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Subsurface Vapor-Monitoring Plan for Material Disposal Area T at Technical Area 21



Prepared by the Environmental Programs Directorate

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EXECUTIVE SUMMARY

This plan describes the proposed subsurface vapor-monitoring activities for Material Disposal Area T. Three permanent vapor monitoring wells are proposed to be installed. Each well will have multiple sample ports with the shallowest port at the base elevation of the disposal area (~80 ft below ground surface) and the deepest port at the Cerro Toledo interval contact (approximately 350 ft below ground surface). Samples will be collected on a quarterly basis for 1 year beginning in October 2007. Samples will be analyzed for VOCs and tritium. Results from the quarterly monitoring will be submitted as a status report.

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1.0 INTRODUCTION

The following plan describes proposed subsurface vapor-monitoring activities and the locations, depths, and frequencies at which they will be conducted within the vadose zone beneath Material Disposal Area (MDA) T. The objectives of the vapor monitoring are (1) to confirm previously detected volatile organic compound (VOC) concentrations and tritium activities beneath MDA T and (2) to collect additional vapor samples from the total depths (TDs) of the previously sampled boreholes at MDA T. This additional sampling is a step in resolving the nature and extent of vapor-phase contamination at MDA T.

2.0 2006 DATA SUMMARY

Preliminary monitoring of VOCs in subsurface pore gas occurred at MDA T in 2006. Data were reported in the September 2006 "Investigation Report for Material Disposal Area T, Consolidated Unit 21-016(a)-99, at Technical Area 21" (LANL 2006, 094151).

Two rounds of pore-gas samples were collected from boreholes 21-25262, 21-25263, and 21-25264 from January to May 2006. A summary of the pore gas sampling depths and sample collection dates for Consolidated Unit 21-016(a)-99 is presented in Table 2.0-1. All pore gas samples were analyzed for VOCs and tritium.

Six different intervals were sampled at location 21-25262, and five intervals were sampled at locations 21-25263 and 21-25264. The initial TD sample from each borehole was collected through the augers using a single inflatable packer. All subsequent samples were collected using a straddle packer system that isolates a 2-ft interval within the borehole after the removal of the augers. When the augers were removed, the TD sample could not be replicated because of approximately 30 ft of sloughing of the borehole. For the second sampling round, samples were collected from the same intervals, with the exception of the TD samples. Subsurface pore gas samples were collected in SUMMA canisters for analysis of VOCs and in silica gel samplers for tritium analysis.

The data set consists of approximately 1700 VOC and tritium analytical results. The general trend of VOCs in subsurface vapor is a decrease in concentration at the deepest sample location in each borehole; however, there are no clear trends of consistently decreasing concentrations from a horizon of maximum concentration to the bottom of the borehole. In addition, most chemicals show inconsistent temporal trends between the round 1 and round 2 analyses. The VOC concentrations detected at Consolidated Unit 21-016(a)-99 are significantly lower than those observed at other MDAs within the Laboratory (2004, 087624; LANL 2005, 090513). The highest vapor concentration of any chemical was 2200 $\mu g/m^3$ for methylene chloride (methylene chloride was not observed in the tuff sample collected at the same depth in the same borehole), and most vapor concentrations were less than 500 $\mu g/m^3$.

As with the VOCs, the general trend of tritium in subsurface vapor is a decrease in activity at the deepest sample interval in each borehole; again, there are no clear trends of consistently decreasing activity from the top of the borehole, or from a horizon of highest activity, to the bottom of the boreholes. In addition, tritium shows inconsistent temporal trends between round 1 and round 2 analyses. Tritium in pore gas was detected in all three boreholes during both rounds of pore gas sampling. The peak activity of 73,400 pCi/L was detected at a depth of 150 ft and decreased to 2310 pCi/L at 350 ft.

3.0 PROPOSED PORE GAS MONITORING

As directed in the April 9, 2007, letter from the New Mexico Environment Department (NMED) (2007, 095725), three permanent pore gas monitoring wells will be installed at MDA T.

