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CERTIFIED MAIL
RETURN RECEIPT REQUESTED
VIA FACSIMILE

HSWA LANL GW/HWP/2001

March 16, 2001

John C. Browne, Director
Los Alamos National Laboratory
P.O. Box 1663, MS-A100
Los Alamos, New Mexico 87545

Theodore Taylor, Area Manager
Los Alamos Area Office-Department of Energy
528 35th Street
Los Alamos, New Mexico 87544

RE: NEW MEXICO ENVIRONMENT DEPARTMENT CONCERNS REGARDING GROUNDWATER MODELING LOS ALAMOS NATIONAL LABORATORY, EPA ID NO. NM0890010515

Dear Dr. Browne and Mr. Taylor:

The New Mexico Environment Department (NMED) has prepared this letter to summarize its perspective on the vadose-zone and groundwater modeling effort being performed at Los Alamos National Laboratory (LANL). Compilation and transmittal of this information was agreed to at a January 17, 2001 meeting between NMED, LANL, and U.S. Department of Energy (DOE) personnel.

During the January 17, 2001 meeting, LANL presented information in defense of the computer codes selected for the modeling exercises. LANL has chosen as its principal numerical model code the internally-developed Finite Element Heat and Mass Transfer Code (FEHM) that, compared to other models, is quite complex. FEHM is capable of simulating non-isothermal conditions, multiphase flow and transport, and small-scale heterogeneities such as fractures. As

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was discussed at the meeting, NMED does not take issue with the technical merit of FEHM. In fact, NMED agrees that FEHM can, with the appropriate data (of sufficient quality), adequately model the hydrogeologic complexity that exists beneath the Pajarito Plateau. Our concerns instead focus on data collection, adequacy of existing data, whether enough data exists, and how model results will be utilized as: 1) a predictive tool for analyzing groundwater flow and contaminant transport; and 2) a management tool for determining appropriate monitoring regimens and whether or not corrective action is required.

Although communication of information has improved recently with the submission of well completion reports for five wells, to date NMED has not received complete data packages (e.g., geophysical logs, pump/slug tests results, core analyses, geochemical analyses, etc.) for many of the wells installed under the Hydrogeologic Workplan (Workplan). The resulting dearth of information gives rise to concerns that too few data of sufficient quality currently exist to provide reliable, meaningful results from the computer models. Extant data are not sufficient to confidently simulate conditions at a regional or even LANL-wide scale. In fact, information available to NMED does not indicate that individual sites have been sufficiently characterized to utilize the capabilities of FEHM except in a very cursory manner.

LANL's lack of an accurate understanding of water levels that match the measured equipotential surface in properly constructed monitoring wells illustrates our concerns. LANL has not shown that it is even collecting the basic information to develop accurate equipotential surface map(s), as only three of the newly constructed wells are equipped with transducers. Additionally, currently utilized head data from municipal supply and other wells may not be constructed or screened properly to acquire reliable, accurate measurements. Likewise, enough data of adequate quality to model the complex vadose zone characteristics in Los Alamos Canyon or elsewhere on the Pajarito Plateau have not been made available to NMED. Consequently, NMED asserts that at the present time adequate screening-level modeling could be performed using much simpler computer codes, simulating conceptual models of a level of detail commensurate with the available data.

Regardless of the computer codes (e.g., FEHM, GoldSim, Visual ModFlow) used to model the vadose-zone and groundwater systems, NMED recognizes that as the implementation of the Workplan and other required drilling activities progresses, the reliability of the model for use in regulatory compliance, corrective action, groundwater protection decision-making will evolve and mature. At this point the model is in its infancy and undoubtedly has much uncertainty associated with it and therefore should not be relied on as a primary decision-making tool.

In general, NMED is briefed by LANL on the status of the hydrogeologic model at Quarterly and Annual Workplan meetings. Detailed descriptions of the input parameters used and assumptions made regarding the model have yet to be submitted. Identified in Attachment A are the basic physical, mathematical and conceptual information required for each hydrogeologic component

and/or watershed of the hydrogeologic system. This information is required under the approved Workplan and/or the current LANL Resource Conservation and Recovery Act Operating and Hazardous and Solid Waste Amendment Permits.

