—	6.6	19	—	670	—	—	—
MD21-08-14818	21-603059	77.50–82.50	9/25/2008	—	—	—	—	—	—	—	67	—	1000	—	—	6.2	—	—	—	—	—	—	—	—	—	4.3	—	—	—	1700	—	—	—	21	—	770	—	—	—
MD21-07-6803	21-603059	187.50–192.50	11/3/2007	290	5.5	6.4	—	—	55	5.1	150	—	630	3.4	—	7.4	—	7.4	—	—	—	—	6.8	—	3.6(J)	43	4.7	11	160	340	—	6.6	19	29	—	480	—	—	—
MD21-08-10519	21-603059	187.50–192.50	2/8/2008	—	—	7	—	—	—	3.5	140	—	570	—	—	7.1	—	6.2	—	—	—	—	—	—	—	24	—	—	—	320	—	—	15	28	—	460	—	—	—
MD21-08-12237	21-603059	187.50–192.50	5/9/2008	—	—	6.7	—	—	—	—	140	—	610	—	—	—	—	7.1	—	—	—	—	—	—	—	22	—	—	—	320	—	—	18	24	—	440	—	—	—
MD21-08-14819	21-603059	187.50–192.50	9/25/2008	—	—	7	—	—	8	—	130	—	550	—	—	6.5	—	5.5	—	—	—	—	—	—	—	24	—	—	8.4	300	—	—	15	26	—	440	—	—	—
MD21-07-6801	21-603059	229.50–234.50	11/3/2007	560	8.2	7.8	—	21	170	15	290	—	630	3.4	—	7.4	—	12	3.6	—	11	24	7.7	86	21	68	12	9	210	250	3.7	25	30	31	—	580	11	16	35
MD21-08-10520	21-603059	229.50–234.50	2/6/2008	11	2.9	—	—	—	—	2.7	140	—	330	—	—	4.8	—	5.7	—	—	—	—	—	—	—	23	—	—	—	120	—	13	12	14	—	300	—	—	—
MD21-08-12238	21-603059	229.50–234.50	5/9/2008	31	—	6.8	—	—	4	4	330	—	670	—	—	8.4	—	14	—	—	—	—	—	—	—	50	—	—	—	240	—	—	35	29	—	620	—	—	—
MD21-08-14820	21-603059	229.50–234.50	9/25/2008	—	—	—	—	—	—	—	280	—	580	—	—	7.1	—	11	—	—	—	—	—	—	—	49	—	—	13	230	—	—	29	28	—	600	—	—	—
MD21-07-6802	21-603059	292.50–297.50	11/3/2007	150	3.2	9.2	—	—	8.4	5.1	620	—	680	—	—	9.2	5.2	27	5	—	—	—	—	—	—	380	—	—	—	200	2.7	6	55	26	27	1100	—	—	—
MD21-08-10521	21-603059	292.50–297.50	2/6/2008	—	—	9.6	—	—	—	3.7	670	—	660	—	—	9.8	5.4	26	3.9	—	—	—	—	—	—	330	—	—	—	180	—	4.6	51	27	24	1200	—	—	—
MD21-08-12239	21-603059	292.50–297.50	5/9/2008	—	2.8	8.4	—	—	—	—	620	—	650	—	—	9	5.3	24	13	21	—	—	—	—	—	290	—	—	—	170	—	3.8	54	25	22	1000	—	—	—
MD21-08-14821	21-603059	292.50–297.50	9/25/2008	—	—	9.7	—	—	—	—	620	—	620	—	—	8.6	5.3	23	3.8	—	—	—	—	—	—	300	—	—	20	160	—	3.9	49	25	20	1100	—	—	—
MD21-07-6800	21-603059	372.50–377.50	11/3/2007	130	3.3	7.3	—	—	3.7	2.8	350	—	540	—	—	—	11	33	—	—	—	—	—	—	—	720	—	—	40	78	—	5.1	16	8.2	81	800	—	—	—
MD21-08-10522	21-603059	372.50–377.50	2/8/2008	9.4	3.4	12	—	—	—	3.4	580	—	750	—	7	—	16	52	5.9	—	—	—	—	—	—	920	—	—	—	110	—	7.9	24	14	120	1300	—	—	—
MD21-08-12240	21-603059	372.50–377.50	5/9/2008	58	3.2	10	—	—	6.6	—	540	—	780	—	7.6	—	14	51	4.4	65	—	—	—	—	—	880	—	—	—	100	—	6.2	28	12	110	1200	—	—	—
MD21-08-14822	21-603059	372.50–377.50	9/25/2008	—	—	8.4	—	—	—	18	380	—	520	—	—	—	12	32	—	—	—	—	—	—	—	680	—	—	11	63	—	5.4	17	9	81	860	—	—	—

Note: Results are in µg/m^3.

