

# Los Alamos

Los Alamos National Laboratory  
Los Alamos, New Mexico 87545

LIBRARY COPY

DEC 1999 memorandum

RECEIVED

TO: Distribution  
*Charlie Nylander*  
FROM: Charlie Nylander, ESH-18

DATE: November 24, 1999

SYMBOL: ESH-18/WQ&H:99-0451

MAIL STOP/TELEPHONE: K497/5-4681

SUBJECT: **NOTES FROM THE HYDROGEOLOGIC CHARACTERIZATION PROGRAM  
QUARTERLY STAKEHOLDER MEETING AND SEMI-ANNUAL EXTERNAL  
ADVISORY GROUP VISIT, OCTOBER 13-15, 1999**

Attached are the notes from the combined Stakeholder Quarterly Meeting and Semi-Annual External Advisory Group visit. Action items resulting from the meetings are bulleted below along with the institution responsible for their implementation.

- Include data (chemistry, etc.) from wells on the drambuie web site. LANL.
- Distribute Field Implementation Plans (FIPs) for the R-wells to the four Accord pueblos, NMED, and EAG for review before drilling activities begin. LANL.
- Finalize data sharing agreements with stakeholders and a mechanism for releasing draft data. LANL.
- Send out weekly drilling activities reports. LANL.
- Discuss response to contamination in more detail with regulators. LANL.
- Review Quarterly Meeting minutes and respond with a letter acknowledging the action items identified. NMED
- Form a policy group to define the "end state" of the Hydrogeologic Characterization Program. Management of NMED, DOE, and LANL. LANL will facilitate.

Please review the attached notes. If you have any comments on the notes or the action items identified above, please submit them to Charlie Nylander at (505)-665-4681 or nylander@lanl.gov.

CN/rm

Attachments: a/s



13315

HSWA LANL  
G/M/HWP/99

77

Distribution:

P. Maggiore, NMED Secretary, Santa Fe, NM, w/enc.  
J. Parker, NMED/DOE/OB, Santa Fe, NM, w/enc.  
M. Dale, NMED/DOE/OB, MS J993, w/enc.  
C. Hanlon-Meyer, NMED/DOE/OB, Santa Fe, NM, w/enc.  
S. Yanicak, NMED/DOE/OB, MS J993, w/enc.  
R. Montoya, NMED/DOE/OB, Santa Fe, NM, w/enc  
B. Wedgeworth, NMED/DOE/OB, Santa Fe, NM, w/enc  
J. Kieling, NMED/HRMB, Santa Fe, NM, w/enc.  
K. Birdsall, NMED/HRMB, Santa Fe, NM, w/enc.  
J. Young, NMED/HRMB, Santa Fe, NM, w/enc.  
M. Taylor, NMED/HRMB, Santa Fe, NM w/enc  
G. Lewis, NMED/HRMB, Santa Fe, NM w/enc  
M. Leavitt, NMED/GWQB, Santa Fe, NM, w/enc.  
P. Bustamante, NMED/GWQB, Santa Fe, NM, w/enc.  
J. Jacobs, NMED/GWQB, Santa Fe, NM, w/enc.  
J. Mullany, NMED/GWQB, Santa Fe, NM, w/enc.  
J. Davis, NMED/SWQB, Santa Fe NM, w/enc.  
K. Agogino, EPD, DOE/AL, Albuquerque, NM 87116, w/enc  
R. Enz, DOE/LAAO, MS A316, w/enc  
B. Koch, LAAME, DOE/LAAO, MS A316, w/enc  
T. Taylor, LAAME, DOE/LAAO, MS A316, w/enc  
J. Vozella, DOE/LAAO, MS A316, w/enc.  
G. Turner, DOE/LAAO, MS A316, w/enc  
J. Ordaz, DOE/HQ/DP-13, Germantown, MD, w/enc  
T. Longo, DOE/HQ/EM-45, Germantown, MD, w/enc  
W. Holman, ERD/DOE, Oakland, CA, w/enc  
A. Chang, EPA-Region 6, Dallas, TX, w/enc  
R. Mayer, EPA-Region 6, Dallas, TX, w/enc  
D. Neleigh, EPA-Region 6, Dallas, TX, w/enc  
E. Anderson, EAG, Sciences International Inc., Alexandria, VA, w/enc  
R. Charles, EAG, Ranchester, WY, w/enc  
R. Powell, EAG, Las Vegas, NV, w/enc  
J. Powers, EAG, Murray, UT, w/enc  
D. Schafer, EAG, Schafer&Associates, Minneapolis, MN, w/enc  
J. Gerwin, NNM CAB, NM, w/enc  
A. Armijo, NNM CAB, Nambe Pueblo, NM, w/enc  
J. Pecos, Cochiti Pueblo, Cochiti, NM, w/enc  
D. Duffy, Jemez Pueblo, Jemez, NM, w/enc  
J. Chavarria, Santa Clara Pueblo, Espanola, NM, w/enc  
D. Saracino, San Ildefonso Pueblo, Santa Fe, NM, w/enc  
B. Jacobs, Bandelier, NM, w/enc  
R. Hull, LATA, MS M321, w/enc  
S. Johnson, LATA, MS M321, w/enc  
M. Everett, MK/PMC, MS M327, w/enc

A. Crowder, MK/PMC, MS M327, w/enc  
K. Bitner, Neptune & Co., Albuquerque, NM, w/enc  
P. Reneau, IT Corp., MS M892, w/enc  
K. Nasser, Revision, Denver, CO, w/enc  
A. Stoker, SAIC, MS J521, w/enc  
B. Johnson, Westbay, N. Vancouver, w/enc  
F. Patton, Westbay, N. Vancouver, w/enc  
M. Bates, Los Alamos Study Group, w/enc  
J. Arends, CCNS, w/enc  
F. Orth, Los Alamos County, Los Alamos, NM, w/enc  
K. Henning, CIC-15, MS M311, w/enc  
G. Suazo, CRO-1, MS A117, w/enc  
T. Gunderson, DLDOPS, MS A100, w/enc  
J. Aldrich, EES-1, MS D462, w/enc  
D. Broxton, EES-1, MS M992, w/enc  
G. Cole, EES-1, MS D462, w/enc  
D. Hickmott, EES-1, MS D462, w/enc  
P. Longmire, EES-1, MS D469, w/enc  
R. Warren, EES-1, MS D462, w/enc  
K. Birdsell, EES-5, MS F649, w/enc  
E. Keating, EES-5, MS C306, w/enc  
B. Robinson, EES-5, MS F649, w/enc  
B. Stone, EES-5, MS F649, w/enc  
A. Pratt, EES-13, MS M992, w/enc  
A. Dorries, EES-13, MS M992, w/enc  
D. Katzman, EES-13, MS M992, w/enc  
S. Bolivar, EES-13, MS H865, w/enc  
E. Springer, EES-15, MS J495, w/enc  
B. Newman, EES-15, MS J495, w/enc  
A. Gallegos, EES-15, MS J495, w/enc  
T. Baca, EM-DO, MS J591, w/enc  
J. Canepa, EM/ER, MS M992, w/enc  
V. George, EM/ER, MS M992, w/enc  
R. Vocke, EM/ER, MS J591, w/enc  
D. Hollis, EM/ER, MS M992, w/enc  
M. Cummings, EM/ER, MS M992, w/enc  
D. Erickson, ESH-DO, MS K491, w/enc  
B. Gallaher, ESH-18, MS K497, w/enc  
S. Kinkead, ESH-18, MS K497, w/enc  
S. McLin, ESH-18, MS K497, w/enc  
K. Mullen, ESH-18, MS K497, w/enc  
C. Nylander, ESH-18, MS K497, w/enc  
S. Rae, ESH-18, MS K497, w/enc  
D. Rogers, ESH-18, MS K497, w/enc  
B. Turney, ESH-18, MS K497, w/enc

Distribution  
ESH-18/WQ&H:99-0451

- 4 -

November 24, 1999

A. Barr, ESH-19, MS K498, w/enc  
M. Cash, ESH-19, MS P915, w/enc  
C. Bare, ESH-20, MS M887, w/enc, (3 copies)  
P. Schumann, ESH-19, MS M992, w/enc  
J. Sisneros, F-1, MS P908, w/enc  
D. Woitte, LC-GL, MS A187, w/enc  
J. Holt, NWT-PO, MS F629, w/enc  
LANL Reading Room, MS A117  
WQ&H File, MS K497, w/enc  
CIC-10, MS A150, w/enc

**Los Alamos National Laboratory  
Hydrogeologic Characterization Program**

**EXTERNAL ADVISORY GROUP MEETING**

**OCTOBER 13, 1999**

**Introduction**

Charlie Nylander (LANL) reviewed agenda for the three days of meetings and asked everyone present to introduce themselves. Expressed appreciation to everyone for their attendance and to LATA for providing space for the meeting. At the request of the External Advisory Group (EAG), will try to add a field trip to R-15.

**Action Plan For EAG March Report**

Charlie Nylander (LANL) said the EAG was formed about 1.5 years ago to provide senior-level peer review and oversight Hydrogeologic Workplan activities. The EAG meets 2 times per year to hear progress made in the program. The EAG consists of five members with different experience. They are helpful as quality check and to suggest ways to improve implementation. This is the third semi-annual meeting of the EAG. In the future we are planning on adding members with different areas of expertise. The EAG makes a report after each meeting and an action plan is formulated based on each EAG report.

Charlie Nylander summarized the actions implemented or planned based on EAG recommendations. Starting with November 1998 report, the completed actions are:

- NMED participate with EAG: have done this and will continue for every EAG meeting.
- Prioritization of wells: the cited table was updated in the Annual Report.
- Core logging after retrieval: there is SOP for core collection, core protection, and placement in the core storage area. There is an intricate operation of storing and retrieving core.
- Review DQO and annual report: continued to evaluate DQOs and had a joint LANL/NMED meeting a few weeks ago to do this
- Westbay system: Looked at Westbay, visited different installations with Westbay wells, read reports. We feel that we understand the Westbay system.
- Filterpacks above screens to account for settling: at least 5 feet of fine sand is placed above and below the sand pack of every screened interval. There is a new SOP on well construction planned.
- Rebid drilling: during last 6 months new SOW for drilling services was developed under the lead of Steve Bolivar (LANL). The new SOW has a new cost basis for services.

**Actions in Process**

- Communication efforts: continued efforts. Annual meeting, quarterly, special presentation to CAB, Pueblo tours.
- ACL/MCL: discussions with NMED on the process, but we believe it is premature to develop ACL while still characterizing.
- Contingency for intermediate zones: at the Annual Meeting in March we discussed a new approach; the approach must still be finalized with NMED. Once it is finalized, we expect it will become part of the RCRA permit.
- FIMAD more rapidly incorporate legacy data: the Groundwater Database (GWDB) is in development, the status will be discussed at the Quarterly Meeting tomorrow.
- Three person drilling crew: with the existing contract it is difficult to get more than a 3-person crew, although we have been working with the driller. After trying 24-hour operations we have gone back to 12-hour shifts for safety. There will be further discussion on this at the Quarterly Meeting tomorrow.
- Revise budget regularly: an Annual Project Review will be presented this morning.
- Annual project review: Is scheduled for later this morning
- Use modeling as tool: we have focused on this. There will be a modeling presentation this afternoon and there is significant progress that will be reported.
- Cement seals: If other seals necessary ask EAG for input on options; get agreement with regulators before implementing a change in sealing methods or materials.
- Don't use mud rotary: EAG provide options; will go over this tomorrow and discuss potential for other drilling methods.
- Use metal casing not PVC: all casings are made with metal.

**Los Alamos National Laboratory  
Hydrogeologic Characterization Program**

**EXTERNAL ADVISORY GROUP MEETING**

**OCTOBER 13, 1999**

- Benchmark costs to date: Some has been done in FY99 by DOE consultant. The Lab tried to get started. To ensure benchmarks represent appropriate goals, it is more complicated than cost comparison.
- Better description of management reactions: the Friday meeting of EAG will allow EAG to get a sense of management concerns.
- Stakeholder identification map: discussed at March meeting. Next meeting more detailed map.
- Low-flow purging sampling techniques: GIT has continued to discuss. Will have better evaluation when wells are actually completed and will be sampled.
- More detailed GANTT Chart: the presentations at the Quarterly Meeting tomorrow will demonstrate that there is more integration between the Hydrogeologic Workplan activities and the Environmental Restoration (ER) Project.

**June Report Recommendations:**

- Relationships with upper management: session scheduled for Friday
- Pursue benchmarking: some progress made. Used DOEs cost comparison and tried to determine the comparison of apples to apples. Probably need to do site visits to other sites to understand the details of what they are doing. Gross cost comparisons not adequate.
- Continue to meet with stakeholders: the afternoon session today is for the EAG to meet with stakeholders and this will be part of every EAG meeting.
- Continue communication: will get more info on web.
- Meeting locations to enhance focus: Ghost Ranch was good. Will continue this for the Annual Meetings, but for not for the October meetings because it adds to the cost of the program.
- Hard copies of transparencies: a bound set of all the overheads was prepared for the EAG members.
- Add technical sessions: increasing time for technical topics. Trying to work toward concurrent sessions.
- Add members: Ask EAG for suggestions for candidates.
- Risk-based conceptual plan: will go through that in response to contamination in the Quarterly Meeting tomorrow.
- EAG review risk assessment plan: we will ask the EAG to review the response to contamination. We would also like the EAG to review and provide feedback on the ER risk assessment process.
- Risk based approach for findings/ACL: this has been incorporated in the response to contamination strategy.
- Compare to other plans: Did some of that legwork in the response to contamination strategy.
- Site specific ACL: the response to contamination strategy incorporates the ACL process.
- DQO scenarios: Conceptual model being refined. Scenarios also refined along with models.
- DQO for subordinate data collection: GIT subcommittees encouraged to use a DQO-type process. Working well. Example is the Geochemistry Subcommittee.
- Data gathering use DQO process: subcommittees encouraged to use a DQO-type process.
- Database high priority: Information Management Subcommittee has developed a resource-loaded schedule to determine resources needed.
- Geologic model used for stratigraphic contacts: The Field Implementation Plan for each well has expected stratigraphy using the geologic model. As more data is added to the geologic model, there will be better stratigraphic projections.
- Overall geochemical model: Pat Longmire (LANL) has a geochemical conceptual model and will give a briefing on it at the modeling presentations this afternoon.
- More sorption studies: Pat Longmire (LANL) will be reviewing interpretive tasks at the Quarterly Meeting tomorrow.
- More modeling: focus on that this afternoon.
- Segmented approach to modeling: 3 different scales, the afternoon presentations should provide good visualization of the integration between these three modeling scales this afternoon.
- Review modeling reports: we will ask EAG to review modeling reports.
- Recharge continue to be refined: more discussion on recharge will be presented this afternoon.
- Benchmarking: continue to work this.

Los Alamos National Laboratory  
Hydrogeologic Characterization Program

EXTERNAL ADVISORY GROUP MEETING

OCTOBER 13, 1999

- Review of screen design: EAG will be requested to review design of each well in Field Implementation Plan. These include the specifications for each well.
- Evaluate drilling method after 5-6 wells: Procurement will allow flexibility for using other methods.
- Geophysical logging, modern and accurate: Seeking most appropriate. Goes hand in hand with drilling technique. If mud rotary used, will require more extensive geophysics

John Ordaz (DOE/HQ) asked if the cost and schedule impacts of implementing recommendations have been assessed? Charlie Nylander (LANL) responded that some of the recommendations have no impact at all, e.g. EAG review of documents. Other recommendations have cost impacts, e.g. legacy data in database. It is a good recommendation, but it comes with a cost, which will be presented tomorrow. We could go through individually and look at these. John Ordaz (DOE/HQ) asked if Nevada has a group similar to the EAG? Charlie Nylander (LANL) responded that Nevada has internal review but no external review group. John Ordaz (DOE/HQ) said that the recommendations are good, but concerned particularly about schedule impact. Charlie Nylander (LANL) suggested that during the Performance Review particular impacts can be examined. Joe Vozella (DOE/LAAO) asked if any of the EAG recommendations not been fully funded? Charlie Nylander (LANL) responded that the recommendation regarding benchmarking has not been implemented. Joe Vozella (DOE/LAAO) asked if the recommendations regarding modeling have been fully funded? Charlie Nylander (LANL) said that modeling recommendations have been implemented and that has been funded largely by institutional funds. Joe Vozella (DOE/LAAO) asked if Information Management has been fully funded? Charlie Nylander (LANL) responded that recommendations regarding information management are being implemented but are not fully funded.