Regarding future information sharing, the status of the subsurface modeling effort (e.g., results of model calibration, data needs, data collected, changes in model assumptions, deliverable schedule) should be discussed in quarterly technical meetings (outside the Quarterly Workplan meetings) between NMED, DOE and LANL. To facilitate timely transmittal of information acquired during the drilling of wells, well completion reports must be submitted to NMED within ninety (90) days of well construction. The data supplied in each completion report should include, but not be limited to, geophysical logs, pump/slug tests results, core analyses, geochemical analyses of groundwater and cuttings, and other data pertinent to the modeling efforts and hydorgeologic characterization activities. Data not available at the time of the submittal of the well completion reports must be reported in the Quarterly Technical Reports produced by the Environmental Restoration Project.

To reiterate our position as stated in earlier correspondence with LANL, modeling is an important aspect of the Workplan and subsurface characterization, but it is *not* a substitute for monitoring. All models, regardless of their sophistication, must be calibrated by actual field data.

NMED expects LANL to respond within thirty (30) days of receipt of this letter. Should you have any questions, please feel free to contact John Young of my staff at (505) 827-1557, extension 1036.

Sincerely,

James P. Bearzi
Chief
Hazardous Waste Bureau

JPB:jry

cc:

P. Allen, NMED HWB
J. Kieling, NMED HWB
J. Young, NMED HWB ✓
J. Parker, NMED DOE OB
S. Yanicak, NMED DOE OB, MS J993
J. Davis, NMED SWQB
M. Leavitt, NMED GWQB
G. Lewis, NMED WWMD
D. Neleigh, EPA 6PD-N
J. Vozella, DOE LAAO, MS A316
D. Erickson, LANL ESH-DO, MS K491
J. Canepa, LANL EM/ER, MS M992
M. Kirsch, LANL EM/ER, MS M992
D. McInroy, LANL EM/ER, MS M992
C. Nylander, LANL ESH-18, MS K497

File: Reading and HSWA LANL G/M/HWP '01

Attachment A

A fundamental understanding of the entire hydrogeologic system is required before any reasonable level of confidence in the model can be achieved. NMED identifies five components of the hydrogeologic system beneath the Pajarito Plateau. The components include: 1) canyon-specific alluvial systems; 2) intermediate perched water in the volcanic rocks (Tschicoma Formation and Tsherige Member of the Bandelier Tuff); 3) canyon-specific perched water within the Otowi Member of the Bandelier Tuff, Cerros del Rio basalt and/or sedimentary units of the Puye Formation; 4) the regional aquifer; and 5) the vadose zone located beneath the mesa tops, between each alluvial and intermediate zone(s) as well as between the intermediate and regional ground water. Examples of individual components of the system are the intermediate groundwater zones encountered at roughly 180 and 275 feet at R-9i and accompanying vadose zone in Los Alamos Canyon.

Data Needs:

NMED has developed a list of the following basic physical, mathematical and conceptual information needed in order to adequately model the subsurface. Due to the lack of information available NMED perceives the following data needs for each component and/or watershed of the hydrogeologic system. In lieu of a detailed modeling work plan, LANL shall provide a detailed discussion regarding the status of the collection of the basic physical, mathematical and conceptual information listed below for *each* component of the hydrogeologic system.

1) aquifer boundaries
2) extent of saturation (lateral and horizontal)
3) thickness of saturation
4) water levels/water table and potentiometric surface map-head distributions
5) groundwater flow directions and velocities
6) transmission or movement of ground water across hydrostratigraphic boundaries
7) water balance information
    a. recharge/discharge locations, rates and volumes
    b. evapotranspiration data and/or estimates
    c. stream-flow data
    d. pumping influences, zones of influence, etc
8) geologic maps (e.g., surface geology, structure contour maps, water table)
9) topographic map
10) saturated and unsaturated hydraulic-conductivity ($K_{x,y,z}$), porosity, effective porosity, transmissivity, storage coefficients and estimated fracture/secondary porosity for the important hydrostratigraphic units (e.g., weathered Bandelier Tuff, alluvium, Cerros del Rio Basalt, Puye Formation)

11) sorption coefficients (Kds) for important hydrostratigraphic units (e.g., weathered Bandelier Tuff, alluvium, Puye Formation)

Other Issues:

In addition, NMED is requiring that detailed discussions regarding the following issues be developed to address each on a canyon-specific basis, from the surface system down to the regional aquifer.

1) Model input parameters, with discussion/rationale of the methodologies used to determine appropriate values for those parameters;

2) Information regarding the quality of the input parameters and discussions as to the procedures used to assess the quality of the data used;

3) Critical (sensitive) input parameters for each model and discussion of the uncertainties associated with the available data;

4) Current data needs and how those data needs will be satisfied for each component of the hydrogeologic system;

5) Acceptable confidence and/or uncertainty level of the modeled results;

6) Data sufficiency for a meaningful model, model calibration and how the process will be implemented.