* — = Not detected.

Table 5.2-1
Summary of Tritium Results in 2007–2008 Pore-Gas Samples at MDA T

Sample ID	Location ID	Depth (ft)	Collection Date	Tritium (pCi/L)
MD21-08-10511	21-25264	67.50–72.50	2/14/2008	1541.74
MD21-08-12247	21-25264	67.50–72.50	5/7/2008	4353.51
MD21-08-14828	21-25264	67.50–72.50	9/23/2008	4218.93
MD21-07-6814	21-25264	150.50–155.50	10/19/2007	9385.24
MD21-08-10512	21-25264	150.50–155.50	2/14/2008	60699.9
MD21-08-12248	21-25264	150.50–155.50	5/7/2008	128043
MD21-08-14829	21-25264	150.50–155.50	9/23/2008	106724
MD21-08-10513	21-25264	222.50–227.50	2/14/2008	35183.9
MD21-08-12249	21-25264	222.50–227.50	5/7/2008	45383.1
MD21-08-14830	21-25264	222.50–227.50	9/23/2008	74687.2
MD21-08-10514	21-25264	323.00–328.00	2/14/2008	1397.55
MD21-08-12250	21-25264	323.00–328.00	5/7/2008	2688.04
MD21-08-14831	21-25264	323.00–328.00	9/23/2008	1843.05
MD21-08-10515	21-25264	349.50–354.50	2/14/2008	805.354
MD21-08-12251	21-25264	349.50–354.50	5/7/2008	1406.68
MD21-08-14832	21-25264	349.50–354.50	9/23/2008	1022.31
MD21-08-10504	21-603058	67.50–72.50	2/13/2008	563.806
MD21-07-6808	21-603058	160.50–165.50	10/30/2007	816.721
MD21-08-10505	21-603058	160.50–165.50	2/13/2008	779.214
MD21-08-10506	21-603058	217.00–222.00	2/13/2008	16974.6
MD21-08-12244	21-603058	217.00–222.00	5/8/2008	418.555
MD21-08-14814	21-603058	217.00–222.00	9/24/2008	504.074
MD21-08-12245	21-603058	242.50–247.50	5/8/2008	361.873
MD21-08-14815	21-603058	242.50–247.50	9/24/2008	651.794
MD21-08-10508	21-603058	339.50–344.50	2/13/2008	10722.1
MD21-08-10518	21-603059	77.50–82.50	2/6/2008	565.45
MD21-08-14818	21-603059	77.50–82.50	9/25/2008	300.31
MD21-08-12237	21-603059	187.50–192.50	5/9/2008	329.351
MD21-08-14819	21-603059	187.50–192.50	9/25/2008	349.081
MD21-07-6801	21-603059	229.50–234.50	11/3/2007	1585.58
MD21-08-10520	21-603059	229.50–234.50	2/6/2008	719.504
MD21-08-12238	21-603059	229.50–234.50	5/9/2008	768.824
MD21-08-14820	21-603059	229.50–234.50	9/25/2008	1113.67
MD21-08-10521	21-603059	292.50–297.50	2/6/2008	438.3
MD21-08-12239	21-603059	292.50–297.50	5/9/2008	227.726
MD21-08-14821	21-603059	292.50–297.50	9/25/2008	1979.88

Table 5.2-1 (continued)

Sample ID	Location ID	Depth (ft)	Collection Date	Tritium (pCi/L)
MD21-08-10522	21-603059	372.50–377.50	2/8/2008	1496.79
MD21-08-12240	21-603059	372.50–377.50	5/9/2008	4277.97
MD21-08-14822	21-603059	372.50–377.50	9/25/2008	239.181

