Pilot Test Work Plan for Evaluating FLUTe Vapor-Sampling Systems in Use at Material Disposal Area G

Introduction	The U.S. Department of Energy–Los Alamos Site Office (DOE-LASO), and Los Alamos National Security, LLC, received letters from the New Mexico Environment Department (NMED) on March 14 and May 1, 2008 (NMED 2008, 100606; NMED 2008, 101409) concerning the potential for absorption of volatile organic compounds (VOCs) by the Flexible Liner Underground Technology (FLUTe) vapor-sampling system in use at Material Disposal Area (MDA) G. MDA G uses FLUTe systems in concert with other vapor-sampling systems to monitor volatile organic plumes. In its letters, NMED requested additional field tests to evaluate the absorption of VOCs by the tubing and liner in the SEAMist [FLUTe] system used in MDA G. The field tests would demonstrate whether VOC concentrations in samples are lower than those in subsurface pore gas. This work plan has been prepared in response to NMED's request. Los Alamos National Laboratory (the Laboratory) is currently evaluating the straddle packer sampling system (borehole PT-1), diffusion barrier FLUTe system (borehole 50-24821), and the stainless-steel tubing system (borehole PT-1) at a nested site at MDA C in accordance with a separate work plan approved with modification by NMED on March 28, 2008 (NMED 2008, 101113). This work plan describes additional work that will be done concurrently with the approved MDA C work plan to evaluate the FLUTe systems currently in use at MDA G.
Purpose of Pilot Test	The purpose of this work plan is to present the scope necessary to perform a pilot test to evaluate absorption of VOCs from the FLUTe's urethane-coated nylon fabric's membrane, polyester fabric and polypropylene spacer materials, and nylon tubing (hereafter referred to as early FLUTe system), currently in use at MDA G.
Number, Locations, and Depths of Boreholes	A single borehole will be drilled within 10 ft of existing vapor-monitoring nested borehole 50-24821 and PT-1 at MDA C. The borehole will be drilled deep enough to accommodate a FLUTe system with the deepest port at 300 ft below ground surface (bgs). The field program will be implemented in conjunction with the MDA C field effort (Figure 1).
Vapor-Sampling System	The FLUTe system uses a flexible liner that provides a seal against the borehole wall. The sampling ports and the tubing are installed in the interior sleeves of the liner. The FLUTe proposed for this study is constructed of the following materials: (1) a membrane liner made of urethane-coated nylon fabric, (2) spacer material composed of polyester fabric and polypropylene, and (3) tubing made of nylon. The liner is lowered into the borehole while the borehole is supported by a temporary casing and then filled with sand as the casing is withdrawn. The pressure of sand inside the liner seals the liner against the borehole wall, pressing the sampling ports against the formation. Vapor is drawn through a permeable spacer material between the liner and the borehole wall and into the tubing (Figure 2).
Drilling Approach	A borehole will be drilled with the hollow-stem auger (HSA) method to a depth of 300 ft bgs. The inside diameter of the HSA flights is 4 in. The FLUTe system will be installed per the manufacturer's requirements using sand to fill the annulus.
Subsurface Vapor Sampling	All subsurface vapor sampling will be conducted in compliance with Section IX.B.2.g of the Compliance Order on Consent. Purge times for similar vapor-sampling systems were calculated based on the inside diameter of the tubing used (0.18 in. for all tubing), the length of tubing for each port, the nominal flow rate of the pumps (30 ft^3/h), and the void space associated with the packers. The time required to purge the entire tubing volume for the FLUTe (and the tubing volume plus packer void space for the packer system) was less than 1 min. Therefore, purge times for all systems will be 5, 10, and 20 min. These purge times are conservative and will allow for the complete purging of all parts of each sampling system to ensure that samples contain formation air. A vapor sample will be collected in a SUMMA canister after each purge interval is completed. A total of three samples will be collected at each depth interval. A single tritium sample will be taken at each pore depth following collection of VOC samples. Details of the number, locations, and depths of the vapor samples to be collected are discussed below.

