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TECHNICAL AREA 49 MOISTURE MONITORING FACT SHEET

INTRODUCTION

Technical Area 49 was the location of underground nuclear safety and related tests performed during 1960 and 1961. In 1961, the entire surface of Area 2 [Potential Release Site 49-001(b)] was covered with fill and an asphalt pad after it was determined that plutonium contamination resulting from an accidental release was present in the surface soils. It was subsequently determined that moisture was accumulating between the asphalt and tuff surface and that there was a potential for surface water to pond at Area 2. In 1998, a stabilization plan (LA-UR-98-1534) was written and implemented to reduce the potential for deep subsurface migration of contaminants by reducing moisture infiltration. Best management practices and interim measures detailed in the plan consisted of constructing a run-on diversion channel upgradient of the site, removing the asphalt pad, and regrading the site to eliminate surface water ponding.

Section six of the plan identified routine moisture monitoring at the site to determine the effectiveness of the stabilization activities. The plan called for the use of neutron probes in existing boreholes to acquire this information on a quarterly basis for two years. The New Mexico Environment Department (NMED) issued a Request for Supplemental Information (RSI) after reviewing the plan. The RSI asked that a sampling schedule and contingency plan be developed for the site. Los Alamos National Laboratory's response to the RSI included a contingency plan, as Attachment A, which provided this information. The contingency plan was designed to supplement section six of the stabilization plan and proposed additional monitoring requirements. The additional requirements include increasing the monitoring frequency to monthly, added monitoring in two off-cap boreholes, and installation of a new borehole on the cap.

After partial implementation of the proposed plan, it was determined that construction of the existing boreholes on the cap was inadequate for the collection of moisture monitoring data. The following section describes a new monitoring plan which will adequately collect the moisture monitoring data needed to assess the effectiveness of the stabilization activities.

PROPOSED MONITORING PLAN

This proposed monitoring plan calls for the replacement and abandonment of the two boreholes determined to be inadequate for monitoring (49-2906 and 49-2907). Two-inch-diameter aluminum casing will be installed in replacement boreholes to be located directly adjacent to boreholes 49-2906 and 49-2907 to a nominal depth of 15 feet beneath the present ground surface (Figure 1). A new borehole will also be installed at a location to be agreed to by the NMED Hazardous and Radioactive Materials Bureau (HRMB) (2-inch-diameter aluminum casing driven to a nominal depth of 15 feet beneath the present ground surface). The proposed location for this borehole is shown in Figure 1 (new hole). Moisture content will be measured in these three boreholes with a neutron probe. In addition, horizontal and vertical time domain reflectometry (TDR) arrays would be installed adjacent to the new borehole and adjacent to borehole 49-2906. The most promising emerging technology for in situ moisture sensing is TDR, which when connected to a data logger can be set to record moisture content at any time interval. Two TDR sensors would be installed at each of the two monitoring points (new hole and 49-2906). One sensor would be positioned horizontally just below the bottom of the top soil in the crushed tuff layer of the new cap, and one vertical probe would be placed just below the new cap into the old cover material (Figures 2 and 3) to detect any progressive downward migration of a wetting front. The proposed design will allow comparison and correlation of moisture monitoring data using neutron probes and TDR arrays. If data show that the two moisture monitoring techniques are comparable, then the TDRs can be used to continuously monitor transient events and potentially replace use of neutron probes.