Appendix A

Field Methods

A-1.0 INTRODUCTION

This appendix summarizes the field methods implemented during the 2007–2008 pore-gas monitoring period at Material Disposal Area (MDA) T, Consolidated Unit 21-016(a)-99, in Technical Area 21 at Los Alamos National Laboratory (the Laboratory). All activities were conducted in accordance with the applicable standard operating procedures (SOPs), quality procedures (QPs), Laboratory implementation requirements, Laboratory procedural requirements and Laboratory implementation guidance. The Laboratory procedures may be found at the following URL: http://www.lanl.gov/environment/all/qa/adep.shtml.

The following sections provide a description of field methods used during the 2007–2008 pore-gas monitoring period at MDA T. Table A-1.0-1 provides a summary of the specific field methods followed, and Table A-1.0-2 lists the general procedures followed.

A-2.0 FIELD METHODS

All work was conducted in accordance with a site-specific health and safety plan and an integrated work document. Field activities conducted according to SOPs are discussed below.

A-2.1 Pore-Gas Field Screening and Sample Collection

All samples were collected in accordance with the current version of the Environment and Remediation Support Services SOP-5074, Sampling Sub-Atmospheric Air.

Before each sampling event, each sample port was purged and monitored with a Landtec GEM2000 instrument (or equivalent) until the percent carbon dioxide and oxygen levels stabilized at values representative of subsurface pore-gas conditions. In addition, the vapor sample tubing was purged of stagnant air as the air was drawn from the sampling interval through the line. To ensure that the sample collected was representative of the subsurface air at depth, every sampling activity included a purge cycle. Once purging and field screening were completed, vapor samples were collected using SUMMA canisters (for volatile organic compound [VOC] analysis) and silica gel columns (for tritium analysis), and the sample information was recorded on the appropriate sample collection log (SCL). Field-screening results were also recorded on the appropriate SCL and/or in the field logbook. Field chain-of-custody (COC) forms and SCLs are provided in Appendix B.

In addition to the characterization samples, two types of quality assurance/quality control (QA/QC) samples were collected and analyzed for VOCs using SUMMA canisters: a field duplicate (FD) sample and an equipment blank (FB) of ultrapure nitrogen. Silica gel column FD samples were also collected for tritium analysis. FD and FB samples were collected at a frequency greater than or equal to 10% per sampling event in accordance with SOP-01.05, Field Quality Control Samples. Table 4.0-2 summarizes all (2007–2008) QA/QC samples collected from MDA T monitoring wells 21-603058, 21-603059, and 21-25264, and their respective analyses.

All samples were submitted to the Sample Management Office (SMO) for processing and transport to off-site contract analytical laboratories.

Table A-1.0-1
Summary of Field Methods

Method	Summary
General Instructions for Field Investigations	This general procedure provides an overview of instructions regarding activities to be performed before, during, and after field investigations. It is assumed that field investigations involve standard sampling equipment, personal protective equipment, waste management, and site-control equipment/materials. The procedure covers premobilization activities, mobilization to the site, documentation and sample collection activities, sample media evaluation, surveillance, and completion of lessons learned.
Sample Containers and Preservation	Specific requirements/processes for sample containers, preservation techniques, and holding times are based on the U.S. Environmental Protection Agency guidance for environmental sampling, preservation, and QA. Specific requirements are met for each sample and are printed in the sample collection logs provided by the SMO (size and type of container, preservatives, etc.). All samples are preserved by placing them in insulated containers with ice to maintain a temperature of 4°C.
Handling, Packaging, and Transporting Field Samples	Field team members seal and label samples before packing to ensure that the sample containers and the containers used for transport are free of external contamination. All environmental samples are collected, preserved, packaged, and transported to the SMO under COC. The SMO arranges for shipping of the samples to analytical laboratories. Any levels of radioactivity (i.e., action-level or limited-quantity ranges) are documented in sample collection logs submitted to the SMO.
Sample Control and Field Documentation	The collection, screening, and transport of samples are documented in standard forms generated by the SMO. These forms include sample collection logs, COC forms, sample container labels, and custody seals. Collection logs are completed at the time of sample collection and are signed by the sampler and a reviewer who verifies the logs for completeness and accuracy. Corresponding labels are initialed and applied to each sample container, and custody seals are placed around container lids or openings. COC forms are completed and signed to verify that the samples are not left unattended.
Field QC Samples	Field QC samples are collected as follows: Field duplicates are collected at a frequency of 10% at the same time as a regular sample and submitted for the same analyses. Equipment rinsate blanks, collected at a frequency of 10%, are taken by rinsing sampling equipment with deionized water, which is collected in a sample container and submitted for laboratory analyses. Trip blanks, required for all field events that include collecting samples for VOC analyses, are collected. Trip blanks are kept with the other sample containers during the sampling process and are submitted for laboratory analyses.
Sampling of Subatmospheric Air	Vapor sampling was performed on four monitoring wells in accordance with SOP-5074 and analyzed for VOCs and tritium. This SOP describes the process of sampling subatmospheric air from vapor ports in monitoring wells and boreholes. Procedure covers presampling activities, sampling to detect and quantify gaseous organic concentration in air, SUMMA sampling (a passive collection and containment system of laboratory-quality air samples), adsorbent column sampling, sampling through the packer system (a sampling system that uses inflatable bladders to seal off a desired interval in an open borehole, or at the end of drill casing, to obtain a sample from a discrete section), and postsampling activities.