John Ordaz (DOE/HQ) suggested that the EAG prioritize the recommendations. Robert Powell (EAG) responded that this is why we wanted to meet with management to learn concerns and issues. Try to improve process, not increase cost. Good idea to prioritize recommendations. Bob Charles (EAG) added that the EAG makes recommendation with high-level review, but may not fit with the program. It is up to the Program Leader and DOE to negotiate whether they should be incorporated. John Ordaz (DOE/HQ) said it looks as though the GIT has accepted each recommendation and can't reject any but the program is asking for more and more money. Charlie Nylander (LANL) said the GIT reviews the recommendations. There is not funding for all, but those that have merit are embraced. An example is information management. We have looked at cost of incorporating legacy data into the Groundwater Database. The cost for doing that can't come out of program and we have gone to the institution to request supplemental funding. The GIT has embraced this recommendation positively, but must look for other funding. We understand the frustration of requests for increased funding. In area of benchmarking, LAAO commissioned study; have good dialogue on how to make that useful for us.

Joe Vozella (DOE/LAAO) said that from the site perspective, we are trying to hit the drilling schedule because the State wants it. We are trying to find ways to drill cheaper, which will then free up funding for other things. Have success by end of fiscal year. Continue to work with Charlie Nylander to fund the important things. When we talk with EAG they can hear the concerns that we have. Charlie Nylander (LANL) suggested that the managers ask the EAG on Friday about specific recommendations. David Schafer (EAG) pointed out that not every EAG recommendation costs money, some will save money. Steve Rae (LANL) said we have been able to leverage G&A funds to make progress. Ken Mullen (LANL) said that many of the EAG recommendations were of minimal cost. The database is not. It is not funded so it has not taken money away from drilling.

### Program Review

Charlie Nylander (LANL) said this is the first time to do a program review. Typically a review is done for DOE programs and the EAG recommended an annual program review. Remember that the start date was FY99 for DP funding. In FY98 got advance money of \$1 million. ER was already funded in FY98. The project has been going for 2 years, but from a DP perspective it is 1 year old.

**Los Alamos National Laboratory  
Hydrogeologic Characterization Program**

**EXTERNAL ADVISORY GROUP MEETING**

**OCTOBER 13, 1999**

Charlie Nylander (LANL) gave an outline of the presentation. He then described the goal and scope of the program and the regulatory framework. Betty Anderson (EAG) asked what the NMED considered was inadequate about the characterization? Charlie Nylander (LANL) said their letters cited four elements – recharge, fracture/fault role in movement of water, site characterization parameters, flow directions and effects of pumping well. These are in Chapter 1 of HWP and in Appendix 1 and 2.

Charlie Nylander (LANL) described the FY99 Accomplishments:

- Drilled and constructed 2 wells: R-25 and R-15 in Mortadad Canyon, which was completed this summer.
- R-9 was deepened to TD and well construction begun. Started drilling R-31 on Ancho Canyon.
- EAG produced two reports and we have prepared two action plans
- Stakeholder participation increased and was broadened to include pueblos, CAB, LA County
- FY98 Annual Report, published as LANL report
- GIT in 3 division review committee reviews. These are groups that come once a year. ESH, EES, and CST each had GIT members that presented the Hydrogeologic Workplan program. The review committees gave the program outstanding marks and accolades.
- Modeling significant work. Will be talking more about this in the afternoon.
- Aquifer recharge evaluated, preliminary water budget
- Higher resolution Pajarito Plateau grid in regional model
- Canyon and MDA-scale models calibrated
- Formed GIT Geochemistry subcommittee
- Reprioritized wells in response to HE in well R-25.
- Discussed understanding of resources required for interpretive tasks. Will be discussed tomorrow afternoon.
- Initiated web interface development

John Ordaz (DOE/HQ) asked how the well prioritization was formalized? Charlie Nylander (LANL) said it was discussed at Quarterly or Annual meeting and documented in meeting notes. We accelerated wells down-gradient from R-25.

Charlie Nylander (LANL) introduced the issues that he discussed in further detail: R-25, Drilling Method, Drilling Cost Comparisons, Response to Contamination

R-25 repairs had significant impact on budget and schedule. There were 2 major incidents, the dropped tremie lines and collapse of screen 3. Actions have been taken to prevent similar incidents in the future. The impact has been 7+ months on the schedule and \$1.5 million.

Tremie lines are hollow tubes used to place backfill materials in the well. At R-25 we used a one-inch diameter tremie line for bottom and a 2-inch diameter tremie line for the upper portions. The 1-inch tremie line was inside the 2-inch tremie line and both were supported by sling. The sling broke, the tremie lines fell and penetrated 700 feet of backfill materials in the well. The tremie lines were fished out with the assistance of logging by Schlumberger. The cost of this repair was 1.5 months and \$300,000. There will be cost sharing with driller, negotiations are on-going to determine how much. There are a LANL attorney and buyer involved. The driller is willing to pay it just a matter of negotiating how much.

R-25 is 1,940 feet deep and has 9 screened sections. The bottom 1 to 1.5 feet of screen 3 is compressed, like a slinky. Westbay equipment wouldn't fit through. Had to open screen up to have access to lower six screens. The GIT reviewed repair options and decided to cement in screen 3 and drill it out. Screen 3 was compressed and torqued during retraction of heavy wall casing. The heavy wall casing is lifted and rotated during retraction, the well got caught and the entire well was pulled up. The well was designed to be in tensile stress, and was not supposed to be under compressive stress. The screen gage not adequate for compressive stress. Screen 3 is unthreaded completely from casing section below. Could only happen by rotation and it probably occurred during heavy-wall casing retraction.

Los Alamos National Laboratory  
Hydrogeologic Characterization Program

EXTERNAL ADVISORY GROUP MEETING

OCTOBER 13, 1999

Bill Holman (DOE/OAK) asked what is holding up the rest of the casing? Charlie Nylander (LANL) responded that a collar and the backfill material, which provides a frictional force. As the cementing was going on, there was cement loss out of the joint. That cement formed a collar around the casing. We worried about if in the cementing of the screen it wouldn't support the lower part of the well, but it was already separated, so we didn't need to worry about it. Bill Holman (DOE/OAK) said had you known, could have just pulled that part out of the well. Charlie Nylander (LANL) said that section was already backfilled and could not have been easily extracted.

Robert Powers (EAG) asked if the screens below screen 3 were video logged? Charlie Nylander (LANL) responded that all of the screen to the top of screen 9 have been video logged. Robert Powers (EAG) asked there was no problem with backfill material? Charlie Nylander (LANL) said there is 60 feet of sediment in well covering screen 9, but the rest of the screens are intact. The sediment in screen 9 may be from the detached screen section. Mark Everett (MK/PMC) said that the sediment in screen 9 was there before backfilling the upper screen, so it was not the result of anything at screen 3. There was no evidence of backfill coming in at screen 3.

John Ordaz (DOE/HQ) asked if R-25 will be 100% after repairs? Charlie Nylander (LANL) said that screen 3 will not be usable. It is located at the bottom of perched water with highest concentration of HE. Will lose ability to monitor that part of aquifer, but can monitor above and below the zone. Lab data from 1,047 feet had 84 ppm RDX from the water collected during drilling. John Ordaz (DOE/HQ) asked if there is a guarantee we won't have to drill a new well? Charlie Nylander (LANL) responded that it does not look like it. The ER Program is putting in a new well that will monitor the zone that will be missing in R-25. R-19 will go in this year. Expected to be adequate. John Ordaz (DOE/HQ) asked if the State agrees with this approach? Charlie Nylander said the State agreed to cementing screen 3 but has not explicitly said that no additional wells will be necessary. Bill Holman (DOE/OAK) asked if the next down-gradient well will be multiple completion? Charlie Nylander said there will be further discussion tomorrow on how they will be drilled and completed. The down-gradient wells will monitor in that zone.

Charlie Nylander (LANL) said that during repair of screen 3, there was significant delay in finding appropriate cement. Need fine grain size that will penetrate through screen and into formation. Jack Powers (EAG) and David Schafer (EAG) have been here on and off since August to help with this. Micromatrix cement has a flyash matrix. The repair has required a careful cementing job. Didn't want to core the cement and have backfill flow into the well. Had a lot of erroneous information from vendors. Sent brochures and told us different things on the phone. Thought epoxy might be beneficial, so we ordered epoxy. After 2-3 weeks of being assured it was on the truck on its way, it turned out it had not been manufactured yet. Gave up on epoxy. Screen 3 and the lower casing section are slightly offset, so to get a straight hole has been difficult. We have re-cemented the hole many times (>5 times in one weekend). To do the cementing we put a packer in well, add sand as base to make platform in hole to support the cement. The costs of the screen 3 repair has been 5+ months and \$700,000. We are in the process of negotiating for recovery of some of the costs.

Betty Anderson (EAG) asked what would have happened if the other problem had not caused you to use the video to see screen 3? Charlie Nylander (LANL) responded that we would have become aware of the screen 3 problem when trying to install the Westbay. It would have encountered the blockage. Lessons learned will be to video the casing before backfill.

Resolutions to the R-25 repair issues are:

- ESH safety group more inspections of drilling equipment. No home-made equipment only certified.
- Awareness of dropping things.
- Use heavy gage screen. The specifications in FIP, reviewed by EAG. May go to solid well or machine slotted screens instead of wire wrap, depending on drilling method. Mud holes need stronger screen to develop. May have welded joints rather than threaded.
- Minimize number of tremie lines

Los Alamos National Laboratory  
Hydrogeologic Characterization Program

EXTERNAL ADVISORY GROUP MEETING

OCTOBER 13, 1999

- Video casing
- Pursue subcontractor re-performance and claim enforcement.

John Ordaz (DOE/HQ) asked if these are these QA/QC problems? What about this well is different from other wells? Charlie Nylander (LANL) said it was a QA/QC problem in the screen specifications. The screens were not checked and they were wrong. Another problem was trying to backfill the annular space 2000 feet deep with a one-inch pipe. The telescoped casing required the small lines. Changes in backfill from bentonite, fine sand, filterpack causes problems in the small lines. Backfilling would be better with large diameter wells so the tremie lines don't have to be so small. Struggled in backfill material. The borehole drilling went well for the depth with the drilling method. The failure was in the well construction process. Bob Charles (EAG) asked what is the negotiation position - will the driller give money back or will LANL hold payment? Charlie Nylander said there is a problem with the Lab not paying a subcontractor. We are now in cost recovery mode. The driller is willing to give credit. Steve Rae (LANL) pointed out that the Lab usually has a 1% retainage.

Rich Mayer (EPA) asked if this has been done before as far as depth and number of screens? Frank Patton (Westbay Instruments) said that there are up to 30 screens in 1200 meter wells. Orange County has more than fifty 2000-foot Westbay wells. No site has more difficult geology and drilling conditions. This is a drilling/completion problem. Once you get to the Westbay, it is simple. Multiply unconformity with weathering profiles and hard basalts one after another with clay materials below. The drilling method for one rock type is not the optimum for other rock types. Experimentation at this stage of the program is good.

Charlie Nylander (LANL) said if the driller drops a wrench or something they don't charge us for that or if their equipment breaks down, no charge. But for these major incidents there have to be negotiations or cost recovery by getting credit on future invoice on DP well. Karen Agogino (DOE/AL) asked if you had a stronger screen would this problem have occurred? Charlie Nylander (LANL) responded it probably would not have occurred.

Charlie Nylander (LANL) said the drilling method used is also an issue that impacts cost and schedule. The drilling method must be capable of maintaining an open hole. The Data Quality Objectives (DQO) influence drilling method because the DQO in the Hydrogeologic Workplan require characterizing saturated zones during the drilling through them. Recent correspondence from NMED indicated flexibility in this requirement. NMED is suggesting flexibility because of the perception of slow and expensive drilling. They are advocating getting the borehole in fast and cheaper and characterize afterwards.

The current drilling method is simultaneous air rotary and casing advance. It is perceived as slow because the experience at R-25 (the first borehole this method was used on) showed that 75% of drilling time where casing was stuck. R-25 was originally dry drilling without introduction of material behind the casing. This experience has shown that bentonite and water are needed to lubricate the casing. Compare R-25 to R-15 where mud was used behind the casing, the difference was dramatic. With the adjustments we have a pretty efficient system. This issue has been resolved by having the flexibility to select the appropriate drilling method on well-by-well basis.

Charlie Nylander (LANL) discussed the drilling cost comparison that had been prepared by DOE/LAAO. On a per foot basis, the LANL program has much more expensive than the \$200-500/foot at Nevada. Factors that have to be considered in looking at these others programs: they are mature programs, don't have problems with borehole stability. Therefore they may not reflect apple to apple comparison. Bob Charles (EAG) asked if the geologic problems that Frank Patton brought up are reflected in this slide? Charlie Nylander (LANL) said that the borehole stability problems that are present at LANL are not present in Nevada. Allyn Pratt (LANL) asked if these are comparing same costs? Charlie Nylander (LANL) responded that the total cost, but the devil is in details. Trying to figure out how to adequately compare the two. Bob Enz (DOE/LAAO) said the costs have refined this to isolate just drilling cost and the costs still higher at Los Alamos.

Bill Holman (DOE/OAK) what about the costs to drill the Guaje wells? Bob Enz (DOE/LAAO) said that the Guaje wells are not a good comparison, they were 1300-foot with mud rotary, but they are 30-inch diameter

Los Alamos National Laboratory  
Hydrogeologic Characterization Program

EXTERNAL ADVISORY GROUP MEETING

OCTOBER 13, 1999

wells, required moving lots more dirt. Bill Holman (DOE/OAK) asked if the casing had to advanced? Mark Everett (MK/PMC) said the casing was advanced to 500 feet. They had to drill with mud, advance the casing, cement the casing, continue to drill with mud. David Schafer (EAG) said to illustrate how little characterization can be done with mud, in the Guaje wells 3000-4000 feet are screened in completely dead zone.

Charlie Nylander (LANL) said the resolution to this issue is maturity and flexibility. There has been a decrease in cost with each well except R-25 and we have refined the drilling technology to match geology. There has been a steep learning curve and with increasing maturity the program will benefit from these lessons. Changes that have been made have resulted in a much more cost efficient system. Flexibility to choose other drilling methods on a well-by-well basis will provide an avenue for finding more cost efficiencies if they are out there.

Charlie Nylander (LANL) said the response to contamination is the last issue. The State has requested that the Lab commit to a consistent response process. So far in the program the responses have been inconsistent. Our proposed resolution of the response to contamination issue is the following process:

- Confirm results
- Check water supply, emergency response to above standards
- Joint GIT/NMED committee use criteria to prioritize: high (6 months), moderate (1 yr), high (3-5 years)
- Contaminant Response Criteria: first 9 from CFR process for establishing ACL. Last 6 important for Lab logistics. There will be more detail on this at the Quarterly Meeting tomorrow.

Bob Charles (EAG) asked what if the contingency funds are gone? There will have to be a balance between continuing deep wells or shallower wells. Charlie Nylander said the contingency funds are in the ER baseline and they are not part of the Hydrogeologic Workplan budget. Gene Turner (DOE/LAAO) said if contamination is found, there is a mechanism in the ER baseline to reprioritize funds. Allyn Pratt (LANL) said that the contingency in ER baseline is associated with uncertainty in constructing wells. That contingency is held at DOE/AL. The uncertainty associated with characterizing plumes is a different issue. Gene Turner (DOE/LAAO) said that the focus of the Hydrogeologic Workplan is characterization. Once contamination is found, it is the responsibility of the ER Project to address it. Bill Holman (DOE/LAAO) said that "high" and "moderate" responses would be required within a year, so an ER deep well would have to be kicked out to subsequent year. Allyn Pratt (LANL) said the ER Project re-baseline is very detailed. The main component is characterization on a watershed-by-watershed basis. Deep drilling program doesn't follow the watershed approach because deep groundwater does not respond to watersheds. Will have to reprioritize ER activities to find the money.

Charlie Nylander (LANL) reported on the budget performance:

Total Program Costs (1997-1999): \$9.8 million

Alluvial wells	\$428,000
Equipment	\$389,000
GIT	\$65,000
Modeling	\$522,000
Other	\$31,000
R-12	\$1.1 million
R-15	\$1.2 million
R-25	\$3.6 million
R-31	\$119,000
R-5	\$3,000
R-9	\$2.3 million

The bulk of the budget was spent on wells. In FY99, \$4.8 million was spent on wells, largest amount on R-25.

R-25 FY99 Cost Summary

\$1.8 million Well Construction  
\$0.5 million Field Operations – escort, field geologist, trailers

Los Alamos National Laboratory  
Hydrogeologic Characterization Program

EXTERNAL ADVISORY GROUP MEETING

OCTOBER 13, 1999

\$79,000 Project Management  
\$271,000 Testing and Analysis – land application of water  
\$112,000 Equipment

Project management was about 3% of the total cost of the well. The cost of Field Operations has been decreased by having individuals take on roles – so that the costs are down to 2-3 FTE.

