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Interim Subsurface Vapor-Monitoring Plan for Material Disposal Area L at Technical Area 54

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1.0 INTRODUCTION

The following plan describes proposed subsurface monitoring activities and the frequencies at which they will be conducted within the vadose zone beneath Material Disposal Area (MDA) L. The objective of the monitoring is to evaluate trends in volatile organic compound (VOC) and tritium concentrations over time.

2.0 HISTORICAL DATA REVIEW

Routine monitoring of VOCs in subsurface pore gas has been ongoing at MDA L from 1992 to the present. Data were last reported in the "MDA L Periodic Monitoring Report for Vapor Sampling Activities at Material Disposal Area L, Solid Waste Management Unit 54-006, at Technical Area 54, for Fourth Quarter Fiscal Year 2005 through Third Quarter Fiscal Year 2006" (LANL 2006, 093910) and the "Addendum to the Investigation Report for Material Disposal Area L, Solid Waste Management Unit 54-006, at Technical Area 54" (LANL 2007, 096409).

Results from routine monitoring indicate that 1,1,1-trichloroethane (TCA) is the dominant contaminant present as a vapor beneath MDA L, followed consistently in quantity by trichloroethene (TCE). The VOC plume (as represented by TCA screening data) has been in a near-steady state since the first quarter of fiscal year (FY) 1999. Spatial analysis of the pore-gas monitoring data indicate two unique sources, identified as the southeast shaft field composed of shafts 1 through 28 and the northwest shaft field composed of shafts 29 through 34. Both source areas are dominated by the presence of TCA and TCE, but the relative compositions and the concentrations of lesser compounds differ. Based on the screening results from quarterly sampling, it was determined that concentrations have remained relatively constant over time.

Monitoring and modeling have shown that VOCs migrate by vapor diffusion from the source areas, and vertical migration is affected by stratigraphy with concentrations decreasing significantly in the Otowi and basalt formations. Modeling results for the MDA L vapor plume have been presented in the technical report "Subsurface Vapor-Phase Transport of TCA at MDA L: Model Predictions" (Stauffer et al. 2005, 090537; Stauffer et al. 2007, 097871). Based on the observed site data and numerical modeling results, Stauffer et al. concluded the vapor plume at MDA L is currently at a near-steady state, both in concentration and size. The plume size is predicted to decrease when the contaminant source is depleted (probably before 2040), based on estimates of a conservative TCA source. Stauffer et al. (2000, 069794) concluded the numerical model would provide a useful tool to explore the effects of potential corrective measures (e.g., passive venting or soil vapor extraction).

3.0 SCOPE OF ACTIVITIES

The pore-gas monitoring locations are shown in Figure 3.0-1 and listed in Table 3.0-1. The eight boreholes drilled in 2004–2005 and three drilled in 2007 are equipped with sampling ports for pore-gas monitoring and provide complete coverage from east to west across the site and encompass all the subsurface rock units down to the basalt. Two pore-gas samples will be collected quarterly from each of the 11 boreholes for VOCs. Pore-gas samples will be collected quarterly from all available ports at location 54-27642 for tritium. Borehole 54-27642 has historically detected the highest concentrations of tritium. All 25 pore-gas monitoring locations listed in Table 3.0-1, excluding the nine that will be abandoned, will be monitored quarterly by field measurement of percent carbon dioxide, percent oxygen, and organic vapors using the methods described in section 4.0. These data will be compared with the historic record to confirm whether the plume remains in a steady state. At each sampling location, the ports identified for collection of SUMMA canisters will be the port nearest the lowest base elevation of the

adjacent disposal unit and at the borehole total depth. The corrective measures evaluation report for MDA L will include a recommendation on future use for the 25 remaining boreholes at MDA L.

Quarterly pore-gas monitoring data will be reported in an annual periodic monitoring report according to the requirements of Section XI.D of the Compliance Order on Consent signed by the U.S. Department of Energy, the New Mexico Environment Department, and the University of California.

Table 3.0-1 and Figure 3.0-1 identify six boreholes in MDA L that are no longer required for pore-gas monitoring because of redundancy in placement and three boreholes formerly used to evaluate pore-gas monitoring construction techniques. These boreholes are planned to be abandoned in FY08.

4.0 METHODS

Monitoring methods were selected to provide both precise and accurate data on the concentrations of tritium and VOCs in subsurface vapor beneath MDA L to determine trends through time.

4.1 Sample Collection Methods

Pore-gas samples will be collected in accordance with the current version of Environmental Programs Directorate Standard Operating Procedure (SOP) 06.31, Sampling Sub-Atmospheric Air. The method for collecting pore-gas samples includes purging the sampling port, field screening purge gas, and collecting samples in SUMMA canisters from prescribed locations for off-site laboratory analysis. The proposed frequency of sampling and the locations to be sampled are presented in section 3.0.

Pore-gas samples for tritium analysis will be collected by pulling pore gas through columns filled with absorbent silica gel according to SOP-06.31.