Table A-1.0-2
List of Applicable General Procedures for MDA T Periodic Pore-Gas Monitoring Activities

Document Number	Los Alamos National Laboratory Procedure Title
EP-ERSS-SOP-5055 R0	General Instructions for Field Investigations
P101-6 R0	Personal Protective Equipment
QP-5.7, R2 ICN3	Notebook Documentation for Environmental Restoration Technical Activities

Appendix B

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

Appendix C

Quality Assurance/Quality Control Program

C-1.0 INTRODUCTION

This appendix discusses the analytical methods and data quality review for the quarterly pore-gas samples collected during the 2007–2008 monitoring period at Material Disposal Area (MDA) T, Consolidated Unit 21-016(a)-99, in Technical Area 21 at Los Alamos National Laboratory (the Laboratory).

Quality assurance (QA), quality control (QC), and data validation procedures were implemented in accordance with the “Quality Assurance Project Plan Requirements for Sampling and Analysis” (LANL 1996, 054609), and the Laboratory’s statement of work (SOW) for analytical laboratories (LANL 1995, 049738; LANL 2000, 071233). The results of the QA/QC procedures were used to estimate the accuracy, bias, and precision of the analytical measurements. Samples for QC include method blanks, matrix spikes (MSs), laboratory control samples (LCSs), internal standards, initial calibration verifications (ICVs) and continuing calibration verifications (CCVs), surrogates, and tracers.

The type and frequency of laboratory QC analyses are described in the SOW for analytical laboratories (LANL 1995, 049738; LANL 2000, 071233). Other QC factors, such as sample preservation and holding times, were also assessed in accordance with the requirements outlined in Standard Operating Procedure (SOP) 01.02, Sample Containers and Preservation.

The following SOPs were used for data validation:

- SOP-5161, Routine Validation of Volatile Organic Data
- SOP-5166, Routine Validation of Gamma Spectroscopy Data, Chemical Separation Alpha Spectrometry, Gas Proportional Counting, and Liquid Scintillation Data

Routine data validation was performed for each data package (also referred to as request numbers), and analytical data were reviewed and evaluated based on U.S. Environmental Protection Agency (EPA) National Functional Guidelines, where applicable (EPA 1994, 048639; EPA 1999, 066649). As a result of the data validation and assessment efforts, qualifiers are assigned to the analytical records as appropriate. The data qualifier definitions are provided in Table C-1.0-1.

C-2.0 ANALYTICAL DATA ORGANIZATION AND VINTAGE

The 2007–2008 MDA T pore-gas analytical data were obtained from 75 samples (58 characterization and 17 QA/QC) collected during four sampling events (October 2007–September 2008) from vapor-monitoring well locations 21-25264, 21-603058, and 21-603059. Complete data packages and sample documentation for the 2007–2008 samples are provided in Appendix B. Although the first round of 2007–2008 pore-gas data was previously reported in the MDA T Phase II investigation report (LANL 2008, 102182), these data are also presented and evaluated in this report.