R-15 FY Cost Summary

\$1.1 million Total Cost  
\$400K Well Construction  
\$160K Testing Analysis, Field Operations  
\*These two are the major costs

Bill Holman (DOE/OAK) asked if "testing/analysis" includes analytical costs? Pat Longmire (LANL) responded that it includes sample collection, sampling handling (e.g. filtering), support facility, and analytical costs.

FY00 Budget for DP

\$400K: Modeling  
\$50K : Information Management  
\$50K: GIS Activities  
\$2.35 million: Well Construction  
\$2.850 million Total

The costs for this year include R-25 completion, R-31, and R-5.

Bill Holman (DOE/OAK) said the modeling costs are up, why is that? Charlie Nylander (LANL) said the extra funding is to accelerate modeling to get ahead. Will be discussed more this afternoon. \$350,000 to fate and transport and \$75K to geologic model.

FY00 for ER Funded Wells

R-7	\$2.523 million
R-9	\$169 for Quarterly Sampling
R-12	\$ 998 for Quarterly Sampling and Development
R-15	\$ 605 for Quarterly Sampling
R-19	\$2.841 million
R-27	\$2.688 million
TA-15	\$2.400 million
Alluvial Wells	\$123
Modeling	\$800K

Total FY00 ER budget: \$10,455 million.

**Modeling**

Bruce Robinson (LANL) introduced the hydrogeologic conceptual model to characterize the Plateau. There are differences between the canyons and the mesas. There is lower recharge on mesas. In the subsurface, alluvial groundwater is perched on alluvium-bedrock interface. Some percolates deeper, possibly into intermediate zones and eventually there is percolation downward to regional aquifer. Modeling is being done on scales that vary from individual waste site to canyon to regional aquifer, which is the catchment for all contaminants.

Modeling activities that won't be presented this afternoon but that contribute to the characterization are geologic, Area L vapor plume, surface water modeling studies, and Area G risk assessment model development.

**Los Alamos National Laboratory  
Hydrogeologic Characterization Program**

**EXTERNAL ADVISORY GROUP MEETING**

**OCTOBER 13, 1999**

Waste Site Scale Modeling: TA-49 MDA AB

TA-49 is a mesa top site, and this work was done on Area 2 specifically. In the late 1950-1960s the area was used for underground safety experiments. The experiments involved detonating HE with some nuclear fuel in 6-ft diameter shafts that were 50-80 ft deep. Area 2 was subsequently covered with an asphalt pad because of surface contamination. The asphalt pad was placed above grade, which caused ponding in the adjacent area.

The site issues are the increased moisture levels beneath the asphalt pad. The increased moisture occurs because the asphalt pad traps moisture by limiting evaporation, has concentrated runoff into cracks within the pad, and increased seepage from ponded water in adjacent areas. A number of Best Management Practices (BMPs) have been implemented at Area 2, including removal of the asphalt pad, installation of an upgradient diversion channel, the pad area has been graded and tuff added, and the area has been revegetated. Future work at the site includes installation of a directional borehole under shafts to assess vertical extent of plume and moisture monitoring.

The modeling had two primary objectives: current extent of plume and assess the effectiveness of the BMPs. The modeling will be validated with field data. Robert Powers (EAG) asked if there is evidence that there actually is a plume? Kay Birdsell (LANL) responded no, a plume has not been detected.

Kay Birdsell (LANL) said the numerical model used is a 2-dimensional grid from the surface to water table with a single shaft. Unsaturated zone flow will use background and transient flow. The moisture content data from surrounding wells was used for background and moisture content from wells in site 2 was used for transient simulations. The background flow is estimated to be 0.1 mm/year, this seems to provide the best match with the field data. This was the number used as initial condition for transient simulations. For transient flow beneath the asphalt pad, 60 mm/year is best fits the data. However, corehole 2 is problematic, because it is wetter. It is in the middle of a collapsed area that got a lot more water. The simulations assume background 20% moisture content except in the Guaje Pumice (moister) and 50% moisture content under pad.

Kay Birdsell (LANL) explained the numerical model transport assumes a source located in the fractured zone at time 0. The source consists of uranium (particles, no sorption, low matrix diffusion, solubility limited,  $K_d=2.4$  ml/g) and cesium (infinite solubility,  $K_d = 428$  ml/g). Robert Powers (EAG) asked where the  $K_d$  values are from? Kay Birdsell (LANL) said that Yucca Mountain is the source of the cesium  $K_d$ .

Kay Birdsell (LANL) presented the numerical model results. The background unsaturated flow is 0.1 to 1.0 mm/yr and the transient flow beneath the asphalt pad is between 60 and 388 mm/yr. With the asphalt removed, the moisture redistribution will be slow and difficult to monitor. The predicted transport was simulated for the end members of the range of transient flux rate. The target predictions are that for flux rates of 60 mm/yr, the cesium does not move and the uranium moves a bit. The particles spread out more than the soluble uranium. At a flux rate of 388 mm/yr, both Cs and U move more. So at the end of the simulation, about 99% of the uranium is located near the shaft bottoms and plutonium should be similar. Cesium is also near the shaft bottoms. The movement of uranium particles is controlled by the pore size distribution. With increasing saturation, pores that are larger are saturated. For example, 0.12 mm is the largest pore size that is saturated at 50% saturation, whereas 0.6 mm is the largest pore size saturated at 65% saturation. Going to the other end of the scale, 0.04 mm is the largest pore size that is saturated at 20% saturation. This is an indication of the particle size that can move through the rock. Using a pore size analysis only 1% of U particles can move through the tuff.

Kay Birdsell (LANL) said the future predictions based on this work are that the moisture front redistributes, it does not just dry out (although the model does not take evaporation into account). Based on the predicted redistribution, we have suggested 4 monitoring points: a shaft point, a soil, unit 4, and unit 3. Soil appears to be the best monitoring points. The effects of the BMPs that have been installed are to return to the flux to 0.1 mm/yr. Recommendations made are to place the directional borehole close to fractured zone beneath 1 shaft, but no deeper than unit 2 and sample for colloids. In general, the use of asphalt pads should be questioned.

**Los Alamos National Laboratory  
Hydrogeologic Characterization Program**

**EXTERNAL ADVISORY GROUP MEETING**

**OCTOBER 13, 1999**

Mark Everett (MK/PMC) said that since it is dominantly fracture flow particle size/pore size may not apply. Kay Birdsell (LANL) responded that it appears to be matrix flow, not fracture flow because match of moisture content curves. Saturation not high enough for fracture flow. Rich Mayer (EPA) asked if the directional borehole will be installed soon? Kay Birdsell (LANL) replied it will be soon if the funding is available. John Ordaz (DOE/HQ) asked if the modeling is applicable to other TA's? Kay Birdsell (LANL) responded that they used FEHM, which is the same code that is used for all the modeling. David Schafer (EAG) asked how will flow be induced into the well? Kay Birdsell (LANL) responded that she doesn't know. Robert Powers (EAG) asked what the assumed oxidation state of the uranium. Kay Birdsell (LANL) responded that it was assumed to be oxidizing, so the uranium was assumed to be oxides. Robert Powers (EAG) said that the charge on the particles will effect transport. When the charge on the particle is the same charge as pore throats, the particles move right through. When the particles have the opposite charge as the pore throats, the particles won't go through.

Canyon-Scale Modeling: Los Alamos Canyon

Bruce Robinson (LANL) said they begin with a hydrostratigraphic model. Flow and transport model is used on the geologic model that has been constructed from well data and surface mapping. Two-dimensional surfaces are constructed and a 3-dimensional system is built from those layers. Flow and transport in the vadose zone uses the 2-dimensional grid that goes down to the water table. The stratigraphy is turned directly into the grid using software developed here and used numerous places. The 2-D and 3-D models are done. Grid resolution is increased in areas of more interest, generally along the axis of canyon.

Bruce Robinson (LANL) said the water budget is the most important factor. The water budget used is based on the work of Gray (1997). Gray measured precipitation and snowpack, stream flow discharge, made latent heat energy measurements (for ET), and did head measurements in alluvial wells. The models have a spatially dependent boundary condition, enhanced recharge on the fault. The 3-D fluid flow simulation shows the effects of spatial dependence of recharge in canyon/mesa. The fluid is increased under canyon bottoms. Data used to constrain the model includes well LADP-3 volumetric water content with depth. The water content curve from this well was compared to water content curve calculated different recharge rates. Well LAOI 1.1 was also used in this fashion. However, the range of recharge rates was too low to capture the wet conditions in this well. In order to account for this we will look at increased local recharge rate or varying the hydrologic properties. In the basalt the predictions didn't work, pointing out the need for more data. In the Puye the model underpredicts the water contents.

Bruce Robinson (LANL) said the sensitivity to hydrologic properties has also been evaluated. In the Otowi Member – need range of hydrologic properties. Uncertainty in hydrologic properties translates into an uncertainty that is 3x the recharge rate. In the Puye Formation we had to reduce the permeability by an order of magnitude. Bill Holman (DOE/OAK) asked which tests have been conducted that give the order of magnitude difference in Puye permeability? Bruce Robinson said the original values used were based on an initial guess. Then we looked at regional aquifer. The initial guess was in that range, but an order of magnitude lower is also in the range.

Bruce Robinson (LANL) presented a comparison of 3-D model results to data. The data comes from well LADP-4 and the data match is good. Captures the wetter conditions in canyon and the drier conditions on the mesa. For transient flow simulations we are evaluating are averages adequate? We can use averages, but transients on scale of years to decades must take those into account. To model the perched water we have developed a reduction factor to be applied at interfaces where a barrier is expected. The barrier diverts water laterally rather than continued vertical movement. Under the mesa, the recharge is slow enough that perching probably does not occur. Under the high recharge conditions in canyons, perched water probably occurs.

Bruce Robinson (LANL) discussed the results of the model with respect to tritium transport. Data from alluvial wells was used as input to model. Recharging fluid assumed to come from alluvial aquifer. Tritium is a good

**Los Alamos National Laboratory  
Hydrogeologic Characterization Program**

**EXTERNAL ADVISORY GROUP MEETING**

**OCTOBER 13, 1999**

water surrogate. Tritium in four wells along Los Alamos Canyon were used in a simulation from 1967 (assume background) to August 1991. Present day conditions simulation show some tritium reaches the regional aquifer. Tritium mass balance was estimated. Tritium inputs stopped when reactor shut down. Over 20-100 years the tritium concentration gets much lower, close to background due to three processes: 1. movement of tritium to regional aquifer, 2. dilution, 3. radioactive decay. The peak of tritium concentration is probably right now. However, monitoring would be over the order of 10 years to see significant changes in tritium concentration, won't be seen on a quarterly basis.

Bruce Robinson (LANL) presented the conclusions from the Los Alamos Canyon modeling. First, the process for model construction is workable. Second, the water budget is a reasonable bound (water budget study together with hydrologic parameters get good match). David Schafer (EAG) observed that it looked like a change in order of magnitude still matched data. Bruce Robinson (LANL) responded that a level of 3 to 5 times is what we are aiming for. Third conclusion is that the flow model calibration is reasonable.

Bruce Robinson (LANL) described the conclusions with respect to tritium. First, travel times of 40 years or less through vadose zone. Second, concentrations naturally decline over next 50 to 100 years by dilution, decay, going to regional aquifer. Third, long-term monitoring on order of decades will be needed to see change in concentration. David Rogers (LANL) said that the model assumes diffuse flow—what about fractures? Bruce Robinson (LANL) responded that water prefers to be in matrix because higher capillary suction in matrix. The matrix can handle the amount of water that appears to be flowing through. Pat Longmire (LANL) said in well LAOI-1.1 we expected to find high tritium in Guaje pumice, but it was low. We did find clay mineral formed by alteration of glass, which probably effected the tritium in the Guaje pumice.

John Ordaz (DOE/HQ) asked if R-9 was used in the model? Bruce Robinson (LANL) responded that data from R-9 was used in Puye characteristics. However, R-9 penetrates units that need much more work. John Ordaz (DOE/HQ) asked what can the model say about the uranium in R-9? Bruce Robinson (LANL) responded that tritium is not sorbed and goes to regional aquifer. Joe Vozella (DOE/LAAO) asked if this model is just for LANL? Bruce Robinson (LANL) responded that the model is just within the LANL boundaries. Joe Vozella (DOE/LAAO) said so the cleaning out is cleaning out on LANL property. If we wanted to show our pueblo neighbors we could use this model. Bruce Robinson (LANL) said we would use my model as source term for Elizabeth Keatings' regional model to predict what would happen on pueblo property. John Ordaz (DOE/HQ) asked when can we predict what the tritium concentration will be on their pueblo. Bruce Robinson (LANL) said we are prepared to do that now.

Bruce Gallaher (LANL) said that the modeling suggests a leading edge. Direct measurements would be better. Bruce Robinson (LANL) responded that models are for prediction. Sampling would be better for knowing the concentrations right now. Robert Powers (EAG) asked what else is coming down the canyon and what are the retardation factors? Pat Longmire (LANL) said that he would address that in the geochemical modeling presentation. Charlie Nylander (LANL) said there are two points to reiterate:

- 1) Site specific models are part of overall model
- 2) Data fit will be improved by additional data from new wells

#### Geochemical Conceptual Model

Pat Longmire (LANL) said that geochemistry varies from location to location. The focus for geochemistry will be on upper Los Alamos Canyon for next year, but we will also look at R-15 and R-25. The purpose of the Geochemical Subcommittee of the Groundwater Integration Team is to collect, interpret, and integrate geochemical data and information with hydrogeologic and risk data and information. It is critical to understand the geochemistry in order to distinguish between processes. There are processes that influence water composition and age, water/rock interactions, and fate and transport of contaminants. Distinguishing between these are important in estimating risk and potential remediation. Betty Anderson (EAG) asked are you thinking about time lines for remedial options? Pat Longmire (LANL) responded yes, we are considering time lines. For

**Los Alamos National Laboratory  
Hydrogeologic Characterization Program**

**EXTERNAL ADVISORY GROUP MEETING**

**OCTOBER 13, 1999**

example, the RDX will degrade over time, slowly. In comparison, the uranium half-life is too long to count on decay for remediation. With mobile contaminants we have to consider how fast they are migrating, which is dependent on hydrologic conditions and will be contaminant specific. This year we will write report on background water quality in alluvial, intermediate, and regional aquifer. As we go deeper in flow system, the water is older, more opportunity for water/rock interaction, so TDS goes up.

Pat Longmire (LANL) presented a geochemical conceptual model. On the western side of the Lab, recharge occurs along the Pajarito Fault zone and there is movement of water within Bandelier Tuff. There are steep gradients near R-25. At R-25 tritium in the water suggests it is 10-40 years old. Further to east, canyons with alluvium have recharge through Bandelier Tuff, alteration of glass to clay, recharge in a stair-step pattern. Basalts are important because we don't know much about them. Fracture flow and porous media basalts have elevated chloride, tritium, sulfate, and, in one zone, uranium. Water gets older the closer it is to the Rio Grande. Lots of clay minerals formed by water reacting with volcanic glass. Did not see that at R-25. The smectite has high absorption capacity, and will be a help to natural attenuation remedial response. Bob Charles (EAG) asked what speciation is expected at pH of 8? Pat Longmire (LANL) said at R-9 the pH in basalt was 8.8; in the Puye it was approximately 7.8. David Sarracino (San Ildefonso Pueblo) asked if the Santa Fe Group has less absorption capacity than Puye? Pat Longmire (LANL) responded that is hard to answer, if the clay minerals are there it could be similar. Elizabeth Keating (LANL) said that there are many facies in the Santa Fe group and that it depends what facies you are in.

Pat Longmire (LANL) discussed the distribution of Sr-90. Existing surveillance data in 1997 showed 1 to 35 pCi/L in Los Alamos Canyon. A goal was to identify the migration rate of the Sr. The question is whether Sr-90 adsorbs or precipitates. There is a strong correlation of Sr-90 with organic carbon but there is not much organic carbon in the tuff. Distribution coefficients are between 8 and 14. He showed an activity diagram that showed that Sr is stable as aqueous  $Sr^{2+}$ . There is a strong correlation between solid organic matter and Sr sorption Kds for soils and sediments collected from Los Alamos Canyon.

Pat Longmire (LANL) discussed Uranium contamination of groundwater at R-9. Background values are about 1 ppb but find 48 ppb in R-9 at a depth of 275 ft. Tritium information provides useful hydrologic information. Minteq was used to do the geochemical modeling which will be discussed on the next day at the quarterly meeting. Factors affecting adsorption of radionuclides are looked at while building the geochemical model. In alluvial aquifer Sr-90 is more mobile than Cs-137. Of the Actinides (U, Pu, Am), uranium is far more mobile. Field chemistry data is being collected to support the adsorption model. Stability boundaries for clay minerals show that R-9 and alluvial wells data plot within the stability range for Ca-smectite. From a contaminant transport issue that is good because it increases the sorptive capacity.