	Sampling for VOCs and tritium at PT-2 will be coordinated to coincide with sampling of adjacent monitoring locations, 50-24821 and PT-1. Three sampling ports will be used in the pilot test (30 ft, 90 ft, and 260 ft bgs). A total of nine VOC samples (three samples at three ports) and three tritium samples (one sample at three ports) will be collected from the borehole.
Vapor-Sampling Protocol	All vapor-sampling activities will be performed using the following protocols. • Static pressure will be measured at each port before purging starts. • The nominal flow rate for all tests will be 30 ft^3/h. Actual flow rates will be recorded during purging and sampling. The flow rate will be measured using a Kobold Instruments Inc., SCFH Air Meter. • Vapor samples will be collected in SUMMA canisters after each proposed depth interval is purged for 5, 10, and 20 min. • After the third SUMMA sample is collected at each proposed depth interval, a vapor sample will be collected using a silica gel sampler. • Concentrations (percent) of methane, carbon dioxide, and oxygen will be measured and recorded every 2 min during purging and between samples and immediately before samples are collected. Concentrations will be measured using a LANDTEC GEM 500 Gas Extraction Meter. • Ambient air temperature and barometric pressure will be recorded immediately before each sample is collected. • Any other field conditions that may influence sampling results will be recorded in a field notebook and reported with the pilot test results.
Vapor-Sample Analyses	SUMMA canisters will be submitted through the Laboratory's Sample Management Office (SMO) to an off-site contract analytical laboratory for analysis of VOCs by the U.S. Environmental Protection Agency (EPA) Method TO-15. Silica-gel samplers will be submitted through the SMO to an off-site contract analytical laboratory for analysis of tritium by EPA Method 906.0. All samples will be submitted with requests for 15 work day returns of full analytical data packages.
Evaluation of Results and Decision Process	Results obtained from samples collected from the early FLUTe system will be evaluated by comparing VOC and tritium concentrations collected at the same depth intervals in the diffusion-barrier screened FLUTe and stainless-steel systems (at locations 50-24821 and PT-1) per the MDA C pilot test evaluation criteria. Analytical result from the three different purge times at each depth interval will also be evaluated to determine if the vapor-sampling systems affect VOC or tritium concentrations as a result of absorption and/or desorption over time.
Schedule	Pilot test field activities will begin after NMED approves this work plan and after the completion of the MDA C vapor-monitoring installation program. The following durations will be required for drilling, sample collection, analytical analysis, report preparation, and submittal. **Drilling Activities** • Installing the FLUTe system at nested site adjacent to 50-24821 and PT-1 is expected to take 3 work days. **Sampling Collection** • Collecting VOC and tritium samples at boreholes using the early FLUTe system will take approximately 2 work days.

	Data Evaluation and Report Preparation • Data evaluation of sampling results is expected to take 5 work days after the last set of analytical data packages is received from the contract laboratories. • The Laboratory expects to receive the final analytical laboratory results within 48 work days of the start of the pilot test field activities. The results of the early FLUTe system pilot test will be reported with the MDA C pilot test report. The MDA C pilot test report will be submitted to NMED within 15 work days after the reporting data sets for all testing is received and evaluated. The report will present all data collected in the pilot tests, a summary of the data evaluations performed, and recommendations based on the results.

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 DOE–LASO; EPA, 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.

NMED (New Mexico Environment Department), March 14, 2008. "Review of Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area G, Technical Area 54, for Fiscal Year 2007," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2008, 100606)

NMED (New Mexico Environment Department), March 28, 2008. "Approval with Modification, Pilot Test Work Plan for Evaluating Vapor-Sampling Systems at Material Disposal Area C," 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 2008, 101113)

NMED (New Mexico Environment Department), May 1, 2008. "Approval with Direction for the Response to the Review of Periodic Monitoring Report for Vapor Sampling Activities at Material Disposal Area G, Technical Area 54, for Fiscal Year 2007 and Submittal of Pilot Test Work Plan for Evaluating Type 4 Vapor-Sampling Systems at Material Disposal Area G," 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 2008, 101409)