3.1 Monitoring Distribution and Frequency

The three deep boreholes (21-25262, 21-25263, and 21-25264) drilled in 2005–2006 remain open and are proposed for permanent vapor monitoring wells (Figure 3.1-1). Each well will be equipped with multiple sampling ports for pore-gas monitoring. Sample ports will be installed at the same depths as previously sampled, that is, six ports at 21-25262 and five ports at 21-25263 and 21-25264 (Table 2.0-1). These depths include the base elevation of the nearby disposal unit (69–81 ft) and the borehole total depth (350–380 ft). The sample tubing will be ¼-in. stainless-steel tubing connected with Swagelok® fittings. The 5-ft-thick sampling intervals will be filled with 10/20 silica sand. Bentonite chips will tremied into the borehole and hydrated to isolate the sampling intervals. Figure 3.1-2 provides a generalized schematic of the vapor-monitoring well design.

In accordance with comment 2 in the April 9, 2007, letter from NMED (2007, 095725), samples will be collected from the port nearest the lowest base elevation of the adjacent disposal unit (69–81 ft) and at TD (350–380 ft). Sampling ports corresponding to the depths from the 2006 sampling (i.e., six ports at 21-25262 and five ports at 21-25263 and 21-25264) will be available to sample for additional vertical resolution. Samples will be analyzed for VOCs and tritium. Samples will be collected on a quarterly basis for 1 yr beginning in October 2007.

3.2 Monitoring Methods

The method for monitoring pore gas at MDA T includes purging the sampling port and field screening purge gas, followed by collecting samples in SUMMA canisters and silica gel columns from prescribed intervals for off-site laboratory analysis. The SUMMA canister is an evacuated vessel used for collecting and containing analytical quality air samples. The low pressure in the canister pulls air inside until a neutral pressure has been achieved. SUMMA canister samples will be analyzed for VOC concentrations by the U.S. Environmental Protection Agency (EPA) Method TO-15. The silica gel column captures and contains water for tritium analysis. Water vapor is adsorbed onto the silica when subsurface air is pulled though the column. After a sample of subsurface water vapor has been collected, the column is removed from the system and sealed. The sealed columns then are then sent to an analytical laboratory for analysis. Silica gel column samples will be analyzed for tritium by EPA Method 906.0. Field screening of subsurface vapor at MDA T will include measuring the percent carbon dioxide, percent oxygen, and organic vapors.

Monitoring of pore gas at MDA T will be conducted in accordance with the current version of the Environmental Programs Directorate–Environment and Remediation Support Services Standard Operating Procedure 06.31, Sampling Sub-Atmospheric Air. According to this procedure, field screening will be performed before analytical samples are collected. Each port will be purged and monitored with a Landtec GEM2000 instrument or equivalent, until the percent carbon dioxide and oxygen levels have stabilized at values representative of subsurface pore-gas conditions. Before each sampling cycle, vapor sample tubing must be purged of stagnant air in the line by drawing air from the sampling interval through the line. Purging the line ensures that the sample collected is representative of the subsurface air at depth; every sampling activity must include a purge cycle. Once purge and field screening are completed, vapor samples will be collected using SUMMA canisters and silica gel columns.

During each sampling event, three types of field quality assurance (QA) samples will be collected and analyzed for VOCs using SUMMA canisters: a field duplicate sample, an equipment blank of zero-grade air (a common term for air certified to be free from VOC contamination) or nitrogen drawn through the sampling apparatus in the working area, and a performance evaluation sample/calibration gas sample taken from a tank of a certified gas mixture. Analytical laboratory QA for EPA Method TO-15 includes internal standards, surrogates, replicates, blanks, laboratory control samples, and reference standards. A field duplicate silica gel column QA sample will be collected and analyzed for tritium.

3.3 Reporting

Results from the quarterly monitoring will be included in a status report. This report may include recommendations for future monitoring based on data results and trends.

4.0 REFERENCES

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

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

LANL (Los Alamos National Laboratory), November 2004. "Investigation Work Plan for Material Disposal Area L, Solid Waste Management Unit 54-006 at Technical Area 54, Revision 2," Los Alamos National Laboratory document LA-UR-04-8245, Los Alamos, New Mexico. (LANL 2004, 087624)

LANL (Los Alamos National Laboratory), September 2005. "Investigation Report for Material Disposal Area G, Consolidated Unit 54-013(b)-99, at Technical Area 54," Los Alamos National Laboratory document LA-UR-05-6398, Los Alamos, New Mexico. (LANL 2005, 090513)

LANL (Los Alamos National Laboratory), September 2006. "Investigation Report for Material Disposal Area T, Consolidated Unit 21-016(a)-99, at Technical Area 21," Los Alamos National Laboratory document LA-UR-06-6506, Los Alamos, New Mexico. (LANL 2006, 094151)