C-3.0 ORGANIC CHEMICAL ANALYSIS METHODS

MDA T pore-gas samples were submitted for analysis of volatile organic compounds (VOCs) as presented in Table C-3.0-1. Table 4.0-2 summarizes all 2007–2008 pore gas samples collected at MDA T and the requested analyses. All VOC results are provided on CD in Appendix D.

C-3.1 Organic Chemical QA/QC Samples

The QC samples are designed to produce a qualitative measure of the reliability of a specific part of an analytical procedure. The methods for validating organic chemical results on the basis of the various QA/QC sample types are specified in the SOPs. The validation of organic chemical data using QA/QC samples and other methods may have resulted in the rejection of the data or the assignment of various qualifiers to individual sample results.

Calibration verifications, LCSs, method blanks, surrogates, and internal standards were analyzed to assess the accuracy and precision of organic chemical analyses. Each of these QA/QC sample types is defined in the analytical services SOW (LANL 1995, 049738; LANL 2000, 071233), described in the applicable validation SOPs, and summarized below.

Calibration verification is the establishment of a quantitative relationship between the response of the analytical instrument and the concentration of the target analyte. There are two aspects of calibration verification: initial and continuing. The initial calibration verifies the linearity of the calibration curve as well as the individual calibration standards used to perform the calibration. The continuing calibration verifies that the initial calibration is still linear and valid. The continuing calibration also serves to determine that analyte identification criteria, such as retention times and spectral matching, are being met.

The LCS is a sample of the same matrix spiked with the target analytes and serves to monitor the overall performance. Following Laboratory SOP guidance, analytical results were qualified according to EPA National Functional Guidelines (EPA 1999, 066649) if the individual LCS recoveries were not within method-specific acceptance criteria.

A method blank is an analyte-free matrix to which reagents are added in the same volumes or proportions as those used in the environmental sample processing and 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.

A surrogate compound (surrogate) is an organic chemical used in the analyses of target analytes. The surrogate is similar in composition and behavior to the target analytes but is not normally found in environmental samples. Surrogates are added to every blank, sample, and spike to evaluate the efficiency with which analytes are recovered during extraction and analysis. The recovery percentage of the surrogates must be within specified ranges, or the sample may be rejected or assigned a qualifier.

Internal standards are chemical compounds added to every blank, sample, and standard extract at a known concentration. Internal standards are used as the basis for quantitation of target analytes. The percent recovery (%R) for internal standards should be within the range of 50%–200%.

Details regarding the quality of the 2007–2008 MDA T VOC pore-gas data are summarized below.

C-3.1.1 MDA T Pore-Gas VOC Data

During the 2007–2008 investigation, 58 characterization samples and 16 QA/QC samples were submitted for VOC analysis.

No VOC data were rejected.

Eight VOC results were qualified as estimated (J) for the following reasons.

- The ICV exceeded the percent relative standard deviation (%RSD) criteria and/or the associated multipoint calibration correlation coefficient was <0.995 (three carbon tetrachloride and two dichlorobenzene[1,4-] results).
- The analytical laboratory qualified the result as estimated and requalification of the data via data validation did not occur because of QC requirements (one result for methyl-2-pentanone[4-], trichloro-1,2,2-trifluoroethane[1,1,2-], and trichloroethane[1,1,2-]).

One trimethylbenzene[1,2,4-] result was qualified as estimated biased low (J-) because the LCS %R was greater than the upper acceptance limit.

A total of 178 VOC results were qualified as estimated and not detected (UJ) for the following reasons.

- The LCS %R was less than the lower acceptance limit but greater than 10% (13 hexachlorobutadiene and 9 trichlorobenzene[1,2,4-]).
- The required LCS documentation was missing (two dichlorobenzene[1,2-] and eight trichlorobenzene[1,2,4-]).
- The ICV exceeded the %RSD criteria and/or the associated multipoint calibration correlation coefficient is <0.995 (2 bromoform, 17 butanol[1-], 2 chlorodifluoromethane, 2 chloroethane, 14 dichlorobenzene[1,2-], 12 dichlorobenzene[1,4-], 2 dichloropropane[1,2-], 15 hexachlorobutadiene, 17 methanol, 15 methyl tert-butyl ether, 15 methyl-2-pentanone[4-], and 14 trichlorobenzene[1,2,4-]).
- The ICV and/or CCV were recovered outside the method-specific limits (5 chlorodifluoromethane and 14 methyl tert-butyl ether).