4.2 Field-Screening Methods

In accordance SOP-06.31, 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 and are consistent with previously recorded measurements. The vapor will then be screened for VOCs using a Brüel and Krajer (B&K) multigas analyzer, Type 1302, which measures four VOCs: TCA, TCE, PCE, and Freon-11. The B&K analyzer also measures percent carbon dioxide to 0.01%.

4.3 Analytical Methods

Once purge and field screening are completed, pore-gas samples for VOC analysis will be collected using SUMMA canisters, as prescribed in section 3.0. During each sampling event, three types of field quality assurance (QA) samples will be collected and analyzed for VOCs using SUMMA canisters: (1) a field-duplicate sample, (2) an equipment blank of zero-grade air (air certified to be free from VOC contamination) or nitrogen drawn through the sampling apparatus in the working area, and (3) a performance evaluation sample/calibration gas sample taken from a tank of a certified gas mixture. Analytical laboratory QA for Environmental Protection Agency (EPA) Method TO-15 includes internal standards, surrogates, replicates, blanks, laboratory control samples, and reference standards.

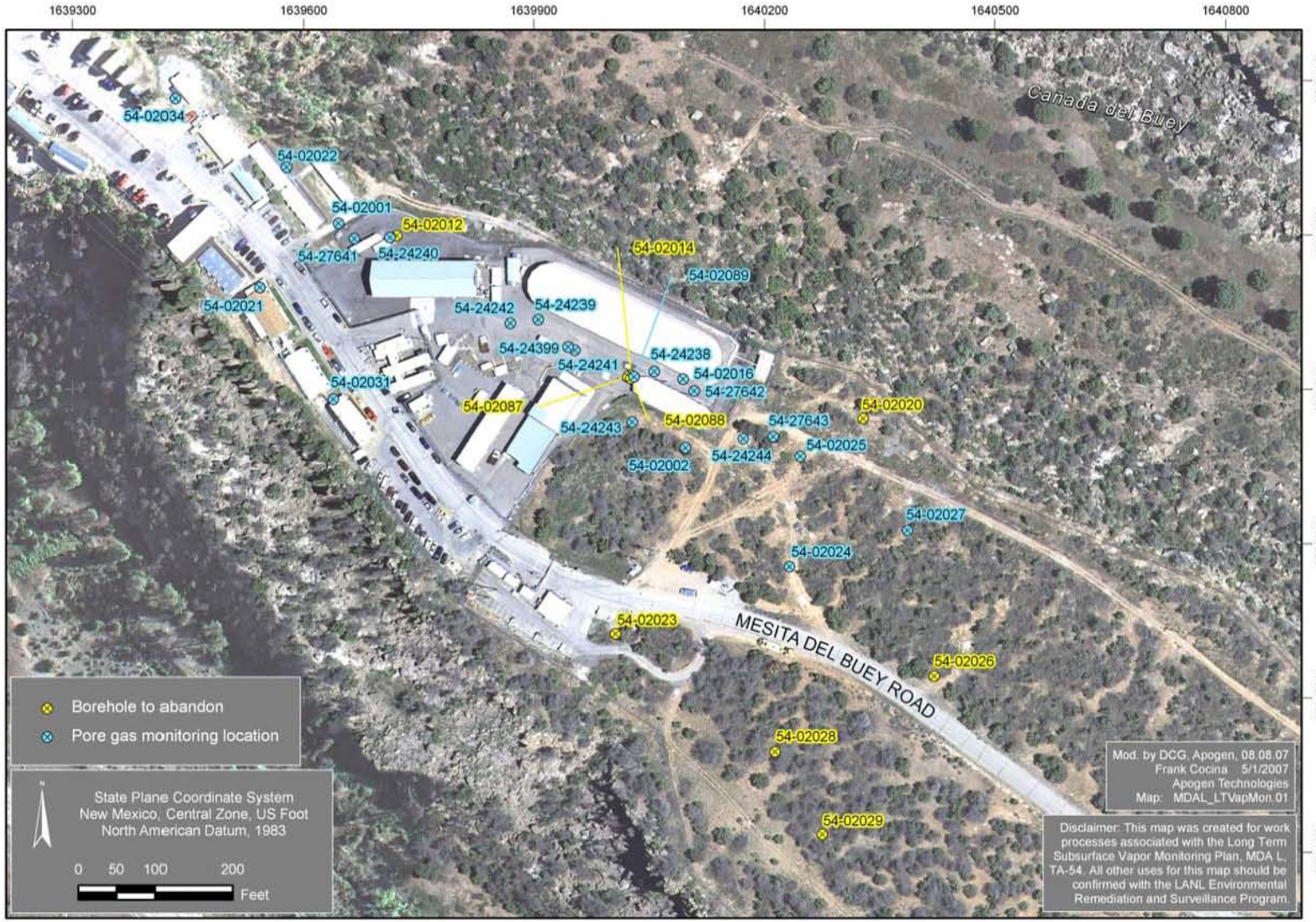

Figure 3.0-1 Proposed pore-gas monitoring locations

Pore-gas samples for tritium analysis will be analyzed by EPA Method 906.0.

