

Critique of some of the issues in NMED's April 5, 2007 letter to LANL
Regarding Well Evaluations for Intermediate and Regional Wells
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Failure to monitor productive strata near the water table. Resource Conservation and Recovery Act (RCRA) and DOE Orders require monitoring wells to be installed in the first interval of water-productive strata immediately below the water table of the regional aquifer. None of the existing characterization wells installed for monitoring the three Material Disposal Areas (MDA) at TA-54 meet this requirement. The NMED rehabilitation activities for the three wells will not correct this deficiency. In fact, NMED instructs LANL/DOE to seal off the uppermost screen in well R-22 that is installed in productive strata at a short distance below the water table. NMED instructs LANL/DOE to use screen #2 in well R-22 for monitoring contamination from MDA G. This is not allowed by RCRA or DOE Orders because screen #2 is installed in basalt rock with a very low permeability with the top of the screen located at a distance of 65 feet below the water table.

The required rehabilitation of screen #3 in well R-22 is also inappropriate because the top of this screen is located 390 feet below the water table and in poorly productive fine-grained sediments that are contaminated by both the organic drilling fluids and by bentonite grout that invaded the screened interval because of mistakes made during well construction.

Invasion of the well screens with drilling fluids. LANL/DOE, with NMED approval, invaded all of the screened intervals in the large network of LANL characterization wells with drilling fluids that have well known properties to mask the detection of many LANL chemical and radionuclide contaminants, and especially the contaminants produced from research and manufacture of nuclear weapons. All of the characterization wells on the above figure do not produce reliable and representative water samples because of the new mineralogy formed in the screened intervals by the drilling fluids. The rehabilitation activities required in the NMED letter cannot remove the new mineralogy that is pasted onto the screened intervals in wells R-20, R-22, and R-32. The wells cannot be restored to detect the LANL contaminants. On this concern, the EPA Environmental Risk Management Research Laboratory (ERMRL) made the following statement in a conference call on November 8, 2005, as reported by LANL:

"EPA further expressed the opinion that it would be difficult to determine when and whether the impacted screens would return to predrilling conditions. EPA expressed the opinion that LANL would never be able to get representative samples from the impacted wells, but could only make choices and tradeoffs based on specific contaminants at various locations."

Wells R-20 and R-32 (and also R-16 and R-23 on the figure below) were drilled with the mud-rotary drilling method that invaded the screened intervals with a large volume of bentonite clay drilling muds that also contained organic drilling fluids. In a report to LANL and DOE, the EPA ERMRL made the following comment on the impact of the bentonite clay muds:

"With respect to screens where bentonite-based additives were used, it is possible that even trace amounts of residual bentonite that remain following development may render ground-water samples non-representative for highly sorbing constituents. This situation would be difficult to accurately characterize. *Therefore, the quality of samples for constituents such as isotopes of americium, cerium, plutonium, and radium obtained from these screens will likely remain uncertain even after re-development*" [Emphasis Added].

Organic drilling fluids were allowed to invade all of the screened intervals in the characterization wells displayed on the below figure, including well R-22 located east of MDA G. The organic drilling fluids were a fuel for well understood microbial-mediated chemical processes that form a thick paste of hydrous ferric oxide (HFO) coatings on the sediments and strata that surround the screened interval. The iron coatings have exceptional properties to remove many of the LANL contaminants, and especially the actinide contaminants plutonium, americium, neptunium, and cerium from the water produced from the wells. From *Aqueous Environmental Geochemistry* by Langmuir (1996):

"Among common minerals, the strongest sorbents for most actinide cations are the ferric oxyhydroxides and especially HFO."

There is a large inventory of actinide contaminants in the waste buried in MDA G and many other LANL disposal sites, and in the wet sediments along many of the LANL canyon settings. All of the LANL characterization wells have strong properties to mask these contaminants.

Great distance away from the MDAs. NMED is particularly concerned that not enough monitoring wells are currently available for regional groundwater monitoring at TA-54. In fact, currently there are no monitoring wells installed at TA-54 that meet the requirements of the RCRA and the DOE Orders. RCRA requires a minimum of

three monitoring wells to be located along the boundary of each disposal site for sampling groundwater traveling from beneath the site. (Please see Figure 2 attached to this email.) In harmony with the above RCRA requirement, DOE Order 450.1 requires monitoring wells to be located for "early detection" of contamination from each of the MDAs. There are no monitoring wells at TA-54 that meet this DOE Order requirement. NMED has responsibility to enforce the requirements of RCRA. LASO has the responsibility to meet the requirements of the DOE Orders. The rehabilitation activities demanded by NMED in their April 5, 2007 letter for three wells at TA-54 will not meet the requirements of either RCRA or DOE Orders. There are three RCRA regulated waste disposal sites at TA-54 known as Material Disposal Areas (MDA) G, H, and L. None of the three MDAs have even one monitoring well that meets the requirements under either RCRA or DOE Orders.

NMED has demanded that LANL evaluate for drilling additional wells. In light of this request, we note that presently there are no monitoring wells at any of the three MDAs that meet the RCRA requirement for the wells to be located along the boundary of each disposal site. Monitoring wells should be located not greater than 50 feet away from the boundary of each MDA. The three wells surrounding TA-54 that NMED requires to be rehabilitated for monitoring contamination from the MDAs are too distant for this purpose. The wells are displayed on the figure below as R-20, R-22, and R-32. Well R-20 is located east of the drinking water supply well Pajarito Mesa Well 2 (PM-2). For reference, well R-22 is located approximately 500 feet east of the eastern boundary of MDA G, also known as Area G. MDA H is located on the western side of the figure southwest of MDA L. The figure shows all of the characterization wells that are installed in the regional aquifer in the region of TA-54 (wells R-16, R-20, R-21, R-22, R-23, and R-32).

Please contact us with comments or questions.

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