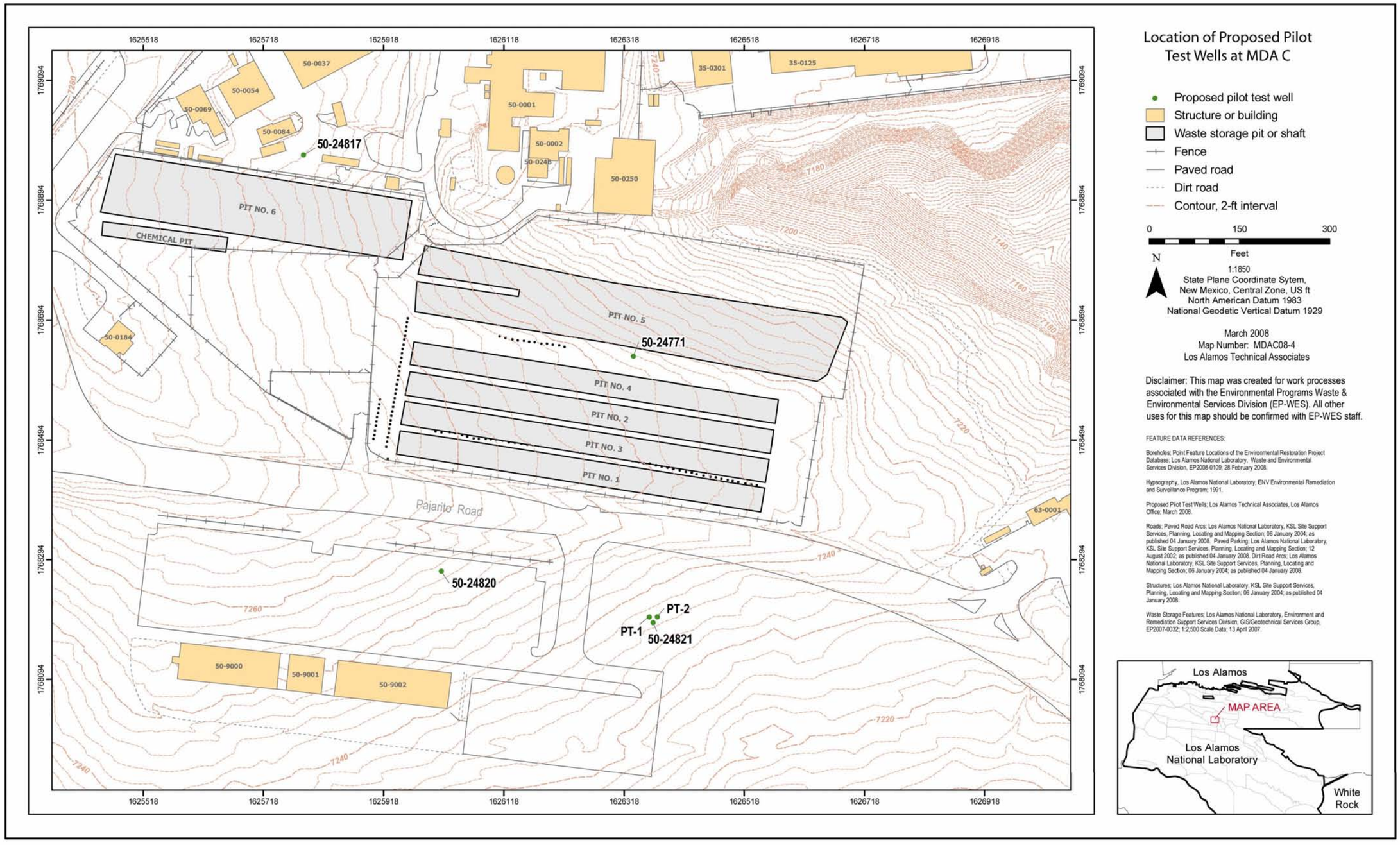

Figure 1 Proposed pilot test borehole locations at MDA C

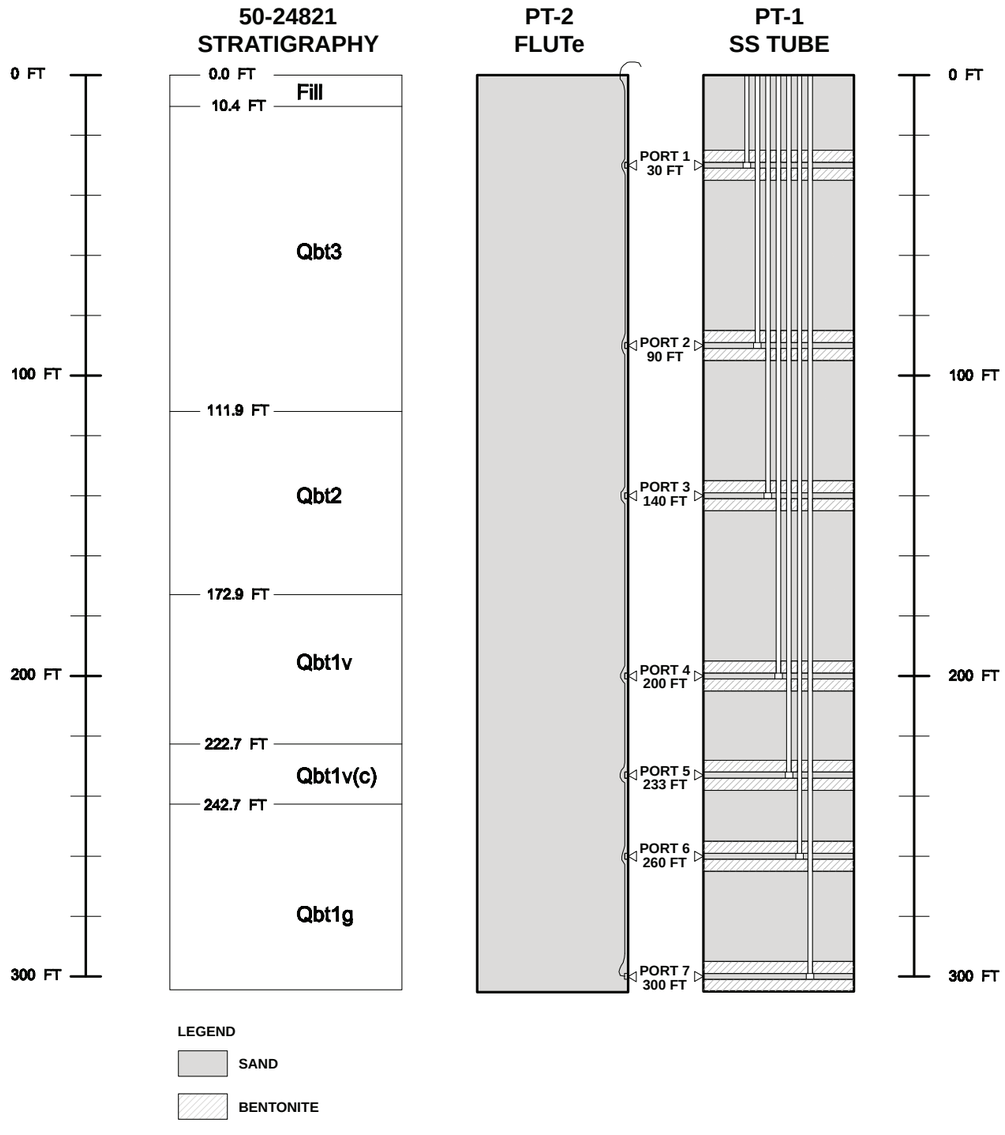

Figure 2 **Proposed designs for early FLUTe system PT-2 as compared with existing stainless-steel vapor-sampling system PT-1 at MDA C**