

MEMORANDUM



TO: Steve Alexander *MA*
FROM: Teri Davis
THROUGH: Bruce Swanton
DATE: November 23, 1993
SUBJECT **Los Alamos National Laboratory (LANL) Site-Wide Hydrogeologic Regulatory Requirements**

A comprehensive regional and facility specific site-wide hydrogeologic characterization is required of LANL by Module VIII of RCRA Operating Permit (Section P, Task III: Facility Investigation, A. Environmental Setting, 1. Hydrogeology). The Module requires the Permittee to collect information that supplements and verifies existing information on the hydrogeologic conditions at the facility. Specific requirements outlined in Module VIII require the Permittee to "conduct a program to evaluate hydrogeologic conditions at the facility". The specific projects as they appear in the Permit are as follows:

- a. A description of the regional and facility specific geologic and hydrogeologic characteristics affecting groundwater flow beneath the facility;
- b. An analysis of any topographic features that might influence the groundwater flow system.
- c. An analysis of fractures within the tuff, addressing tectonic trend fractures versus cooling fractures;
- d. Based on field data, tests, (gamma and neutron logging of existing and new wells, piezometers and borings) and cores, a representative and accurate classification and description of the hydrogeologic units which may be part of the migration pathways at the facility (i.e., the aquifers and any intervening saturated and unsaturated units);
- e. Based on field studies and cores, structural geology and hydrogeologic cross sections showing the extent (depth, thickness, lateral extent) of hydrogeologic units which may be part of the migration pathways identifying:
 - i) Unconsolidated sand and gravel deposits,
 - ii) Zones of fracturing or channeling in consolidated or unconsolidated deposits, and



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- iii) Zones of high permeability or low permeability that might direct and restrict the flow of contaminants;
- f. Based on data obtained from groundwater monitoring wells and piezometers installed upgradient and downgradient of the potential contaminant source, a representative description of water level or fluid pressure monitoring;
- g. A description of manmade influences that may effect the hydrogeology of the site; and
- h. Analysis of available geophysical information and remote sensing information such as infrared photography and Landsat imagery.

Other regulatory requirements to consider in the context of site-wide hydrogeologic characterization include the groundwater monitoring waiver under 40 CFR 264.90 (b) (4) and Section 206.C.1.a(3) of the New Mexico Hazardous Waste Management Regulations. The Permittee is required to verify that no potential for liquid migration from a regulated unit to the uppermost aquifer will occur during the active life of the unit plus thirty years.

Documents on file to support the interim status requirements under 265.90 (c) (1), for low potential need to be updated to include information recently found which disagrees with previous conceptual models of the hydrogeologic system. An example of this apparent misnomer in the literature is the understanding of the aquifer type. This fundamental hydrogeologic issue does not allow for the evaluation of a groundwater monitoring wavier under 265 and certainly not under 264.

At present, fundamental hydrogeologic issues/questions persist at LANL:

- 1) The direction of main aquifer and perched-intermediate ground-water flow as influenced by pumping of the 16 or so production wells in the Los Alamos area is unknown. The lack of a site-wide potentiometric map prevents the assessment of direction of ground-water flow within the main aquifer and possibly the perched-intermediate zone(s), as impacted by the production wells used at Los Alamos.
- 2) The recharge area(s) for the main and perched-intermediate aquifers have not been identified. It is

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unknown at this time if any significant quantity of water is recharging the main aquifer through the fracture-fault zones which exist on the Pajarito Plateau. Characterization of these site-wide fault zones with respect to potential pathways for aqueous migration is not complete. It is unknown what effect if any, these zones may have on the direction of ground-water flow and hydraulic gradient of the main and perched-intermediate aquifers.

3) The nature of the main aquifer has been conceptualized by LANL as generally unconfined except for a wedge-shaped area near the central part of Los Alamos County. Contrary to previous theory, recent transducer data has shown that the nature of the aquifer is confined or most probably semi-confined. Significant error in calculations of aquifer characteristics can result from the evaluation of pumping test data if the type of aquifer is misunderstood.

It is the observation of NMED's LANL AIP staff that Items a., d., e., and f. (Task III of Section P) Module VIII are not being adequately addressed. Currently, no comprehensive program has been developed to address these requirements. The hydrogeologic projects underway lack integration in order to meet the specific requirements of the Permit and to address the fundamental hydrogeologic issues mentioned above. The lack of knowledge surrounding these fundamental hydrogeologic issues does not allow for compliance with the regulatory requirements of a site-wide hydrogeologic characterization.