Pat Longmire (LANL) discussed the geochemical conceptual model of Upper Canon de Valle. Major contaminants include RDX, TNT, and their degradation products. Concentration versus depth plot shows peaks at 1050 ft and 1400 ft for RDX. From a risk perspective, RDX and TNT are of most concern because they are present above health advisory limits. Because of this, need to know mobility. RDX and TNT have retardation factors of about 1 so move at the same rate as the groundwater.

Bob Powell (EAG) asked if organic carbon values apply all the way to the surface. Pat says no.

### Flow and Transport Modeling

Elizabeth Keating (LANL) presented the recent work being done on the regional aquifer flow and transport model. Goals included integrating geologic, hydrologic, and geochemical data into a single, self-consistent, flow and transport model; testing hypotheses; providing information for data collection activities; and providing predictions of fate and transport of contaminants in the regional aquifer. The long list of modeling tasks were divided into three categories: framework development, calibration, and applications.

**Los Alamos National Laboratory  
Hydrogeologic Characterization Program**

**EXTERNAL ADVISORY GROUP MEETING**

**OCTOBER 13, 1999**

Framework development tasks included compiling geologic, hydrologic, and permeability data from a broad range of sources; building a hydrogeologic framework model; building a flow model based on geometries defined in the framework model; and identifying appropriate boundary conditions for the model. A lot of time can be spent making sure that the boundary conditions are appropriate. Other framework development tasks include developing a general model of recharge; and defining the calibration targets such as water levels, flux estimates. Defining calibration targets shows how well the model can predict things such as water levels.

Calibration tasks include calibrating the steady-state flow model to simulate pre-pumping conditions; calibrating the transient flow model to simulate water level responses to pumping over 50 years; calibrating the flow and transport model to geochemistry data such as stable isotopes and major ions, and evaluating the model performance. Modeling task applications include predicting fate and transport of contaminants and evaluating uncertainties. The model can be used to reduce uncertainty.

The original conceptual model is a box that shows none of the surrounding areas that are important for understanding the hydrologic situation on the Pajarito plateau. This year the focus has been more on model development and calibration, incorporating the effects of pumping from LANL wells and the buckman well field. Detailed pumping histories for 40 years have been compiled and withdrawal over that time period has been simulated. Current work is on recharge and incorporating the geochemical data. The steady-state flow model approximating pre-pumping conditions includes new information of fluxes at model boundaries, detailed evaluation of recharge rates, water budget calculations, and preliminary information on aquifer characteristics and model sensitivity. One reason for looking at the aquifer at the basin scale is that water inputs may be small compared to water outputs. Base flow along regional stream reaches. The reaches are gaining reaches, so use information on mean flow for flux calculations.

Current work includes work on the recharge model. Precipitation increases with elevation so made the assumption that a higher percentage of precipitation becomes recharge at higher elevations. Looked at wide range of studies to see if the approach made sense. Evapotranspiration estimates for the plateau are 1 to 1.5 meters per year. Bill Holman (DOE) asked if this is plateau wide and how it relates to specific places like Area G. Ed Kwicklis (LANL) said the numbers are averaged across the plateau. The chloride mass balance method showed a range of 1.9 to 4 meters per year evapotranspiration. These estimates are much too high when compared to calculated base flow to the Rio Grande. The simulated base flow from the model and the observed base flow are very similar for reach of the Rio Grande between Otowi Bridge and Cochiti Reservoir.

Current work includes preliminary information on aquifer characteristics and model sensitivity. Two assumptions are that total recharge is well constrained although the spatial/temporal variations are unclear, or pre-development water levels should be primarily influenced by permeability of aquifer rocks. There is some differences between predicted water levels from the model and known water levels. Some reasons might be that water levels are not accurate due to measurement in supply wells or that the stratigraphy model is wrong. Permeability estimates were given for hydrologic units within the physical boundaries of the model. Bill Holman (DOE) asked why the permeability ranges were so wide. Elizabeth Keating (LANL) said that both permeability data and water level data are needed. Water level data really needs to be from the specific unit.

Current work on simulating transient changes in water levels over a 50-year period. Evaluation of data from pumping wells. Results show good match but there are some inconsistencies such as with data from wells completed in both the Santa Fe Group and the "Chaquehui" formation. Chaquehui might be divided into two hydrologic units. In summary, we have a working system for integrating hydrologic and geologic data via a high-resolution 3-D mesh for flow and transport computations. Through the process of model calibration, we are evaluating the adequacy of our conceptual and numeric framework model and identifying data gaps. Our modeling approach relies heavily on independent data for model parameterization.

Bob Powell (EAG) said when sampling a pumping well, you can't tell where the water is coming from due to the long screen lengths. Elizabeth Keating (LANL) says yes and that the new R-wells will provide good water level data.

**Los Alamos National Laboratory  
Hydrogeologic Characterization Program**

**EXTERNAL ADVISORY GROUP MEETING**

**OCTOBER 13, 1999**

Modeling Of Groundwater Flow And Transport On The Pajarito Plateau

Bruce Robinson (LANL) said there is a need to be able to use models to assess risk to groundwater and to answer questions like what is the concentration of high explosives likely to be in a pumping water supply well. The goals of the Pajarito Plateau Modeling Project include a methodology for groundwater flow and transport model development at potentially contaminated sites at the Laboratory; use the methodology to guide data collection, site characterization, and modeling activities; define and address groundwater issues that are common to many sites on the Plateau; and address a site that currently needs comprehensive treatment, TA-16.

A schematic of probabilistic risk-assessment model shows that there are uncertainties in all steps that need to be propagated. Need to look at the mean behavior but also need to know the uncertainty. Risk assessment model pieces together other models. Results provide both mean and uncertainty, e.g., how long until high explosives contamination reaches a pumping water supply well, and what can be done to reduce the uncertainty. There is an example at TA-16. Focused on the regional aquifer flow and transport with supply well pumping. There are various possibilities of where HE is going. The travel was simulated having a line source along Canon de Valle and particle pathways. The reason for the long travel times would be because of porosities of sedimentary rocks. Need to do pump tests of regional aquifer to get real numbers.

Bill Holman (DOE) said if TA-15 is a mile away, it won't verify the model at all. A well will need to be drilled closer. Bruce Robinson (LANL) said the main use of the information is to determine if aquifer tests are needed to verify. Pat Longmire (LANL) said the sampling of PM-4 showed a lot of mixing so it is impossible to use this to verify the model. Contaminants will never be seen. Bruce Robinson (LANL) said that travel times are tied to porosity. All fast-channel movement, etc. is captured in the effective porosity value. Dave Schaffer (EAG) said the approach is good because you see a lot of variation.

Bruce Robinson (LANL) said that future modeling at TA-16 included expanding the range of parameters in the regional aquifer transport simulations, incorporating information on biodegradation of HE, including vadose zone simulations, and integrating the results of source term and groundwater model using groundwater risk assessment methodology.

**ATTENDANCE**

Betty Anderson	EAG	703-684-0123	<a href="mailto:elanderson@sciences.com">elanderson@sciences.com</a>
Bob Charles	EAG	307-655-3128	<a href="mailto:conehead@cyberhighway.net">conehead@cyberhighway.net</a>
Robert Powell	EAG	702-260-9434	<a href="mailto:rpowell@powellassociates.com">rpowell@powellassociates.com</a>
Jack Powers	EAG	801-269-0673	<a href="mailto:jpowersslc@aol.com">jpowersslc@aol.com</a>
David Schafer	EAG	651-762-8281	<a href="mailto:dschafer@prodigy.net">dschafer@prodigy.net</a>
Gene Turner	DOE-LAAO	505-667-5794	<a href="mailto:gturner@doeal.gov">gturner@doeal.gov</a>
Joe Vozella	DOE/LAAO	505 665-5027	<a href="mailto:jvozella@doeal.gov">jvozella@doeal.gov</a>
Bill Holman	DOE/OAK	510-637-1618	<a href="mailto:william.holman@oak.doe.gov">william.holman@oak.doe.gov</a>
John Ordaz	DOE/HQ/DP	301-903-8055	<a href="mailto:john.ordaz@ns.doe.gov">john.ordaz@ns.doe.gov</a>
Allen Chang	US EPA	214-665-7541	<a href="mailto:chang.allen@epa.gov">chang.allen@epa.gov</a>
Rich Mayer	US EPA	214-665-7442	<a href="mailto:mayer.richard@epa.gov">mayer.richard@epa.gov</a>
Alice Barr	LANL	505-667-0820	<a href="mailto:barra@lanl.gov">barra@lanl.gov</a>
Steve Bolivar	LANL	505-662-9608	<a href="mailto:bolivar@lanl.gov">bolivar@lanl.gov</a>
Dave Broxton	LANL	505 667-2492	<a href="mailto:broxton@lanl.gov">broxton@lanl.gov</a>
Bruce Gallaher	LANL	505-667-3040	<a href="mailto:gallaher@lanl.gov">gallaher@lanl.gov</a>
Elizabeth Keating	LANL	505-665-6714	<a href="mailto:ekeating@lanl.gov">ekeating@lanl.gov</a>
Edward Kwicklis	LANL	505-665-7408	<a href="mailto:kwicklis@lanl.gov">kwicklis@lanl.gov</a>
Patrick Longmire	LANL	505-665-1264	<a href="mailto:plongmire@lanl.gov">plongmire@lanl.gov</a>

Los Alamos National Laboratory  
Hydrogeologic Characterization Program

EXTERNAL ADVISORY GROUP MEETING

OCTOBER 13, 1999

Ken Mullen	LANL	505-667-0818	<a href="mailto:kmullen@lanl.gov">kmullen@lanl.gov</a>
Charlie Nylander	LANL	505 665-4681	<a href="mailto:nylander@lanl.gov">nylander@lanl.gov</a>
Allyn Pratt	LANL	505-667-4308	<a href="mailto:pratt_a@lanl.gov">pratt_a@lanl.gov</a>
David B. Rogers	LANL	505-667-0313	<a href="mailto:slug@lanl.gov">slug@lanl.gov</a>
Steven Rae	LANL	505-665-1850	<a href="mailto:stevenrae@lanl.gov">stevenrae@lanl.gov</a>
William Stone	LANL	505-665-8340	<a href="mailto:wstone@lanl.gov">wstone@lanl.gov</a>
Janet Gerwin	CAB	505-662-9568	<a href="mailto:gerwin@trail.com">gerwin@trail.com</a>
Chris Hanlon-Meyer	NMED	505-827-1536	<a href="mailto:chris_hanlonmeyer@nmenv.state.nm.us">chris_hanlonmeyer@nmenv.state.nm.us</a>
Dave Sarracino	San Ildefonso	505 455-7656	<a href="mailto:dsarraci@trail.com">dsarraci@trail.com</a>
Bob Enz	Enz Inc.	505 982-4038	<a href="mailto:benz@enzinc.com">benz@enzinc.com</a>
Toby Walters	IT Group	505-661-5214	<a href="mailto:twalters@lanl.gov">twalters@lanl.gov</a>
Sue Johnson	LATA	505-662-1830	<a href="mailto:sjohnson@lata.com">sjohnson@lata.com</a>
Mark Everett	MK/PMC	505-662-1322	<a href="mailto:meverett@lanl.gov">meverett@lanl.gov</a>
Kelly Bitner	Neptune & Co.	505-884-8455	<a href="mailto:bitner@neptuneandco.com">bitner@neptuneandco.com</a>
Frank Patton	Westbay	604-984-4215	<a href="mailto:fpatton@westbay.com">fpatton@westbay.com</a>
Bruce Johnson	Westbay	604-984-4215	<a href="mailto:bjohnson@westbay.com">bjohnson@westbay.com</a>

### Introduction

Charlie Nylander (LANL) reviewed the agenda and asked everyone to introduce themselves. The Groundwater Integration Team (GIT) is made up of Lab people involved in the groundwater program. It integrates disciplines and programs within the Lab. The GIT has five subcommittees that are smaller specialized groups. The GIT subcommittees are: Well Construction, Information Management, Hydrology, Modeling, and Geochemistry. The subcommittees are responsible for data interpretation and to develop resources/budget and budgets to complete their interpretive tasks. The subcommittees work with information more formally to capture individual tasks and activities to create a road map for the Hydrogeologic Workplan. This year the Annual Report will have more robust description of the results of the interpretive tasks.

### Information Management

Kendra Henning (LANL) presented the current status and plans for the water quality database. She discussed the design decisions that are important for a large groundwater database. The Phase I data continues to grow as more data are collected. Currently the focus is on data in Phase I, which is electronic data that is easily migrated. Report generation includes well completion reports. The web interface is the key to making the data accessible and we are working on developing that. We had submitted a proposal for internal Laboratory funding to develop a web interface that was capable of responding to queries with spatially-related data displayed on maps. The proposal was turned down because it was felt that the project should be paying for that. Without that funding it is likely the web interface will be able to provide static maps and tabular lists of data in response to queries.

Robert Powers (EAG) asked if the resources available is only a half-time person for 2 tasks? Kendra Henning (LANL) responded that there is one half-time database designer and one half-time program analyst. Carol LaDelfe (LANL) asked about the Quality Control for the database? Kendra Henning (LANL) responded that ESH-18 and ER are collaborating on the QC. Data that can be released after validation. Data stewards determine if the data collection/analysis methods are appropriate and data is good. Data pedigree. Need to have ER and ESH pedigrees. Kathy Cambell (LANL) has developed data quality indicators proposal that will probably be used in the QC for the database.

Kendra Henning (LANL) said that the estimated cost and schedule to complete Phase 1 is 2.5 FTEs and \$400,000. Rich Mayer (EPA) asked what the \$400,000 includes? Kendra Henning (LANL) said that the majority of the cost is labor. The equipment, software, etc already exists here. Janet Gerwin (CAB) said that she had visited the Drambuie website to get the chemistry from wells, but she couldn't get that. Ken Mullen (LANL) said that I have been the hold up because I wanted to add NMED and EPA data and to look at the whole package together. But I haven't gotten to it, so I will get it there soon. Kendra Henning (LANL) said that in 3-4 weeks there will be lots of new data added to the water level data available on web. Bill Holman (DOE/OAK) asked if geology and stratigraphy data be available on web? Kendra Henning (LANL) responded that it will be available. EES will continue to be the data managers for that data but it will be accessible through web site. Betty Anderson (EAG) asked if the plan is to have a staged approach with QA/QC, entering data, then GIS? Kendra Henning (LANL) responded that is the general approach. Parties outside the Lab are the stakeholders, provide input. There was a question about the Web site address and content. Kendra Henning (LANL) responded that currently the surveillance data exists on the website. The site can be accessed via LANL home page, click on ESH Division, click on Groups, then click on ESH-18. That interface as it exists now can be used for the new data.

**Subcommittee Status Report**

**Hydrology Subcommittee Status Report**

David Rogers (LANL) said that estimating permeability is the key task to this subcommittee. In the saturated zone we will measure gravimetric moisture content. The moisture content of the Bandelier is less than 5%, which is dry. The measurements result in moisture retention curves, which are data that support modeling efforts. While drilling the wells we have been able to do some slug test measurements. When water is encountered it is sampled with a bailer, then a transducer is put in the well to track the recovery for slug test. We also hope to conduct single packer tests during drilling. These tests measure pressure for permeability. We have had some problems with this equipment but we continue to work on this. Permeability measurements made after drilling include direct measurements on core and aquifer testing. Geophysical logs can also be used to make estimates of permeability. The Hydrology Subcommittee also has focused on defining hydrostratigraphic units. These units might not correspond to geologic units but they represent units with common properties due to permeability.

Charlie Nylander (LANL) highlighted that the hydrologic testing results can be found in interim completion reports and annual status report. There is also a site-wide hydrologic atlas in development. Bill Stone (LANL) explained that the modeling uses the 3-D geologic model as the basis for grid. However, it is also useful to have 2-D representation for some data. We have made maps (25 sheets) of thickness, depth to water, geology at water table. Want to expand with hydrologic properties and atlas will be distributed to interested parties.

**Modeling Subcommittee Status Report**

Bruce Robinson (LANL) said that the interpretive tasks for the Modeling Subcommittee focus on the permeability of the Puye and developing a perched water conceptual model for the Pajarito Plateau. The perched water model will involve digging into existing information and trying to interpret what is causing the perched water, the thickness, how to simplify the modeling, whether the water is rapidly moving or stagnant. We will then put the information on chemical data to find any correlation, stagnant water vs. underground channel. The contaminants are good tracers and have been useful in modeling Los Alamos Canyon.