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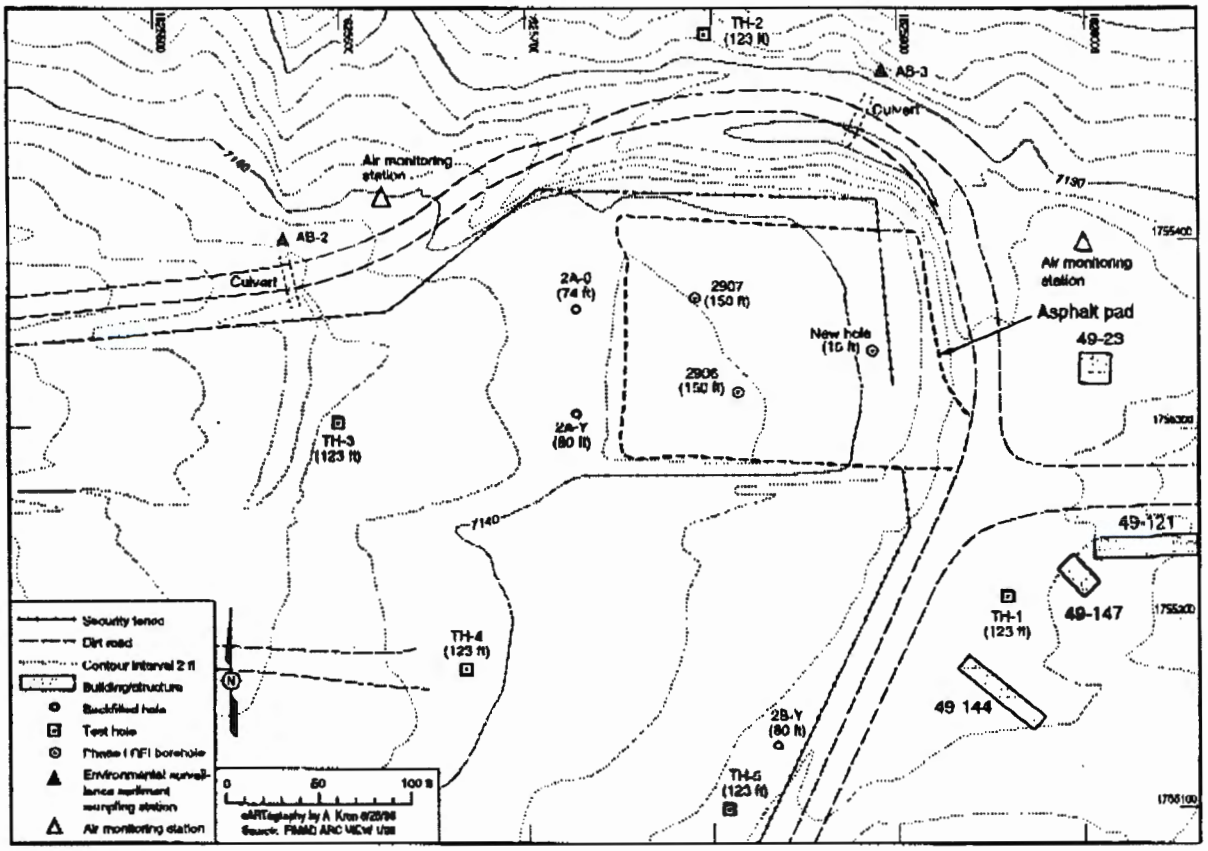