NMED (New Mexico Environment Department), April 9, 2007. "Approval with Modifications, Phase II Investigation Work Plan for Consolidated Unit 21-016(a)-99, Material Disposal Area T, at Technical Area 21," 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, 095725)

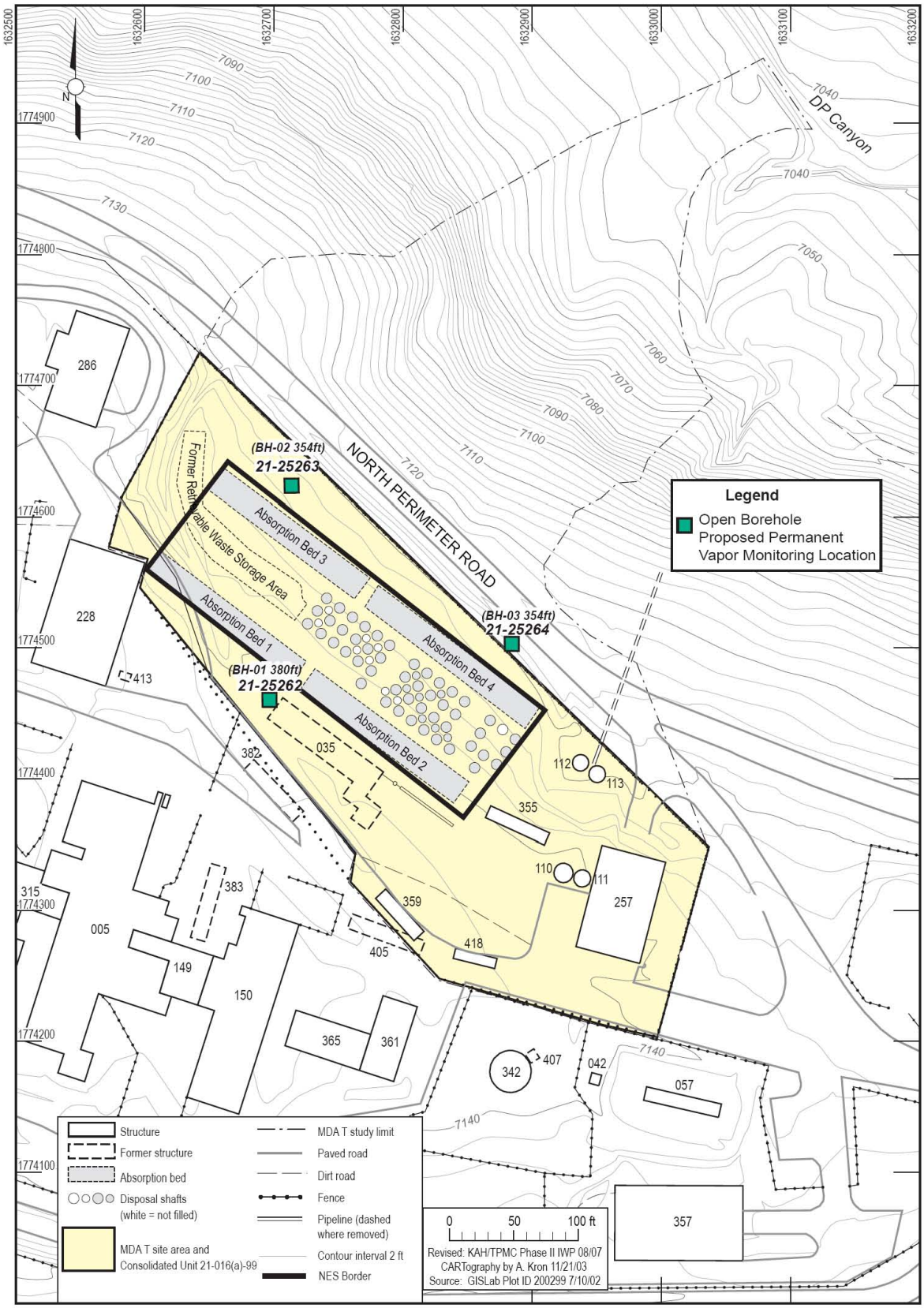


Figure 3.1-1 Proposed permanent pore gas monitoring well locations

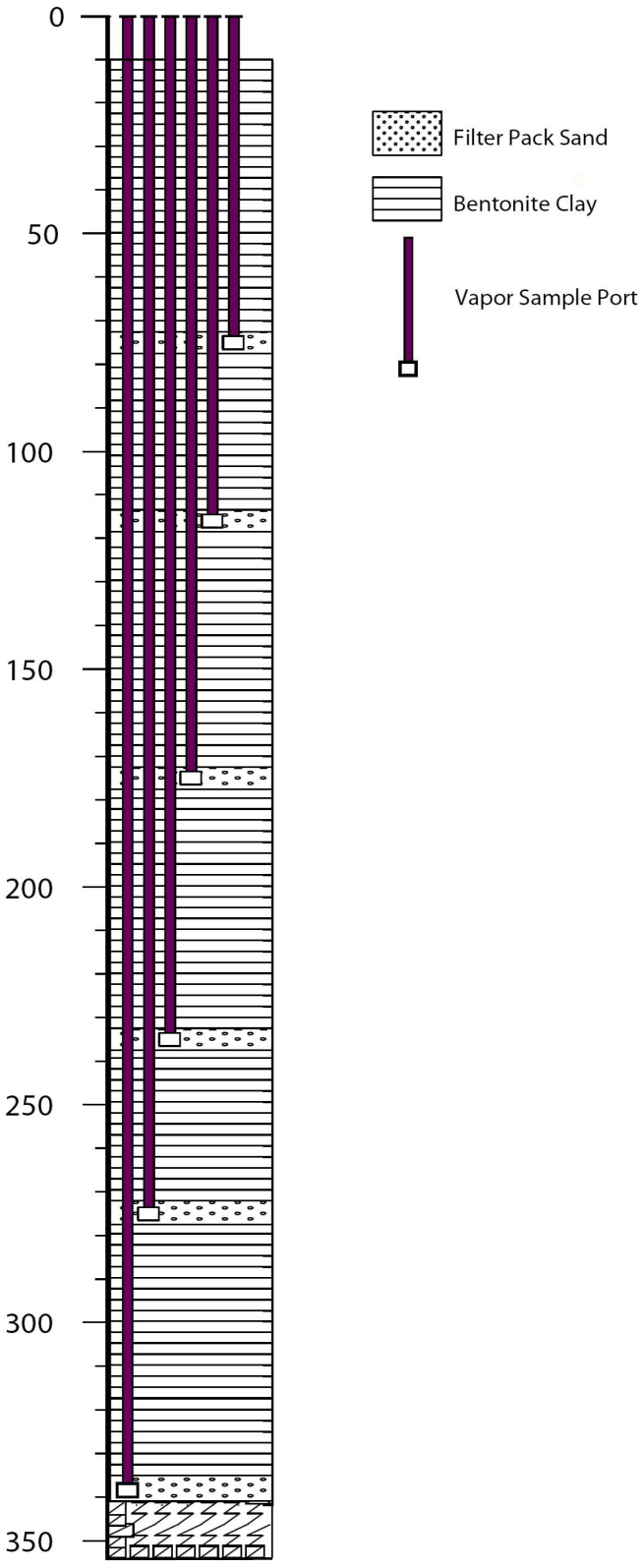


Figure 3.1-2 Generalized schematic of vapor-monitoring well

Table 2.0-1
Pore Gas Sampling Depths and Collection Dates

Borehole ID	Begin Depth (ft)	End Depth (ft)	Round 1 Collection Date	Round 2 Collection Date
1-25262	79	81	11-Jan-2006	20-Apr-2006
21-25262	114	116	23-Jan-2006	19-Apr-2006
21-25262	189	191	10-Jan-2006	18-Apr-2006
21-25262	234	236	20-Jan-2006	18-Apr-2006
21-25262	294	296	11-Jan-2006	17-Apr-2006
21-25262	370	380	5-Jan-2006	Not Collected
21-25263	79	81	13-Apr-2006	23-May-2006
21-25263	172	174	13-Apr-2006	22-May-2006
21-25263	228.5	230.5	12-Apr-2006	22-May-2006
21-25263	311	313	12-Apr-2006	19-May-2006
21-25263	350	354	7-Apr-2006	Not Collected
21-25264	69	71	8-Feb-2006	2-May-2006
21-25264	152	154	10-Feb-2006	2-May-2006
21-25264	224	226	8-Feb-2006	28-Apr-2006
21-25264	325	327	7-Feb-2006	27-Apr-2006
21-25264	350	354	3-Feb-2006	Not Collected