Betty Anderson (EAG) observed there has been lots of progress. Please comment on time frames for completion of conceptual model and use of models. Bruce Robinson (LANL) said that he had presented an overhead slide in March that showed the expected progression of the modeling. We expect that merging the models is about 1 year away. This year the focus is on Los Alamos Canyon tritium flow and transport in regional aquifer. We are using contaminants or other markers i.e. Carbon-14 as tracers and calibration checks for the modeling. Robert Powers (EAG) asked if the data collected during drilling is considered critical to the modeling efforts? Bruce Robinson responded absolutely. We can use past data, but the new data is essential. An example is R-15 and the perching unit characteristics.

David Sarracino (San Ildefonso Pueblo) asked how is flow in perched layers being measured? Bruce Robinson (LANL) responded that it is impossible to get direct measurements. So we use indirect measurements like knowing when and where a release occurred and how fast they must have moved to get there. David Sarracino (San Ildefonso Pueblo) asked if the program is not depending heavily on modeling, but planning on using tracers? Bruce Robinson (LANL) responded that I am a fan of tracers, they are most useful in regional aquifer, particularly useful in pumping scenario. Using tracers is not on the books right now, but modeling may indicate the necessity of nailing down a parameter that requires tracer tests. Charlie Nylander pointed out that in R-25, with multiple ports, we have talked with regulators about doing tracer tests for vertical gradient.

John Young (NMED/HRMB) asked how the modeling data is QA/QC? Bruce Robinson (LANL) responded that there is a split in currently available data versus future data. In the future we will rely on QA/QC for database. The current state is less formal; we get data from reports or individuals. Most of it has a pedigree. The database

**Los Alamos National Laboratory  
Hydrogeologic Characterization Program**

**QUARTERLY STAKEHOLDER MEETING**

**OCTOBER 14, 1999**

adds a level of control that is useful. Charlie Nylander (LANL) said the chemical data goes through rigorous process. SOPs are used for data collection. Bill Stone (LANL) said that another quality check is the measurement of properties by multiple methods and comparing results. Dave Schafer (EAG) recommended having a second set of eyes look at pump test data because it is subjective.

Frank Patton (WESTBAY) said there is a big difference between data collected during drilling, with poor QA, and data collected in completed well. Completed well allows redundant tests in a borehole that has reached equilibrium. Chris Hanlon-Myer (NMED/DOE-OB) asked about the importance of coring through perched layers to the modeling. Bruce Robinson (LANL) responded that it is important. The equations on slides of the perched water conceptual model indicate the need for thickness and hydraulic properties; both necessary so the coring is important. Chris Hanlon-Myer (NMED/DOE-OB) asked if logging can give some of that information? Bruce Robinson (LANL) responded that logs can get at thickness, but prefer lab tests for permeability. Steve McLin (LANL) said that once wells are installed there is lots of collaboration and re-analysis and opportunity for repeated measurements. Can gain a lot of insight on initial vs. repeated measurements. Initial measurements are guiding what we are doing now.

Robert Powers (EAG) said that in standard monitoring wells you have to apply corrections for velocity through filter pack or slots. Are these corrections available for Westbay? Frank Patton (WESTBAY) responded that you can vary the type of test and velocity of test to take into account filter pack, etc. In the case of R-25 the stuck casing was almost always preceded by data collection. The stopping caused the sticking. Waiting until the well is completed will provide better data. Tend to throw out data that was collected during drilling. Only exception is data in zones that are not screened; that is the only data available. Data during drilling is compromised by time available and equipment available. Robert Powers (EAG) asked how long it takes to return to formation values after mud drilling? Steve McLin (LANL) responded that the water supply wells were all drilled with mud. There is the development phase and then annual samples. These long water quality records indicate convergence on a similar time frame. There is also some information in literature on time series. Pat Longmire (LANL) said it will come down to the amount of development. More development in water supply wells, more volume of water than in a monitoring well. Robert Powers (EAG) asked how long was the convergence on asymptotic values in the water supply wells? Steve McLin (LANL) responded a short amount of time. David Rogers (LANL) said the chemistry records do not include radionuclides and trace metals that would be affected by muds. Frank Patton (WESTBAY) said there are 55 wells in Orange County, and they have found it takes 1-2 quarterly sampling events to return to representative of formation. Sometimes up to 1 year. In one well, out of 1000s, they have never returned to background. In that one well bentonite was backfilled in screened interval by mistake.

Geochemistry Subcommittee Status Report

Pat Longmire (LANL) presented the interpretive tasks that have been identified.

Robert Powers (EAG) asked if the indigenous microbial populations been identified? Pat Longmire (LANL) said that they considered it more important to have the rate of degradation rather than the particular bacteria there. Robert Powers (EAG) said that it is not a suggestion to do elaborate tests like lipid fatty acid tests, but to have an idea of what is there. Pat Longmire (LANL) responded that in order to reduce TNT, need electrons, reducing conditions. The reaction is thermodynamically favorable, so might not even need microbes. John Ordaz (DOE/HQ) asked if you believe the plume is traveling at different rate. Pat Longmire (LANL) said the HE is not sorbed, so it is moving at speed of groundwater movement. It is important for flow model.

John Ordaz (DOE/HQ) asked which is more toxic, the RDX or the break-down products? Pat Longmire (LANL) responded that the RDX is more toxic. John Ordaz (DOE/HQ) said that he was told the RDX would take as much as 50 years to reach water supply well. Will it take longer or shorter for degradation products to reach wells? Pat Longmire (LANL) responded that is what we are trying to figure out. John Ordaz (DOE/HQ) asked why do you need to do this? Have you sampled for degradation products? Are they there? Pat Longmire (LANL) said yes we have observed them at R-25 where there were 84 ppb RDX and 19 ppb TNT. There were

also degradation products above detection limits: 4A DNT and 2A DNT. These are the highest concentrations observed. John Ordaz (DOE/HQ) asked if the degradation products also degrade? Pat Longmire (LANL) responded that they eventually to degrade to CO<sub>2</sub> and water. Rich Mayer (EPA) asked which compounds are more toxic? Pat Longmire (LANL) responded that the nitrosamine compounds are more toxic. Don Hickmott (LANL) added that the nitrosamine compounds are suspected to be more toxic, but toxicity studies would be very expensive. Betty Anderson (EAG) said from a risk perspective, not only toxicity is important, but what will arrive at the well. John Ordaz (DOE/HQ) said he was not questioning the need to know this. Questioning whether this can come from literature rather than these studies. Pat Longmire (LANL) said there have been extensive literature searches done. There is a fair amount of data on TNT, but not on RDX. An analogy of substituting one set of data for another would be the appropriateness of using hydraulic conductivity from Weldon Springs on the Bandelier Tuff.

John Ordaz (DOE/HQ) said what about the timing? If takes 50 years to get to well why not wait 10 years and use money to drill wells? Pat Longmire (LANL) responded because there is a risk now. No one drinking that water, but there is a risk. Betty Anderson (EAG) said that you can get lot of information from literature, but also need site specific data. RCRA and other regulations address "potential risk". This data needed to assess the potential. John Ordaz (DOE/HQ) said I wrote a letter to San Ildefonso saying that no risk from water with RDX. Was that wrong? Robert Powell (EAG) said the 50 years is right for what is known now, but it continues to spread and get larger. Don Hickmott (LANL) said that degradation of HE is not well known. But in soil RDX decomposition results in final degradation products that don't seem to be as toxic. Pat Longmire (LANL) said the 50 years is right based on what we know now. There was a question regarding when did the 50 years start? Pat Longmire (LANL) responded that the 260 Outfall started in 1941.

Robert Powell (EAG) said the charge on radical effects the absorption. If you know what the sorption is, that would help with transport estimates. Pat Longmire (LANL) said we have sorption for TNT and RDX, but not on degradation products. John Young (NMED/HRMB) asked are you looking at different adsorption rates in shallower part versus the deeper part? Pat Longmire (LANL) responded yes we are looking at that because it is expected to be different. John Young (NMED/HRMB) remarked that just because degradation products are in regional aquifer doesn't mean it was created in regional aquifer. Pat Longmire (LANL) said that Don Hickmott finds degradation products in the shallow zone, so it happens in the flow path. Not suggesting years of investigation, but a very focused study.

#### Well Construction Subcommittee Status Report

Dave Broxton (LANL) began with well R-15. It is located in Mortandad Canyon, which is a high priority because it is the area that receives most of the effluent from the radioactive liquid waste treatment plant. The objective of the well was to identify perched zones and sample water quality in the regional aquifer. This well was begun with an exploratory hole that we hoped would reach an expected perched water zone in the Bandelier Tuff. The exploratory hole was a 420-ft hole drilled with an auger rig with continuous coring. No saturated zones were encountered in the Bandelier Tuff. The exploratory hole is referred to as Phase I drilling. Phase II drilling was with the Barber rig. That hole started in lower part of Bandelier tuff. It then encountered the Puye Formation. The Puye Formation was very coarse grained and the Totavi had flowing sands. The Totavi is a Rio Grande axial deposit, not a sheet deposit of layer. In a zone below the Puye Formation where driller they thought hit a water zone, cannot be sure, the mud was thinner. This may be an intermediate perched water zone. At about 940 feet we encountered deposits that were water producing, the regional aquifer, and the total depth of the well is 1107 feet. We retrieved continuous core through most of Bandelier Tuff. The analysis of water collected in intermediate zone indicated elevated tritium, but in the regional aquifer the tritium looks like background. For the R-15 completion, a transducer in hole found ground water at 941feet. A screen was placed so that it extended 5 feet above and 60 feet below the groundwater level. The 60-feet of screen is to account for drawdown in the aquifer since R-15 is in the middle of a nest of municipal wells. It was a standard completion, the bottom sloughed in, we placed bentonite, and five feet below the wire screen we placed fine sand, then filter

pack, then fine sand, and finally bentonite, and the top was cemented in. The predicted geology was very close to what was encountered, although the basalt is the most difficult to model.

Dave Broxton (LANL) described the work on well R-9 in Los Alamos Canyon and R-12 in Sandia Canyon. The R-9borehole had to be deepened from 710 feet to 770 feet in order to put in a 60-foot screen. The well is in the ground and has been backfilled up to bottom of the 10-inch casing; it should be complete in about 2 weeks. Well R-12 currently has various casings in to a depth of 847 feet. To complete the well we will deepen it another 30 to 40 feet and install a Westbay-style completion.

Dave Broxton (LANL) described work completed on R-31, located in Ancho Canyon. Phase I included drilling to 250 feet with an auger rig. We did not reach the pumice bed because the Bandelier Tuff was much thicker than expected. The Phase I hole has been backfilled to 40 feet and we are ready to start Phase II when the Barber rig is available.

Bob Hull (LATA) described the progress on the R-25 screen 3 repair. The repair involves cementing the collapsed portion of the screen and coring through it. This repair is necessary in order to open up the hole to accommodate the Westbay equipment. The screen section and the blank casing below it have been decoupled and are offset, so the challenge has been to drill a straight hole through a crooked casing. We have used a stinger made up of 27-½ inch steel and 14-inch PVC, trying to lock the screen in place. The cement is micromatrix Portland Cement. We had to put in place a 2<sup>nd</sup> packer to keep cement from being washed out. We used the video camera to make sure of proper placement, will go back and ream the hole with a tapered reamer try to re-orientate it. Bill Holman (DOE/OAK) asked if there will be a ledge in the screen? Bob Hull (LATA) responded that we re-cement and re-core each time, so no ledges are left. Cindy Abeyta (San Ildefonso Pueblo) asked if deviation logs are being run? Bob Hull (LATA) said they would be helpful. The hole is straight, it is the casing that is not. But that is a good idea. Robert Powell (EAG) asked when will Westbay actually go in the hole? Bob Hull (LATA) said we still have to ream, wash out, remove packer, develop each screen by setting packers above and below and jetting them. Probably sometime in November.

Cindy Abeyta (San Ildefonso Pueblo) suggested using a pilot hole to reduce cost. It would be a small hole and geophysical logs to get information before the final screen. Charlie Nylander (LANL) responded that we have discussed that, but decided not to drill the same hole twice. Jack Powers (EAG) said that in a lot of places the hole won't hold. A pilot hole would either lose lots of mud or it would close up. Cindy Abeyta (San Ildefonso Pueblo) said you could use mud rotary; you would lose information on perched zones, but could get that with geophysical logging. Charlie Nylander (LANL) said if we drill with mud, we could do that. We will reconsider doing that.

Chris Hanlon-Mayer (NMED/DOE-OB) asked what the extent of penetration of cement in the R-25 hole is? Bob Hull (LATA) responded that the volume put in was 4 times the volume of the sand pack and well. Don't know where it went, but the hole took it all. Charlie Nylander (LANL) said the lower packer prevents the intermingling of water with the lower six zones. Tried to minimize that.

### DQO Re-Visitation Results

Charlie Nylander (LANL) said the Hydrogeologic Workplan was developed using the DQO process. The DQO process identified the questions that must be answered in order to resolve the decisions we have to make. The questions were formulated based on the conceptual model. In September we had a joint working session with NMED to review the data collection DQOs in the Hydrogeologic Workplan to make sure we are collecting the right type and quality of data. Together we reviewed DQOs and re-examine them from the decisions to the questions and the resultant data needs. We made no substantial changes, a minor change to the amount of fracture data required. This review resulted in increased flexibility with respect to drilling methods.

**Los Alamos National Laboratory  
Hydrogeologic Characterization Program**

**QUARTERLY STAKEHOLDER MEETING**

**OCTOBER 14, 1999**

Jack Powers (EAG) said that with mud drilling you can't identify perched zones. Charlie Nylander (LANL) said we felt that geophysical logs could be used, although there would be false positives because of penetration of mud into the formation. It appears that with mud drilling we could collect most of the required data and there are other considerations:

- mud drilling been in the background for the past 2 years
- September letter from NMED says that characterization is not possible during drilling, just put in the well and sample after
- DOE continues to ask why not drilling with mud when it is cheaper

Steve Rae (LANL) asked if there was any discussion of what places would be more amenable to mud drilling? Charlie Nylander (LANL) responded that we discussed what formations would be easier or harder to drill in, for example in the basalts we are more likely to lose circulation.

Charlie Nylander (LANL) pointed out the pitfalls of mud drilling:

- TEGD says mud drilling is forbidden
- Drilling experience on plateau, loss of circulation in some units
- Requires 24-hour drilling because have to keep circulating
- Water supply required
- Development would take longer
- Introduced fluid into well effects chemistry
- Tests are not convenient to do
- 

Jack Powers (EAG) asked if there had been consideration of space availability for mud pits? Also, security requires 30-40 minutes to get in – couldn't get mud in fast enough with loss of circulation. Bill Holman (DOE/OAK) asked about disposal of contaminated mud? David Schafer (EAG) said that the drilling costs have been too high because there has been the requirements to characterize while drilling, seal perched zones, and not to use bentonite. If you are willing to forgo these with mud drilling, then casing advance method can be equally as inexpensive. Charlie Nylander (LANL) pointed out that another drilling method would require new learning curve and re-tooling. John Young (NMED/HRMB) said we weren't pushing mud rotary, just a more efficient method. Last year only one hole and its not complete. Just want a more efficient method. The intent was to open up the other methods and streamlining. Using mud to some extent already, and so some clean up has to happen. Robert Powell (EAG) said if the State is concerned about radionuclides, the mud is going to absorb the radionuclides. Gary Simpson (Baroid) said the mud used now is for lubricating, not forced into the formation. Mud drilling will force the into the formation. Charlie Nylander (LANL) said that NMED didn't intend to force mud rotary, that is all I have heard about from DOE and Bearzi. John Young (NMED/HRMB) said we just wanted to get a more efficient method. Steve Rae (LANL) asked if there was discussion of sites where no contamination is expected as better candidate for mud drilling? Charlie Nylander (LANL) said we did discuss that, e.g. R-31 was selected to try mud because no contaminants and fairly shallow. Concern that if it works great in R-31, then more pressure to use only mud. Better completion would be in an area where a comparison is more applicable.

Jack Powers (EAG) suggested that the different types of mud drilling be distinguished. Charlie Nylander (LANL) said there are different mud rotary methods:

- Standard: bit in hole with mud filling up the whole
- Reverse: the pipe holds the hole open and fluid goes up the inside the drill string.

If you have casing down the hole to hold it open, can not run geophysical logs. With all the positives and negatives of mud drilling, the proposed schedule includes drilling all the wells with mud except R-7 and R-19.