Figure 1. Monitoring hole locations at Area 2

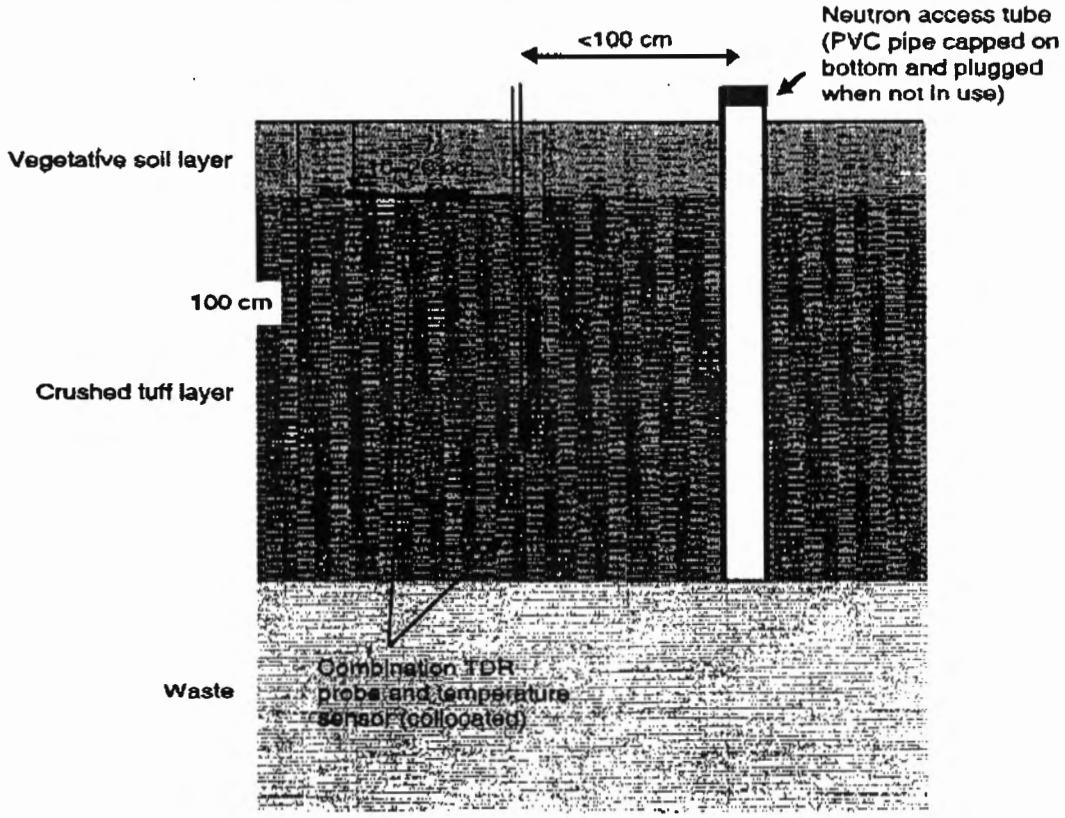

Figure 2. TDR arrays

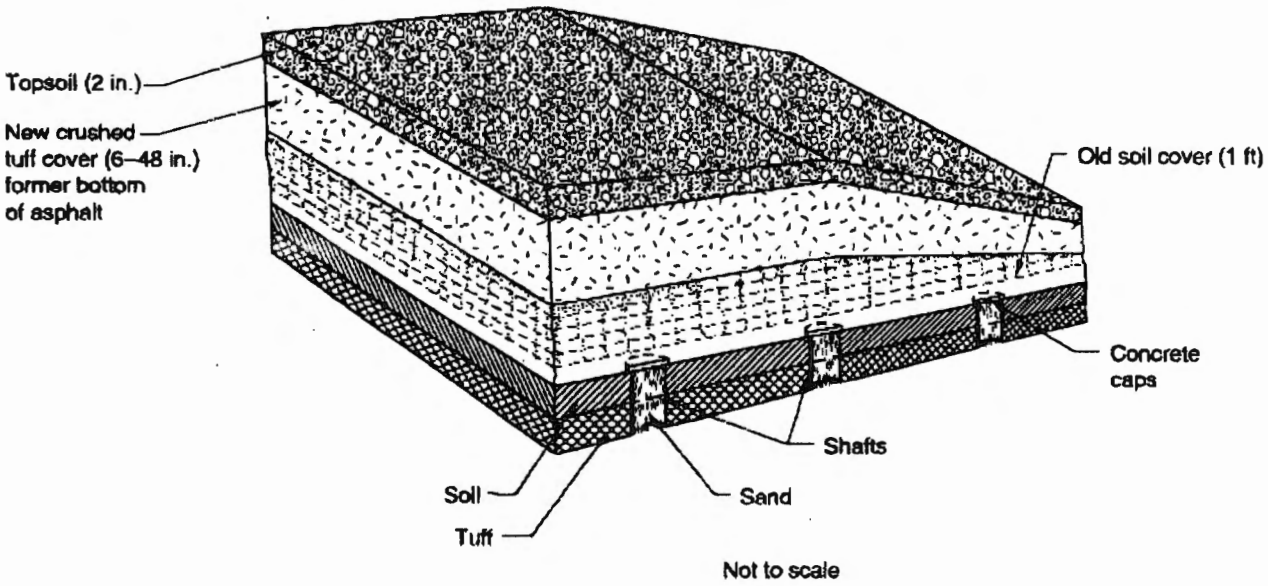

Figure 3. Schematic of subsurface geology

Moisture monitoring will be performed in the surface soils and the soil/tuff interface on a monthly basis in the two locations adjacent to boreholes 49-2906 and 49-2907, in the new borehole on the pad, and in existing boreholes TH-1 through TH-5, 2A-O, 2A-Y, and 2B-Y. Monthly monitoring will be conducted over the entire length of each borehole at 1-foot intervals. Monitoring results will be reported to NMED-HRMB in the Environmental Restoration Project quarterly report in accordance with our request for supplemental information response dated September 10, 1998 (EM/ER:98-336). A list of borehole depths is provided in Table 1.

Table 1
Borehole Descriptions

Borehole Number	Casing Type	Borehole Diameter (in.)	Borehole Depth (ft)
TH-3	4-inch schedule 40 PVC at surface only	5	112
TH-4	4-inch schedule 40 PVC at surface only	5	92
TH-5	4-inch schedule 40 PVC at surface only	5	107
2BY	2-inch schedule 40 PVC at surface only	2	33
2AY	2-inch schedule 40 PVC at surface only	2	28
2AO	2-inch schedule 40 PVC at surface only	2	62
TH-2	4-inch schedule 40 PVC at surface only	5	106
TH-1	4-inch schedule 40 PVC at surface only	5	114