VOC results were qualified as not detected (U) either because the mass spectrum did not meet specifications or because the sample results were less than or equal to 5 or 10 times the concentration of the related analyte in the trip blank, rinsate blank or field blank.

All VOC pore-gas data collected in 2007–2008 at MDA T were used to evaluate VOC trends over the monitoring period as well as assess whether the VOCs present in the subsurface beneath MDA T could potentially contaminate the regional aquifer.

C-4.0 RADIONUCLIDE ANALYSIS METHODS

MDA T pore gas samples collected in 2007–2008 were analyzed by EPA Method 906.0 for tritium (Table C-3.0-1). Table 4.0-2 summarizes all 2007–2008 pore-gas samples collected at MDA T and the requested analyses. All tritium results are provided on CD in Appendix D.

C-4.1 Radionuclide QA/QC Samples

The minimum detectable concentration (MDC) for tritium in preparation blanks (PBs), method blanks, laboratory duplicates, tracer/carrier recovery, LCSs, and MS samples were analyzed as part of the MDA T pore-gas evaluation to assess the accuracy and precision of the radionuclide analysis. The qualifiers and sample types for radionuclides are defined in the analytical services SOW (LANL 1995, 049738; LANL 2000, 071233), are described in the applicable validation SOPs, and are discussed briefly below. The validation of radionuclide data using QA/QC samples and other methods may have resulted in the rejection of data or the assignment of various qualifiers to individual sample results.

The MDC for each radionuclide is defined as the minimum activity concentration that the analytical laboratory equipment can detect in 95% of the analyzed samples and is used to assess analytical performance.

The PBs and method blanks are used to measure bias and assess potential cross-contamination of samples during preparation and analysis. Blank results should be less than the MDC for each radionuclide.

Laboratory duplicates are used to assess or demonstrate acceptable laboratory method precision at the time of analysis as well as to assess the long-term precision of an analytical method on various matrices. Duplicate results are used to calculate a duplicate error ratio (DER). The DER is based on 1 standard deviation of the sample and the duplicate sample and should be less than 4.

The LCS serves as a monitor of the overall performance of each step during the analysis, and the acceptance criteria for LCSs are method-specific. For radionuclide methods, LCS %Rs should fall into the control limits of 80%–120%.

The accuracy of radionuclide analyses is also assessed using MS samples. These samples are designed to provide information about the effect of the sample matrix on the sample preparation procedures and analytical technique. The MS %Rs should be within the acceptance range of 75%–125%; however, if the sample result is more than 4 times the amount of the spike added, these acceptance criteria do not apply.

Details regarding the quality of the 2007–2008 MDA T tritium data are summarized below.

C-4.1.1 MDA T Pore-Gas Tritium Data

During the 2008 investigation, 58 characterization samples and 10 field QA/QC samples were submitted for tritium analysis.

No tritium data were rejected and no other data quality issues were identified.

All tritium data collected in 2007–2008 in MDA T pore gas were used to evaluate tritium trends over the monitoring period.

C-5.0 REFERENCES

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

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

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

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

LANL (Los Alamos National Laboratory), July 1995. “Statement of Work (Formerly Called "Requirements Document") - Analytical Support, (RFP number 9-XS1-Q4257), (Revision 2 - July, 1995),” Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 1995, 049738)

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)

LANL (Los Alamos National Laboratory), February 2008. “Phase II Investigation Report for Material Disposal Area T at Technical Area 21, Revision 1,” Los Alamos National Laboratory document LA-UR-08-1215, Los Alamos, New Mexico. (LANL 2008, 102182)

Table C-1.0-1
Data Qualifier Definitions

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

Table C-3.0-1
Analytical Methods for MDA T Pore-Gas Samples

Analytical Method	Analytical Description	Analytical Suite
EPA TO-15	Gas Chromatography/Mass Spectrometry	VOC
EPA 906	Liquid Scintillation	Tritium