Gene Turner (DOE/LAAO) asked why R-7 with is proposed as air drilling instead of mud? Charlie Nylander (LANL) responded that is because R-7 is in LA Canyon where we need permeability data. This type of data is better much better quality and more efficiently collected when the borehole is drilled with air. David Rogers (LANL) added that Los Alamos Canyon also has a thick vadose zone with multiple perched zones. Pat

Longmire (LANL) added that the chemistry is important from R-7. Robert Powell (EAG) asked if the cost of disposing mud has been considered? Charlie Nylander (LANL) responded that some rough estimates have been put together. One estimate of \$100/drum. We have permission to land apply the produced water from R-25 and think that we could also land apply mud. Would have to get approval from NMED as we did with the produced water. Gary Simpson (Baroid) said that the trouble with lost circulation is that contaminated mud would not come up, it would be stuck in fractures.

Bill Holman (DOE/OAK) asked why R-5 with mud, wouldn't be similar to R-7? Pat Longmire (LANL) said it is a trade off. We will have to develop it very well. Bill Holman (DOE/OAK) said that presumably mud drilling is cheaper, is it really with all the data collection? Pat Longmire (LANL) said the answer is not known. David Schafer (EAG) asked if the wells will be constrained air or unconstrained air? It should be spelled out in order to make a true cost comparison. David Broxton (LANL) said that the air drilling will have to be unconstrained in R-19. Charlie Nylander (LANL) said that in R-15 when the downhole hammer was used, the borehole was advanced quickly.

Jack Powers (EAG) asked if the contract has constraints on deviation for mud drilling? Charlie Nylander (LANL) said it is not in there now, it would have to be modified. Jack Powers (LANL) said that there would not be problems if you will drill small pilot hole, but if you start with big hole there could be problems with deviation. Gary Simpson (Baroid) said that on the Sigma Mesa well and the water wells, the trend seems that as you go up in elevation, the drilling becomes more complex. In the canyons you can probably drill with mud. But on the mesas the chance that it will work goes down. On Sigma Mesa, it was a total disaster. Loss of circulation, tried air, mist, stiff foam, ect., lost the hole. The Puye conglomerate is unstable and needs pressure to keep it open, but formations above it won't support that pressure. Changed water well drilling on mesa; stiff foam down to Puye conglomerate, cement casing, then switch to flooded reverse. Charlie Nylander (LANL) said it is those experiences that have kept us away from fluid drilling. Although using lubricating mud is working well. GIT is not entirely comfortable with this proposed drilling schedule.

Charlie Nylander (LANL) recapped that the experience of air rotary at R-9 was very expensive. But the second well R-12, used the same drilling method at half the price. For R-25 we switched to Barber rig, and had another steep learning curve and costly accidents. R-15 went fast and much less costly. This suggests that changing drilling methods costs in learning. There is some reluctance in changing methods again. Steve Bolivar (LANL) pointed out that the problems are with well completion, not with drilling and this problem won't change with drilling method. Rich Mayer (EPA) asked if the time was spent completing R-25, not drilling it. Charlie (LANL) responded yes. R-25 was started in July and we were at total depth in February, but it has not been completed yet. There was a lot of time stuck during drilling. We learned that lubrication is necessary. The completion included the dropped tremies and screen 3 repair. Gene Turner (DOE/LAAO) said that the schedule for plume chasing wells is not finalized in the baseline. Robert Powers (EAG) noted that with the 2 plume chasing wells and R-19 have excellent data for fence diagram.

### R-25 Lessons Learned

Charlie Nylander (LANL) presented the issues, lessons learned, and corrective actions that have been implemented based on the experience at R-25.

- Issue: Geologic conditions
- Issue: Intermediate zone seal
- Issue: Time spent fishing
- Issue: Incorrect placement of backfill materials
- Issue: Blockage of screen 9
- Issue: Collapsed screen 3
- Issue: Crew experience
- Issue: Safety incidents
- Issue: 24 hour drilling schedule

- Issue: Avoidable rig down time
- Issue: Subcontractor errors
- Issue: Incorrect type of PVC
- Issue: Well casing integrity
- Issue: Crooked casing string

David Schafer (EAG) suggested that to address the issue of crooked casing string, should use either welded screen or threaded pipe that is cut into the pipe. Charlie Nylander (LANL) said that another lesson not up there is, if using mud rotary, use a stronger screen, either covered or cut. David Schafer (EAG) said he would suggest a heavy duty wire wrap, it is just as strong and has bigger holes to develop. Jack Powers (EAG) said that if you go to mud, throw away the video camera. David Schafer (EAG) said another lesson is don't use 1-inch tremie to backfill. Need larger holes. Jack Powers (EAG) said they will be able to drill quickly if no data collection required.

#### Afternoon External Advisory Group And Stakeholder Session

Bob Charles (EAG) said this is the second of stakeholder meetings, the first was in March at Ghost Ranch. Your time to express issues and accolades. We issued a report with a list of issues and accolades. Go through that list and see how things are going. Then add new things. When we are done, will go through this with GIT.

Bob Charles (EAG) said the **first issue** is "involvement in planning". John Young (NMED/HRMB) said from HRMB perspective since our new Bureau Chief has given a homework assignment, I haven't been involved at all. I was hoping the assignment wouldn't be a problem, but the relationship has deteriorated. I used to get routine calls, but have not since then. Bob Charles (EAG) said the letter said John Keiling is the contact. John Keiling (NMED/HRMB) said that I never hear anything either. John Young (NMED/HRMB) said that they know I am the one to call. Rich Mayer (EPA) said the EPA not been involved much. NMED has lead on groundwater, but we have lately been getting more. John Young (NMED/HRMB) said I've requested that EPA be notified of meetings. Chris Hanlon-Meyer (NMED/DOE-OB) provided an example of the schedule in well drilling on the planning side. We have been getting the FIP after wells are started, not for review before information. David Sarracino (San Ildefonso Pueblo) said that from the pueblo perspective, the Lab has made an effort to involve us at meetings, but more can be done. Informal "heads up" by e-mail. I didn't get notice of meeting in June. I was receiving good information from Dave Broxton on drilling, but that has stopped. John Young (NMED/HRMB) said there was a weekly update, but that has stopped.

Charlie Nylander (LANL) responded that with San Ildefonso, when we send letters, but it may not get to governors or council, so they don't know about involvement. Discussed periodic half-page memo to governor as information about working with Welser/Sarracino. Dave Sarracino (San Ildefonso Pueblo) said more specific to this project. We have communication problems, locally. My concern to be able to be involved at department level. Charlie Nylander (LANL) said the well FIPs could be circulated to pueblos as well as NMED and EAG for review. Chris Hanlon-Meyer (NMED/DOE-OB) said the FIP should have exceptions to Hydrogeologic Workplan clearly flagged. Charlie Nylander (LANL) responded on the homework assignment, it requested detailed management information on R-25. Need to clarify expectations. Where does the line exist between jurisdiction to ask questions and directing management. How far should the regulator go in directing our day-to-day work as opposed to specifying data quality or schedule. Need to clarify this to ease tension.

Bob Charles (EAG) said the **second issue** is "data distribution". Dave Sarracino (San Ildefonso Pueblo) said the preliminary data sharing did not occur. Last spring no data sharing until 48 hours before going to press on R-25. Betty Anderson (EAG) said that at the March Annual Meeting we discussed validated vs. unvalidated; releasing preliminary data. Bob Charles (EAG) observed that apparently that hasn't been balanced yet. Rich Mayer (EPA) suggested that the data could just come as "preliminary" and subject to change. Cindy Abeyta (San Ildefonso Pueblo) suggested it would be better if they could just assign a time frame for validation. Our concern is about time. Dave Sarracino (San Ildefonso Pueblo) said that other stakeholders know about it 6

Los Alamos National Laboratory  
Hydrogeologic Characterization Program

QUARTERLY STAKEHOLDER MEETING

OCTOBER 14, 1999

months before we did. Janet Gerwin (CAB) said I got it from Steve Yanicek last fall. He said there was tremendous data, but it wasn't released. Scientists like to go over things and make sure. John Young (NMED/HRMB) said the Lab doesn't want unvalidated data to get to wrong places, example was tritium contamination at the lab. Had to retract data. Julie Jacobs (NMED/GWQB) said that at the GWQB I deal with DOD facilities. They agreed to give us draft data. John Young (NMED/HRMB) said I am surprised I didn't find out sooner. Bob Charles (EAG) asked if the web site help? Janet Gerwin (CAB) said the web site has 1996-1997 data on it. Chris Hanlon-Meyer (NMED/DOE-OB) said it wouldn't be appropriate to have unvalidated data on web site. Jim Mullany (NMED/GWQB) suggested there could be an e-mail list. John Young (NMED/HRMB) said have a to-call list. Dave Sarracino (San Ildefonso Pueblo) said we can handle preliminary data. John Young (NMED/HRMB) asked are you talking about Ken Mullen and surveillance group? So many groups at Lab, that they may not have your name. Dave Sarracino (San Ildefonso Pueblo) said we have had discussions with Charlie and others and they wanted to make sure that I wouldn't be running off and spreading it around. Betty Anderson (EAG) said it may not be that they don't trust you but that they needed to explain the limitations. John Young (NMED/HRMB) said on R-15 we received no data. Heard through the grapevine on tritium. Dave Sarracino (San Ildefonso Pueblo) said the accord pueblos have an agreement on data sharing and it takes us a while to share our data too. San Ildefonso should get an agreement about data sharing, we have the commitment to share, it is the time frame. Cindy Abeyta (San Ildefonso Pueblo) said even data that has been published, they haven't wanted us to talk about it. Now they are taking a more serious look at validating, but they are reluctant to let us talk about historic data. Anthony Armijo (CAB) said we would like to get on weekly update lists if they are continued. Robert Powell (EAG) said we should get on the mailing list too, so the EAG can keep up with what is happening. Anthony Armijo (CAB) said the CAB is interested in following this session. Would like faster turn around so I can take it back to our CAB.

Charlie Nylander (LANL) responded that as we were drilling R-25, the early HE data regulators wanted to see unvalidated data, so did pueblos. Lab was burned on R-9 where unvalidated data got into the newspaper, and it was wrong. When we have high numbers that turn into low numbers, there is suspicion. When we got to the bottom of R-25, needed to share preliminary data to determine how to finish the well. Developed a process. Willing now to share preliminary data, if there is an understanding that it remain guarded. David Sarracino (San Ildefonso Pueblo) said there will be an effort on the part of the Pueblo to make an agreement. Charlie Nylander (LANL) said the Lab has to finalize the mechanism for releasing the data. Started to develop a procedure, Lab got wrapped up in legal review. David Sarracino (San Ildefonso Pueblo) said with the Accord pueblos, there is already a mechanism. Chris Hanlon-Meyer (NMED/DOE-OB) asked what about the weekly report? Dave Broxton (LANL) said I got busy. Also I didn't know anyone was reading them. I can start doing this again. Charlie Nylander (LANL) said we got so busy at end of the year, did not have time to do the phone calls, etc.

Bob Charles (EAG) said the **third issue** is "plume definition". John Young (NMED/HRMB) said the process has started but it is slow. 1 well per year just doesn't do it. Part of problem is cost. When wells cost \$1-\$3 million, money just doesn't appear. Only so many wells they can do, but one a year isn't enough. Robert Powell (EAG) said this program is for characterization. Doesn't plume definition fall under purview of ER? Betty Anderson (EAG) asked what would you recommend they do? John Young (NMED/HRMB) said that was why we wrote the letter (To Brown and Taylor from Bearzi, Aug 20, 1999) to streamline. Chris Hanlon-Meyer (NMED/DOE-OB) said there should be contingency money set aside to respond. Rich Mayer (EPA) said the purpose of wells is only for characterization; isn't for plume chasing. Robert Powell (EAG) and John Young (NMED/HRMB) both responded that the wells are for characterization and monitoring. John Young (NMED/HRMB) said that in addition to characterization and monitoring, a number of groups are relying on the Hydrogeologic Workplan for plume chasing. Jim Mullany (NMED/GWQB) said it seems that it expands the scope of the program. Seems like there should be a separate budget and group to address plumes while they continue with the R-wells. How relevant were the interpretive tasks to the Hydrogeologic Workplan? Are they new requests for funding? With that incremental expense, will that take away from the program? John Young (NMED/HRMB) said some of the tasks might be funded by other programs. Bob Charles (EAG) said that your comments are systematic.

Los Alamos National Laboratory  
Hydrogeologic Characterization Program

QUARTERLY STAKEHOLDER MEETING

OCTOBER 14, 1999

Charlie Nylander (LANL) responded we have developed an approach, will have another meeting (with the regulators) to discuss in more detail. Use 15 criteria to prioritize high- 6 months, medium – 1 year, and low – 3-5 years.

Bob Charles (EAG) said the **fourth issue** is "intermediate wells". John Young (NMED/HRMB) said there had been a meeting where it was agreed there would be a de-coupling of canyons group and intermediate wells. Now, apparently the Hydrogeologic Workplan covers intermediate wells. They were supposed to give us a letter, but haven't seen it. Now, R-9 intermediate is unfunded. We have to write a letter. Chris Hanlon-Meyer (NMED/DOE-OB) said there has been a breakdown in the definition of what is worth monitoring. NMED considers groundwater as saturated material. John Young (NMED/HRMB) said in the WQCC, there is a yield definition. But also have another definition. Chris Hanlon-Meyer (NMED/DOE-OB) said this stirred up DQO about characterizing intermediate zones that can't be characterized during drilling. They will have to go back. John Young (NMED/HRMB) said they won't monitor those zones unless we make them. The zones at R-9 are no brainer, what is the hold up? Betty Anderson (EAG) asked what do you feel about value of information while drilling? John Young (NMED/HRMB) said it is useful, but if they detect something but it is below a standard, so they ignore it. We need to have a good reliable number. I am protecting the Lab and the citizens of New Mexico. Have done so much work modeling geochemistry, but don't need to have so much effort until have "real" data.

Charlie Nylander (LANL) responded that intermediate wells in canyons focus area. This year doing regional wells over intermediate wells. However, some intermediate wells may fall under DP wells if it appears the cheapest way is to drill quickly down to regional aquifer with an intermediate well next to it. Dave Broxton (LANL) said the intermediate well next to R-9 has just been re-baselined. Developed a series of criteria for putting activity in baseline. For next two years on doing "mandatory items". Don't have a letter making it mandatory. It is definitely in next year funding, but may be done this year. Charlie Nylander (LANL) said that it is important that NMED review the meeting minutes from the Quarterly Meetings and send a letter back agreeing that those were the action items. That gives ER the regulatory letter they need. David Sarracino (San Ildefonso Pueblo) said the questions on R-9 have mostly been answered by the presentations here. The R-9 intermediate well was not on the schedule. Our concern that those intermediate wells will help us out in our proposal to DOE to show we understand. Last few days have been very informative.

Bob Charles said the **fifth issue** is "re-prioritization". John Young (NMED/HRMB) said how the wells were ranked in the Hydrogeologic Workplan needs to be looked at again. The ER Program is attacking higher risk sites first. The current list does not reflect that. It reflects data needs. R-31 is because we have no data. That can wait. Need data in high priority canyons. Working on letter on this.

Charlie Nylander (LANL) responded that we took the watershed approach this year, e.g. reprioritizing R-5 and R-7 in LA/Pueblo and R-19 and Don Hickmott's well for HE in R-25.

Bob Charles said the **sixth issue** is "parking wells". Jack Powers (EAG) said they won't be parking any more wells. Chris Hanlon-Meyer (NMED/DOE-OB) said temporary casing is still in at two wells, so it isn't any better. John Young (NMED/HRMB) said but they are scheduled and Broxton says they will never park another well.

Charlie Nylander (LANL) responded that by end of November will have unparked all the wells. Will not park any more wells.

Bob Charles said the **seventh issue** is "drilling methods". John Keiling (NMED/HRMB) said our purpose is to promote flexibility. John Young (NMED/HRMB) said we were not pushing mud. I prefer air. But reluctance to consider anything. To say Barber is the only method that will work. Then they come back to us with need for pristine water samples. We never said there was a requirement for pristine water samples. Cindy Abeyta (San Ildefonso Pueblo) said we still would like to see mud rotary pilot hole. At another place they spent millions on sonic drilling, then went to mud rotary pilot holes before sonic drilling. Jack Powers (EAG) said normally that is true, but there is a big difference between up on mesa and down below. Cindy Abeyta (San Ildefonso Pueblo) said they could use the pilot hole as observation well. John Young (NMED/HRMB) said I was not pushing mud,

Los Alamos National Laboratory  
Hydrogeologic Characterization Program

QUARTERLY STAKEHOLDER MEETING

OCTOBER 14, 1999

just wanted to look at other options. Betty Anderson (EAG) said there was a slide yesterday that showed declining cost. John Young (NMED/HRMB) said we asked at DQO meeting, but they don't want to talk about money. Betty Anderson (EAG) said the cost projections should include the decrease in cost with experience. John Young (NMED/HRMB) said mud won't require as steep a learning curve as Barber rig. Jack Powers (EAG) said that being behind the fence makes a big difference. An hour a day to get in and out. At R-25 have turned on hydrant and no water. Robert Powell (NMED) said I thought you guys would not care how much it costs, but detecting contaminants. Cindy Abeyta (San Ildefonso Pueblo) said most RCRA wells in New Mexico are drilled with mud rotary. Robert Powell (EAG) asked how do you know what contaminants are on the mud? Cindy Abeyta (San Ildefonso Pueblo) said they just keep developing. Still have concerns with absorption and filter pack. John Young (NMED/HRMB) said the funding for them is an issue. I am taxpayer and it impacts other programs.