4.4 Borehole Abandonment

Boreholes will be abandoned in accordance with the current version of Environmental Programs Directorate SOP-05.03, Monitor Well and RFI Borehole Abandonment.

5.0 REFERENCES

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

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

LANL (Los Alamos National Laboratory), September 2006. "Periodic Monitoring Report for Vapor Sampling Activities at Material Disposal Area L, Solid Waste Management Unit 54-006, at Technical Area 54, for Fourth Quarter Fiscal Year 2005 Through Third Quarter Fiscal Year 2006," Los Alamos National Laboratory document LA-UR-06-6239, Los Alamos, New Mexico. (LANL 2006, 093910)

LANL (Los Alamos National Laboratory), May 2007. "Addendum to the Investigation Report for Material Disposal Area L, Solid Waste Management Unit 54-006, at Technical Area 54," Los Alamos National Laboratory document LA-UR-07-3214, Los Alamos, New Mexico. (LANL 2007, 096409)

Stauffer, P.H., K.H. Birdsell, M. Witkowski, T. Cherry, and J. Hopkins, March 2000. "Subsurface Vapor-Phase Transport of TCA and MDA L: Model Predictions," Los Alamos National Laboratory document LA-UR-00-2080, Los Alamos, New Mexico. (Stauffer et al. 2000, 069794)

Stauffer, P.H., K.H. Birdsell, M.S. Witkowski, and J.K. Hopkins, 2005. "Vadose Zone Transport of 1,1,1-Trichloroethane: Conceptual Model Validation through Numerical Simulation," *Vadose Zone Journal,* Vol. 4, pp. 760-773. (Stauffer et al. 2005, 090537)

Stauffer, P.H., J.K. Hopkins, T. Anderson, and J. Vrugt, July 11, 2007. "Soil Vapor Extraction Pilot Test at Technical Area 54, Material Disposal Area L: Numerical Modeling in Support of Decision Analysis," Los Alamos National Laboratory document LA-UR-07-4890, Los Alamos, New Mexico. (Stauffer et al. 2007, 097871)

Table 3.0-1
MDA L Pore-Gas Monitoring Locations

Well ID	Depths of Ports (ft)
54-27641	32, ***82***, 112, 182, 232, 271, ***332.5***
54-27642	30[a], ***75***[a], 116[a], 175[a], 235[a], 275[a], ***338***[a]
54-27643	30, ***74***, 117, 167, 235, 275, ***354***
54-24238	44, ***64***, ***84***
54-24239	25, 50, ***75, 99.5***
54-24240	28, 53, ***78***, 103, 128, ***153***
54-24241	***73***, 93, 113, 133, 153, 173, ***193***
54-24242	25, 50, ***75***, 100, ***110***
54-24243	25, 50, ***75***, 100, ***125***
54-24244	25, 50, ***75***, 100, ***118.5***
54-24399	***A straddle-packer system will be used to collect a total-hole sample (below the well casing) from the Cerros del Rio basalt.***
54-01015	39.5, 164.3, 307.6, 338.3, 382.3, 426.2, 461,4
54-01016	31, 162, 274, 336, 414.4, 459.2, 517.8
54-02001	20, 40, 60, 80, 100,120,140, 160, 180, 200
54-02002	20, 40, 60, 80, 100, 120, 140, 157, 180, 200
54-02012[b]	8, 28, 42
54-02014[b]	13, 31, 46, 86
54-02016	18, 31, 82
54-02020[b]	20, 40, 60, 80, 95, 120, 140, 160, 180, 200
54-02021	20, 40, 60, 80, 100, 120, 140, 160, 180, 200
54-02022	20, 40, 60, 80, 100, 120, 140, 160, 180, 200
54-02023[b]	20, 40, 60, 80, 100, 120, 140, 159, 180, 200
54-02024	20, 40, 60, 80, 100, 120, 140, 160, 180, 200
54-02025	20, 60, 100, 160, 180
54-02026[b]	20, 60, 100, 160, 200, 215
54-02027	20, 60, 100, 160, 200, 220
54-02028[b]	20, 60, 100, 160, 200, 220, 250
54-02029[b]	20, 60, 100, 160, 200, 220, 260, 288
54-02030	20, 60, 100, 160, 200, 220, 243
54-02031	20, 60, 100, 160, 200, 220, 260
54-02034	20, 40, 60, 80, 100, 160, 200, 220, 260
54-02087[b]	13, 31, 46, 86
54-02088[b]	13, 31, 46, 86
54-02089	13, 31, 46, 86

Note: SUMMA samples to be collected quarterly are identified in bold italics.

[a] Tritium samples to be collected quarterly from indicated locations.

[b] Borehole proposed for abandonment.