All daily calibration procedures for the MiniRAE 2000 PID met the manufacturer's specifications for standard reference gas calibration and the requirements of SOP-5006, Control of Measuring and Test Equipment.

B-4.2 Eberline E-600 Instrument Calibration

The Eberline E-600 was calibrated daily by the RCT before local background levels for radioactivity were measured. The instrument was calibrated using plutonium-239 and chloride-36 sources for alpha and beta emissions, respectively. The following five checks were performed and recorded in daily field calibration logs as part of the calibration procedures:

- calibration date
- physical damage
- battery
- response to a source of radioactivity

background

All calibrations performed for the Eberline E-600 met the manufacturer's specifications and the applicable radiation detection instrument manual.

B-4.3 LANDTEC GEM-500 Instrument Calibration

The LANDTEC GEM-500 was calibrated by the manufacturer and did not require daily check/calibration.

B-5.0 SUBSURFACE SAMPLING

This section summarizes the methods used for collecting subsurface dacite and vapor samples, according to the approved MDA C Phase III investigation work plan (LANL 2008, 101653; NMED 2008, 101113; LANL 2010, 109260; NMED 2010, 109695). Procedures for collecting groundwater samples from wells R-46 and R-60 are described in the Laboratory's Interim Facility-Wide Groundwater Monitoring Plan (LANL 2010, 109830).

B-5.1 Subsurface Dacite Sampling Methods

Air-rotary drilling was used in Phase III activities and subsurface dacite samples were collected from drill cuttings.

Samples were collected from the drill cuttings by placing stainless-steel bowl in the path of the cuttings as they exited the Hurricane 655 Dust Vacuum. The samples were field screened for VOCs and radioactivity and were visually inspected and logged. Following inspection, the sample was passed through a sieve to remove fine material, and the dacite was segregated. The samples were placed in sterile sample containers as required for each analysis, sealed, and labeled. Each sample was labeled with the borehole location number, date, time, depth interval, analyses requested, and sample identification number.

B-5.2 Phase III Subsurface Vapor-Sampling Methods

Vapor sampling was conducted using both the Flexible Liner Underground Technology (FLUTe) system and the stainless-steel tubing system at the start of the Phase III investigation, following an approved

subcontractor procedure technically equivalent to SOP-5074, Sampling of Sub-Atmospheric Air. The operation of the two vapor-sampling systems is described below.

The FLUTe system uses a flexible liner that provides a seal against the borehole wall. The sampling ports and the nylon tubing are installed in the interior sleeves of the liner. The liner is lowered into the borehole while the borehole is supported by a temporary casing, and it is filled with sand as the casing is withdrawn. The pressure of the 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. A diffusion barrier is installed in the permeable spacer material to minimize the potential for interactions with the material that could affect analyte concentrations.

The stainless-steel tubing system uses continuous lengths of 0.25-in.-outside diameter (O.D.) stainless-steel tubing with a single port installed at the target depth of each tube. Bentonite is used above and below each sampling port to seal off the interval to be sampled. The 5-ft space between the bentonite seals at each sampling interval is filled with sand. Sampling is performed by extracting the formation air through the sand layer and into the stainless-steel tubing. The stainless-steel tubing system is used in the new wells installed during the Phase III investigation.

After the vapor-sampling system was installed, the system was purged to ensure formation air was extracted. During the purge, percent oxygen, percent carbon dioxide, and percent methane readings from the sample train exhaust were collected every several minutes using a LANDTEC GEM-500 gas-extraction meter. At the end of every purge cycle, a PID reading was collected from the airflow in the sample train apparatus. Vapor samples for VOC analysis were collected in SUMMA canisters, one sample per canister. A silica gel sampler was used to collect the tritium sample after the SUMMA canister sample was collected. Samples were submitted to the Laboratory's Sample Management Office (SMO) for shipment to contract analytical laboratories for VOC analysis by U.S. Environmental Protection Agency (EPA) Method TO-15, and for tritium analysis by EPA Method 906.0.

B-5.3 Quality Assurance/Quality Control Samples

Quality control (QC) samples were collected in accordance with an approved subcontractor procedure technically equivalent to SOP-5059, Field Quality Control Samples. QC samples included field duplicates, equipment rinsate, and field trip blanks. The field duplicate sample was collected to evaluate the reproducibility of field-sampling techniques. The equipment rinsate was used to evaluate field decontamination procedures.

Field duplicate samples were collected at a frequency of approximately 1 duplicate sample for every 10 vapor samples. One field duplicate sample and one equipment rinsate sample were collected with the four dacite samples. Field trip blanks were collected at a frequency of 1 per 10 investigation samples or 1 per borehole (collected only when vapor samples were being collected for VOCs). Field trip blanks were collected by drawing nitrogen through the sampling apparatus into SUMMA canisters.

B-5.4 Sample Documentation and Handling

SCLs and chain-of-custody (COC) forms were completed for each sample. Sample containers were sealed with signed COC seals and placed in coolers at approximately 4°C. Samples were handled in accordance with approved subcontractor procedures technically equivalent to SOP-5057, Handling, Packaging, and Transporting Field Samples, and SOP-5056, Sample Containers and Preservation. Swipe samples were collected and analyzed by the RCT before the sample containers were removed from the site. Samples were transported to the SMO before they were shipped to the analytical laboratory. The SMO reviewed and approved the SCL/COC forms and accepted custody of the samples.