Charlie Nylander (LANL) responded we are conscious of flexibility. In November there will be 3 rigs working simultaneously. The new SOW will be sent out to ER prime contractors and they will subcontract to a drilling company(s). The SOW has specifications on experience of drillers, drillers helpers. Tried to get better rates on different types of work. Will make prime contractor responsible for day-to-day activities. Lab is gearing up to do a better job in managing the prime contractor.

Bob Charles (EAG) said the **eighth issue** is "funding compartmentalization". This is a high-level (Congress) designation of funding. We will discuss with managers tomorrow.

Charlie Nylander (LANL) responded that we are seeking additional G&A funds. Last year got \$1 million additional.

Bob Charles (EAG) said the **ninth issue** is "technical well site and completion decisions". John Young (NMED/HRMB) said there have been personnel changes and we don't know if it has improved.

Charlie Nylander (LANL) responded that we have relied heavily on Bob Hull, David Schafer and Jack Powers. Will continue to rely on EAG. Bob Hull's position will be filled by new contractor.

Bob Charles (EAG) said the **tenth issue** is "methods of sample collection and analysis". Robert Powell (EAG) said this issue related to groups use same SOPs for comparable data. John Young (NMED/HRMB) said I don't know if it has improved. Cindy Abeyta (San Ildefonso Pueblo) asked does this apply just to Hydrogeologic Workplan or to ER and surveillance? Dave Sarracino (San Ildefonso Pueblo) said no standardization between ER and Hydrogeologic Workplan and environmental surveillance. Chris Hanlon-Meyer (NMED/DOE-OB) said the Environmental Surveillance group uses an analytical method where ER used another (SW-846). And ESH-18 will take over the monitoring in the future. Cindy Abeyta (San Ildefonso Pueblo) asked is this a concern of this group? John Young (NMED/HRMB) said it is a fair question about how it effects the work. Cindy Abeyta (San Ildefonso Pueblo) said not just analysis, but collection methods too. Chris Hanlon-Meyer (NMED/DOE-OB) said they need to reference a Lab-wide SOP in the FIP. Cindy Abeyta (San Ildefonso Pueblo) said also where the samples are collected, e.g. if sampling a spring is it at the spring or 15 ft down.

Bob Charles (EAG) said the **eleventh issue** is "modeling vs. monitoring". John Young (NMED/HRMB) said there is still talk that spending so much money on the modeling will eliminate monitoring. I don't get that from Charlie. I've told him enough that monitoring has to validate the model. But other groups, like upper management or TA-16. It will take more wells to monitor natural attenuation. Robert Powell (EAG) said I have discussed that with Pat Longmire and he realizes that. Jack Powers (EAG) said once you have all the wells in, you'll want twice as many. John Young (NMED/HRMB) said yes, but you have to monitor. Betty Anderson (EAG) said there is need to have a combination of both modeling and monitoring.

Charlie Nylander (LANL) responded that the modeling guiding the DQO. These are complementary, not competing. Not either/or. Need more characterization data. Modeling is a tool for visualizing and understanding the data we collect, it is not a replacement for collecting the data.

Los Alamos National Laboratory  
Hydrogeologic Characterization Program

QUARTERLY STAKEHOLDER MEETING

OCTOBER 14, 1999

---

Bob Charles (EAG) said the **twelfth issue** is "recharge". At this meeting we have not heard anything new. Bruce Gallaher was first to say anything about where it comes from. John Young (NMED/HRMB) said there has been no change. Bob Charles said the **thirteenth issue** is "validation", was it the need standard procedures? John Young (NMED/HRMB) said it needs to be more timely.

Bob Charles (EAG) said that at the Annual Meeting in March we also developed a list of positives about the program. Let's go through that list and see if anything has changed.

Positive 1: Scientists. John Young (NMED/HRMB) said it can get into trouble. Big studies on RCRA. Example regional scale model.

Positive 2: Communication. John Young (NMED/HRMB) said it has gotten worse.

Positive 3: Progress. John Young (NMED/HRMB) said R-15 complete, but not developed. Some progress. Hoping new drilling contract will free up other drilling companies I have more faith in. If they got rid of Dynatech I would feel warmer and fuzzier. Too many problems with Dynatech. Some things are going to happen, but too many things have happened. Jack Powers (EAG) said that only a few in the country can drill here. I'm not against what you are saying, they are trade offs. John Young (NMED/HRMB) asked what other companies are out there? Jack Powers (EAG) responded Layne Christiansen is one. Operating internally is a problem here. When stuff needs to be done fast, go outside through a contractor. David Schafer (EAG) said there are some things cannot fix, for example 1-inch tremies, but dropping things shouldn't happen. Jack Powers (EAG) said these are technically complex wells that are deep and they strain the driller. The answer is to simplify, simplify, simplify. Maybe 2 holes, one in the vadose zone and a second one below. Janet Gerwin (CAB) has pushed on how the contracts are let out. Anthony Armijo (CAB) said with lots of help from other agencies to formulate what we asked for just recently. Some of those things they were already doing. Maybe should fire the driller. Jack Powers (EAG) said when I was an operator, when I had a problem I fired the guy. Then I had to do the drilling myself. You have to have a fall back position. John Young (NMED/HRMB) said the new contract is a good thing. Incorporates flat rates; accountability. Jack Powers (EAG) said an hourly rate drops liability to owner. With a per foot rate or other fixed rate it is different. When you drill on site, you are micromanaged. Janet Gerwin (CAB) said I have been promised several times that there would be more than one rig on site but it never happens.

Positive 4: Data exchange improvement. John Young (NMED/HRMB) said delete that. Cindy Abeyta (San Ildefonso Pueblo) said that working w/ ESH and splitting samples, it is greatly improved. Dave Sarracino (San Ildefonso Pueblo) said in a general sense it has improved. Tribal participation in these meetings is good, but not getting data is bad. Our communication has degraded, particularly informal e-mail. Cindy Abeyta (San Ildefonso Pueblo) said the improvement has particularly been ESH. Training and splits of samples. Anthony Armijo (CAB) said we would agree with that as well. Janet Gerwin (CAB) said the Paul Schumann and Gene Turner have been very helpful and arranging things for us.

Positive 5: EEG. Chris Hanlon-Meyer (NMED/DOE-OB) asked on the EEG change to EAG; how has this changed with name change? Bob Charles (EAG) asked do you think the EAG does any good? Chris Hanlon-Meyer (NMED/DOE-OB) said I think it is very good. We feel more confident that you are more grounded in what needs to be done. These sessions where we speak directly to EAG are incredible. Different perspective. Anthony Armijo (CAB) said we would like to invite the EAG to present this to the CAB. Bob Charles (EAG) said that scheduling is difficult, but perhaps in conjunction with another meeting. Anthony Armijo (CAB) said just one of you needs to come.

Dave Sarracino (San Ildefonso Pueblo) said I would like to summarize the Pueblo's concern with R-9 and intermediate well. Same as state. Had a discussion with Michael Dale about multiple completion wells. They are going with separate wells. My concern is that it is not on schedule. We will be doing some regional wells in next

**Los Alamos National Laboratory  
Hydrogeologic Characterization Program**

**QUARTERLY STAKEHOLDER MEETING**

**OCTOBER 14, 1999**

2-3 years and we want to know what is going on. DOE/HQ is holding up money until information is fully known from R-9. These meetings have helped me understand what is ahead. Beneficial to be involved.

**ATTENDANCE**

Betty Anderson	EAG	703-684-0123	<a href="mailto:elanderson@sciences.com">elanderson@sciences.com</a>
Bob Charles	EAG	307-655-3128	<a href="mailto:conehead@cyberhighway.net">conehead@cyberhighway.net</a>
Robert Powell	EAG	702-260-9434	<a href="mailto:rpowell@powellassociates.com">rpowell@powellassociates.com</a>
Jack Powers	EAG	801-269-0673	<a href="mailto:jpowersslc@aol.com">jpowersslc@aol.com</a>
David Schafer	EAG	651-762-8281	<a href="mailto:dschafer@prodigy.net">dschafer@prodigy.net</a>
Karen Agogino	DOE-AL	505-845-6100	<a href="mailto:kagogino@doeal.gov">kagogino@doeal.gov</a>
Bill Holman	DOE/OAK	510-637-1618	<a href="mailto:william.holman@oak.doe.gov">william.holman@oak.doe.gov</a>
John Ordaz	DOE/HQ/DP	301-903-8055	<a href="mailto:john.ordaz@ns.doe.gov">john.ordaz@ns.doe.gov</a>
Gene Turner	DOE-LAAO	505-667-5794	<a href="mailto:gturner@doeal.gov">gturner@doeal.gov</a>
Cynthia Abeyta	USGS	505-830-7958	<a href="mailto:cgabeyta@usgs.gov">cgabeyta@usgs.gov</a>
Allen Chang	US EPA	214-665-7541	<a href="mailto:chang.allen@epa.gov">chang.allen@epa.gov</a>
Rich Mayer	US EPA	214-665-7442	<a href="mailto:mayer.richard@epa.gov">mayer.richard@epa.gov</a>
Steve Bolivar	LANL	505-662-9608	<a href="mailto:bolivar@lanl.gov">bolivar@lanl.gov</a>
Dave Broxton	LANL	505-667-2492	<a href="mailto:broxton@lanl.gov">broxton@lanl.gov</a>
Margo Buska	LANL	505-667-3189	<a href="mailto:mbuska@lanl.gov">mbuska@lanl.gov</a>
Mark Cummings	LANL	505-667-2700	<a href="mailto:mcummings@lanl.gov">mcummings@lanl.gov</a>
Bruce Gallaher	LANL	505-667-3040	<a href="mailto:gallaher@lanl.gov">gallaher@lanl.gov</a>
Kendra Henning	LANL	505-667-2879	<a href="mailto:khenning@lanl.gov">khenning@lanl.gov</a>
Sue Kinkead	LANL	505-665-9736	<a href="mailto:suek@lanl.gov">suek@lanl.gov</a>
Carol LaDelfe	LANL	505-667-8474	<a href="mailto:cladelfe@lanl.gov">cladelfe@lanl.gov</a>
Patrick Longmire	LANL	505-665-1264	<a href="mailto:plongmire@lanl.gov">plongmire@lanl.gov</a>
Steve McLin	LANL	505-665-1721	<a href="mailto:mclins@lanl.gov">mclins@lanl.gov</a>
Ken Mullen	LANL	505-667-0818	<a href="mailto:kmullen@lanl.gov">kmullen@lanl.gov</a>
Charlie Nylander	LANL	505-665-4681	<a href="mailto:nylander@lanl.gov">nylander@lanl.gov</a>
Steve Pearson	LANL	505-667-3005	<a href="mailto:spearson@lanl.gov">spearson@lanl.gov</a>
Steven Rae	LANL	505-665-1850	<a href="mailto:stevenrae@lanl.gov">stevenrae@lanl.gov</a>
John Sisneros	LANL	505-665-0105	<a href="mailto:sisnerosja@lanl.gov">sisnerosja@lanl.gov</a>
William Stone	LANL	505-665-8340	<a href="mailto:wstone@lanl.gov">wstone@lanl.gov</a>
Felicia Orth	LA County	505-662-8007	<a href="mailto:orthf@lac.losalamos.um.us">orthf@lac.losalamos.um.us</a>
Anthony R. Armijo	CAB	505-455-2036	<a href="mailto:denr1nambe@aol.com">denr1nambe@aol.com</a>
John Kieling	NMED/HRMB	505-827-1558	<a href="mailto:john_kieling@nmenv.state.nm.us">john_kieling@nmenv.state.nm.us</a>
Julie Jacobs	NMED/GWQB	505-827-2776	
Jim Mullany	NMED/GWQB	505-827-0212	<a href="mailto:James_Mullany@nmnv.state.nm.us">James_Mullany@nmnv.state.nm.us</a>
Naomi Archuleta	San Ildefonso	505-455-7656	<a href="mailto:archuleta@trail.com">archuleta@trail.com</a>
Dave Sarracino	San Ildefonso	505-455-7656	<a href="mailto:dsarraci@trail.com">dsarraci@trail.com</a>
Gary Simpson	Baroid Drilling	505-924-1511	<a href="mailto:alblois@baroid.com">alblois@baroid.com</a>
Sue Johnson	LATA	505-662-1830	<a href="mailto:sjohnson@lata.com">sjohnson@lata.com</a>
Bob Hull	LATA	505-662-1829	<a href="mailto:rhull@lata.com">rhull@lata.com</a>
Toby Walters	IT Group	505-661-5214	<a href="mailto:twalters@lanl.gov">twalters@lanl.gov</a>
Mark Everett	MK/PMC	505-662-1322	<a href="mailto:meverett@lanl.gov">meverett@lanl.gov</a>
Kelly Bitner	Neptune & Co.	505-884-8455	<a href="mailto:bitner@neptuneandco.com">bitner@neptuneandco.com</a>
Andy Crowder	MK/PMC	505-662-1338	<a href="mailto:crowder@fimad.lanl.gov">crowder@fimad.lanl.gov</a>
Frank Patton	Westbay	604-984-4215	<a href="mailto:fpatton@westbay.com">fpatton@westbay.com</a>

Los Alamos National Laboratory  
Hydrogeologic Characterization Program

EXTERNAL ADVISORY GROUP MEETING

OCTOBER 15, 1999

**MORNING — LANL, DOE, NMED MANAGERS MEETING**

**Introduction**

Bob Charles (EAG) gave an introduction including who the EAG was, how they were formed, and how they operate in an external advisory capacity. Thanked everyone for coming and asked everyone present to introduce themselves by name, title, responsibilities, and their vision of the Hydrogeologic Workplan (HWP) and the work being performed under the workplan. Attendees introduced themselves.

Joe Vozella (DOE-LAAO): Assistant manager of the DOE Los Alamos Area Office, responsible for environmental compliance and environmental protection programs. The HWP is an outgrowth from several requests.

John Ordaz (DOE-HQ): Environmental engineer and Program Manager for environmental issues and problems. HWP is an important issue with defined roles and responsibilities. It is important in that it is based on funding and the objectives should be implemented as soon as can. Sticking to funding agreement. R-25 is an EM well once find contamination. He has responsibility for other wells.

Julie Canepa (LANL): Program manager for ER Project. Tom Baca is boss. HWP is useful to plan and organize environmental work. Broadest description of site characterization. In order to make final decisions on closures — need hydrogeologic model. The HWP has focused perspective and goal, joint data quality needs but dichotomy of program (ER, DP). Disagrees with Ordaz that any contamination found becomes EM's responsibility. If contamination is not legacy then the responsibility is institutional, not EM's. Other important area is buried low-level or TRU waste, so the Lab and the ER project need a technical foundation upon which to make decisions. Who owns what, who contribute to what. ER has submitted all costs that are perceived to be theirs into their ER baseline. Break out site-specific vs. site-wide.

Tom Baca (LANL): Division Director for new E Division. Perception of HWP is that the ER Project is only drilling wells to characterize legacy contamination problems to meet regulators needs.

Denny Erickman (LANL): ESH Division Director. The ESH division has institutional responsibilities of environmental protection, setting policy, oversight responsibilities, and brokering institutional permits. Share responsibilities with Baca (LANL) on GW program and well drilling activities. It continues to be a challenge to interface with institution and regulators. State has legitimate questions that HWP is trying to characterize. He supports modeling effort. LANL is the last of DOE sites to put in a monitoring/characterization system. He would rather see the hydrogeologic characterization program implemented right instead of faster. He meets with program people once a week and is paying attention to what is happening in the field. It is Important to get R-25 done. The view is long term. The Lab has a forward mission. It is important to align ourselves with the regulators.

Karen Agogino (DOE-AL): representing Connie Soden of DOE-AL, involved in ES&H, NEPA, and compliance issues.

Steve Rae (LANL): Group Leader for Water Quality and Hydrology Group, ESH-18. The group performs sampling, monitoring groundwater, surface water, NPDES outfalls. Charlie is Project Leader for the HWP and the Hydrogeologic Characterization Program. He is responsible for coordination within Lab and with regulators.

James Bearzi (NMED): Room situation is "snapshot" of how the regulator feels. One little guy surrounded by lots of power from Lab. Of all projects, HWP is the one project where he is in contact with his people every week. The program is a huge component of his staff's time and energy. Staff also does RCRA Subtitle C program, registration and licensing, NRC. Believes in the plan offered by LANL and approved by HRMB. Share the same concerns as LANL. Frustrated trying to sort issues such as funding, want to get characterization done.

Frustrated with budget constraints, pace of work, technical difficulties, and major changes not made a long time ago. State takes responsibility for delay, didn't make intentions clear. See marked decrease in communication on characterization issues. State should be able to weigh in on issues and get a response rather than LANL clamming up.

Charlie Nylander (LANL): Interfaces with all people on the program. Julie Canepa is competent and provides construction management services. Feel confident working with Julie. No significant difficulties. Some problems in field but communication is done freely. Also free communication with DOE, with Joe Vozella and John Ordaz. They provide a good DOE interface. Locally, have good communication relationship. State has perceived some decrease in communication last few months but rather is because of 4<sup>th</sup> quarter work being overwhelming. Doesn't think there has been any purposeful decrease in communication.

### **EAG's Observations**

Bob Charles (EAG) continued facilitation. This is the 3<sup>rd</sup> meeting of the EAG with LANL. The EAG has some observations on the HWP. In order to understand the management structure will go over documentation chronology. On May 30, 1995, Garcia sent a letter to Kirkman denying GW monitoring waivers. On August 17, 1995, Dr. Kelly sent letter to Kirkman on other GW issues and referenced other documents. This prompted the document (HWP) that was put together and approved by Stu Dinwittie. The EAG would like to see how policy is being formulated.

Seems as the major policy is being constructed in upper DOE and NMED management, I refer to them as kings, but implementation is by a program manager, I refer to him as a prince, and there is no support from LANL upper management. John Ordaz (DOE) says he disagrees. Bob Charles (EAG) says this is general overview and represents EAG's perspective from review of the names on documents.

Bob Charles (EAG) says a more dire issue is that the project manager has created an open door program where everyone can come in and express interest and concerns. So everyone is coming in more and more because the project manager is providing forum for stakeholders. Includes the Citizen's Advisory Board, Pueblos, etc. The problem is that this is time consuming and the project manager is "going to ground."

### **EAG's Suggestions**

Bob Charles (EAG) presents the EAG's suggestions.

- 1). Status Quo – leave just as is after this meeting
- 2). More engagement by Lab management

Tom Baca (LANL) says he still doesn't know what more the EAG wants. He says he is involved in the program and doesn't see what point the EAG is trying to make. Denny Erickson (LANL) says this is typical of how LANL manages so he is waiting to see what (EAG perceives) the problem is. Some discussion is prompted at this point. Julie Canepa (LANL) says all LANL people providing input have needs to meet so it is hard to make clear, concise decisions.

Bob Charles (EAG) said most of ideas are good but don't fit under HWP. John Ordaz (DOE-HQ) says he wants one person to go when we need stuff. Doesn't want to bother Denny. Wants to go to Charlie as program manager and program costs, etc. need to be communicated. The larger the distribution is, the less people will call for information.

Bob Charles (EAG) says the EAG's third suggestion is "True Empowerment." The program manager is now the contact. If he makes decisions, no upper management second-guesses the decisions. If Charlie gets a request,

**Los Alamos National Laboratory  
Hydrogeologic Characterization Program**

**EXTERNAL ADVISORY GROUP MEETING**

**OCTOBER 15, 1999**

---

he makes a contact at the Lab and delegates the request. Upper management has to support the project manager on both good and bad decisions.

Joe Vozella (DOE-LAAO) asks if FY00 work is accurately scoped and everyone knows what their responsibilities are? Charlie says this is not the case. Joe says his point is proven. Projects have budgets, deliverables, etc. Bob Charles (EAG) asks, looking at plan after 7 years, what is the deliverable? Joe Vozella says DOE wants to identify what the deliverable is 2, 3 years from now. When look at other entities putting pressure on Charlie, other groups at Lab can handle those. John Ordaz (DOE-HQ) asks, if have budget, why can't have deliverables.

Charlie Nylander (LANL) asks to clarify. Got letter from James Bearzi (NMED) to review DQOs. It became apparent that they could change the drilling method. The schedule was set, then a manager within ER calls a meeting on drilling schedule and doesn't want to support the decisions already made. My decision gets trumped. Joe Vozella (DOE-LAAO) says when Charlie talked to him, he couldn't justify how they were going to drill the wells.

James Bearzi (NMED) says all the while Charlie is dealing with internal issues, he is leaning on him hard and interprets delays as intentional. John Ordaz (DOE-HQ) says if James is not getting what he needs from Charlie he can call him or Joe (Vozella). John Ordaz says this is engineering project not a science project.

### **Program Goals**

Bob Charles (EAG) asked what does management want out of the program.

Joe Vozella (DOE-LAAO) says he wants a model to use as decision tool and use some or all of the wells as monitoring wells. Wants to see cost-effective project management and run as a finite method over a finite number of years.

John Ordaz (DOE-HQ) says the program needs to characterize the water and how much water there is. DOE has same goals as NMED. Wants to see the project get underway.

Tom Baca (LANL) says he's always had problem with way do business. Project is run by a committee rather than by individuals.

Bob Charles (EAG) says he will ask each person what they want this project to be.

Tom Baca (LANL) says two aspects: 1) Characterize the impact of existing waste on the hydrology 2) Characterize Lab's impact on hydrology.

Julie Canepa (LANL) says the program is needed to provide a characterization baseline and for the final product to be robust enough to serve as basis for decisions on closure, and as a prediction tool. At the end of the program, need a database from which risk assessments can be made.

Joe Vozella (DOE-LAAO) says need workable model.

John Ordaz (DOE-HQ) says need necessary documentation for addressing regulators concerns. Julie Canepa (LANL) says we don't know what regulatory documents will be or look like and the HWP is not place to address them. John Ordaz says LANL is operating the Lab. Defense Programs operations are being consolidated at Lab and this is only place where that is happening. He can't afford for state to not renew LANL's permit. James Bearzi has to tell what regulatory concerns are so that LANL can meet them to keep lab open and running. James Bearzi (NMED) said Julie's list provides strong foundation of documents, databases, etc. upon which decisions can be made for years to come. The documents that are delivered to the state are

**Los Alamos National Laboratory  
Hydrogeologic Characterization Program**

**EXTERNAL ADVISORY GROUP MEETING**

**OCTOBER 15, 1999**

---

important for deciding if standards are going to be met or risks will be appropriately addressed. The documents don't need to support much else.

Bob Charles (EAG) points out that it is difficult to know when a project is over. If management gets a product, even if it is late, will that be okay?

Julie Canepa (LANL) says need clarification of what the end state will be.

Karen Agogino (DOE-AL) says that projects are often graded on scope, schedule, and cost.

Bob Charles (EAG) says original words in the HWP were "characterize regional aquifer".

James Bearzi (NMED) says he is concerned with the "science project" aspect. He cares that long-term data collection will help model. Any project that is over and above needed data collection causes him heartburn.

Joe Vozella (DOE-LAAO) says DOE funded LANL to collect the minimum amount of data necessary to support a model. Budgets are less each year.

James Bearzi (NMED) says if someone has some data need above perceived program goals, they should come to his office and justify them to him. Joe Vozella (DOE-LAAO) says no, they shouldn't have to go to the regulators to discuss decisions.

Bob Powell (EAG) says need agreement on how much detail is needed. HWP keeps getting shot off in other directions like chasing plumes. Need to agree on what is needed out of it and don't change decisions.

James Bearzi (NMED) says his staff is just getting started with data and are beginning to realize that they don't think the data needs are the same. He views the DQOs as vague and one can use professional judgement to meet changing program needs.

Julie Canepa (LANL) says need to collect enough data from the first holes to define what really need from other holes. Data from a monitoring well won't give any information on pathways, methods of recharge, or other turn-key pieces of information.

Denny Erickson (LANL) says he thinks what is going on is a natural step in a difficult project. The end state of project is not known by a long shot. People are just now asking where are we going with project, which is another natural step. DOE wanted to lowball project management. This project is both an engineering and a scientific project. More scientific, otherwise it would be a waste because want to be able to develop models that can stand the test of time. The program should work with what the regulator needs now, but also meet long term goals. The suspicions of regulators have helped change Labs view that there was no way groundwater could be contaminated. Denny Erickson (LANL) says considering alternative drilling methods is good. He feels the Lab did a good job trying to figure out original project scope but didn't really talk about what the end projects would be. We are asking ourselves if it is time to reset the strategy. The answer is yes.

Bob Charles (EAG) says the purpose of his question was to get concurrence on what the final product of the HWP is.

James Bearzi (NMED) says it is worth engaging and figuring out end products.

Denny Erickson (LANL) says the need for an annual "gut check" report was written into the HWP. We knew the program would need adjustment as it proceeds. DOE and the Lab need to get together on policy issues and let the program do what it is supposed to do.

**Los Alamos National Laboratory  
Hydrogeologic Characterization Program**

**EXTERNAL ADVISORY GROUP MEETING**

**OCTOBER 15, 1999**

---

John Ordaz (DOE-HQ) asked about the EAG's role in the annual meeting. Charlie Nylander (LANL) says the EAG is invited to the annual meetings. The annual meetings are for re-adjustments and the quarterly meetings are to rehash information collected and status. Each year we put in wells, collect data and maintain the database. Both the model and database will be long term. The number of wells and their type were the most uncertain, however funding has focused on wells and not the model or the database.

John Ordaz (DOE-HQ) says need to decide what are the data and monitoring parts needed so Charlie will have a charter.

Bob Charles (EAG) says what he is hearing is that the project is not all science, and not all engineering and that products need to be defined.

Julie Canepa (LANL) says science and engineering are same thing and just different languages.

Joe Vozella (DOE-LAAO) says we've drilled 5 wells, have we done what we said?

Betty Anderson (EAG) said her observation is that there is a set of goals around the table. Write goals down, clearly articulated, so can design a product to meet those goals. Legacy goals, future goals. Goals are needed to identify product. Product is needed to set objectives. Then set the scope and schedule off of the objectives.

Bob Charles (EAG) asks everyone to write down goals.

John Ordaz (DOE-HQ) says we can do that but it doesn't solve the immediate problem about what to collect and how to drill. Charlie Nylander (LANL) says he needs support when making decisions and not be trumped. John Ordaz asks if Charlie knows what to go after and if he feels he has support. Charlie says no. John Ordaz asks how to resolve issue so Charlie feels he has support?

Karen Agogino (DOE-AL) says HWP tasks are presented at quarterly meetings, but senior management doesn't review them.

Bob Charles (EAG) asked senior management come up with strawman.

Karen Agogino (DOE-AL) says that way can keep upper management informed.

**AFTERNOON — GIT REVIEW**

Bob Charles (EAG) briefed the GIT on what transpired at the morning managers meeting. The outcome was that there needs to be a policy group that comes up with an idea of what the end product of the HWP should be. Group would include NMED, DOE, (LAAO, ABQ, HQ) EM, and ER. They were asked to come up with strawman of what end state should be. EAG won't presume to present what end state should be.

Betty Anderson (EAG) reiterated the 4 step process presented to the managers. Identify goals, redefine what the product would be, reset program objectives, implement program with cost, schedule, scope set off of newly defined objectives.

Bob Charles (EAG) said modeling and a robust database are two things identified that would be needed. Tom Baca (LANL) mentioned that goals have been established and they should not be regenerated but rather revisited.

**Los Alamos National Laboratory  
Hydrogeologic Characterization Program**

**EXTERNAL ADVISORY GROUP MEETING**

**OCTOBER 15, 1999**

---

David Broxton (LANL) asked if policy group evaluating the end state will affect the current drilling schedule now. No, will try sooner than later to form policy group and identify the end state. Keep drilling until adjustments are identified.

Bob Powell (EAG) says program has more strengths than weaknesses.

Bob Charles (EAG) says consensus was reached about coming together to form the group and reach an end state vision.

**EAG Summary of Quarterly Meeting**

Charlie Nylander (LANL) asked the EAG to give the GIT their thoughts on the previous days presentations and quarterly meeting.

Bob Charles (EAG) said he was impressed with presentations of results of modeling. Bob Powell (EAG) said he was beginning to see where the modeling efforts are coming together rather than being separate efforts. Betty Anderson (EAG) said she can now see how the interactive process is developing between data collection and model development. She suggests keep a sharp focus on the practical end product. Bob Powell (EAG) said beginning to see some images of a developing database.

Karen Agogino (DOE-AL) asked why 50K was presented once and 400K was presented later as the funding for database work. Charlie Nylander (LANL) said 400K is the sum of both DP and ER contributions.

Dave Schafer (EAG) asked if he could summarize the drilling methods. Casing advance method is expensive, but the advantages are infinite characterization, perched zones sealed, and no introduction of bentonite into the aquifer. This makes for a well that costs 0.5 to 1.5 million. If change to mud drilling, there will be no characterization, no identification of PZ, and will introduce bentonite into aquifer. If a modified casing advance method is used, can get more of original DQOs.

Jack Powers (EAG) says it is important to simplify but can still try all the methods, just simplify the well completion.

Bob Powell (EAG) says he would never drill a monitoring wells with mud. Karen Agogino (DOE-AL) asked why he feels so strongly about not drilling with mud. Bob Powell mentioned issues related to quality of data. Also, if change techniques, it will be hard to compare data (from different wells) statistically.

Julie Canepa (LANL) asked for further discussion of drilling techniques. When review presentations, what were the EAGs impressions. Jack Powers (EAG) says all wells are different, characteristics are different in different areas. He is glad that the DQOs were relaxed some so LANL that different drilling methods could be investigated.

Steve Rae (LANL) asked what are aspects associated with different methods, stand by time, coring, etc. Jack Powers (EAG) says some of the other costs for drilling R-25 were associated with security. Time and additional personnel were required for drilling behind the fence. Contract drillers are in charge of the well rather than the Lab people.

Joe Vozella (DOE-LAAO) wants to see a summary of the different drilling techniques. He wants to hear how James Bearzi (NMED) and the state feel about drilling with mud now that Bob Powell has said that mud would adsorb all metals. Bob Powell (EAG) says RCRA says not to use mud. David Broxton (LANL) says it is important to him to know if perched zones need to be sealed. Work could be conducted more efficiently if don't have to.

Los Alamos National Laboratory  
Hydrogeologic Characterization Program

EXTERNAL ADVISORY GROUP MEETING

OCTOBER 15, 1999

James Bearzi (NMED) says he definitely want RCRA samples to come out of RCRA wells. The project can't be everything to everybody. The Environment Department is not looking at bringing in a big drilling company to do the project. The state intends to be engaged with the Policy group and review HWP goals.

**ATTENDANCE**

Betty Anderson	EAG	703-684-0123	<a href="mailto:elanderson@sciences.com">elanderson@sciences.com</a>
Bob Charles	EAG	307-655-3128	<a href="mailto:conehead@cyberhighway.net">conehead@cyberhighway.net</a>
Robert Powell	EAG	702-260-9434	<a href="mailto:rpowell@powellassociates.com">rpowell@powellassociates.com</a>
Jack Powers	EAG	801-269-0673	<a href="mailto:jpowersslc@aol.com">jpowersslc@aol.com</a>
David Schafer	EAG	651-762-8281	<a href="mailto:dschafer@prodigy.net">dschafer@prodigy.net</a>
John Ordaz	DOE/HQ/DP	301-903-8055	<a href="mailto:john.ordaz@ns.doe.gov">john.ordaz@ns.doe.gov</a>
Joe Vozella	DOE/LAAO	505-665-5027	<a href="mailto:jvozella@doeal.gov">jvozella@doeal.gov</a>
Karen Agogino	DOE-AL	505-845-6100	<a href="mailto:kagogino@doeal.gov">kagogino@doeal.gov</a>
James Bearzi	NMED	505-827-1557	
Julie Canepa	LANL	505-667-4109	<a href="mailto:canepa_julie@lanl.gov">canepa_julie@lanl.gov</a>
Tom Baca	LANL	505-667-2211	<a href="mailto:tom_baca@lanl.gov">tom_baca@lanl.gov</a>
Denny Erickson	LANL	505-667-4218	<a href="mailto:derickson@lanl.gov">derickson@lanl.gov</a>
Steve Rae	LANL	505-665-1859	
Charlie Nylander	LANL	505-665-4681	<a href="mailto:nylander@lanl.gov">nylander@lanl.gov</a>
Sue Johnson	LATA	505-662-1830	<a href="mailto:sjohnson@lata.com">sjohnson@lata.com</a>