Kieling, John, NMENV

ENTERED

From:	Rhgilkeson@aol.com
Sent:	Sunday, May 09, 2010 2:06 PM
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Subject:	Fwd: RHG public comment sent on May 7, 2010 to incorrect email address
Attachments:	RHG public comment

Public Comment on May 7, 2010 on the Continuing Overall Failure to Install the Required Network of Monitoring Wells at the Three RCRA Regulated Units (MDAs G, H and L) at Technical Area 54 at the Los Alamos National Laboratory

By

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I request that Judge Alarid, the Hearing Officer for the proposed LANL RCRA Part B Permit make the following findings:

- The air-rotary drilling method used for the LANL monitoring wells shall not use organic foam drilling additives for any part of the borehole unless temporary or permanent casing is installed to prevent the organic foam from 1). leaking into the regional aquifer and 2). leaking into any perched zones of saturation where well screens are installed.

- The drilling record shows that organic foam and water may prevent the detection of perched zones of saturation and possibly, even the water table of the regional aquifer. Therefore, the preferred drilling method is air rotary with only the use of air as a drilling fluid. The use of organic foam or polymer drilling additives shall be only in borehole intervals where drilling only with air is not possible.

- The findings in reports of the National Research Council (AR 30802) and the Environmental Protection Agency (AR 14175 and Sept 30, 2009 report with no AR)

The network of monitoring wells installed or proposed for the regional aquifer at Technical Area 54 (TA-54) at Los Alamos National Laboratory (LANL) are shown in the attached Figure 4 from the Katzman Testimony Exhibit 4 at the public hearing for the LANL proposed Part B Permit. Except for well R-23i, all of the monitoring wells displayed on Figure 4 are installed in the regional aquifer. Well R-23i is a well with two screens that are installed in perched zones of saturation.

The first regional aquifer monitoring wells at TA-54(e.g., wells R-20, R-21, R-22, R-23 and R-32) were installed as an activity of the LANL Hydrogeologic Workplan. Well R-23i was also installed as an activity of the LANL Hydrogeologic workplan. The drilling methods used for all of the Hydrogeologic Workplan monitoring wells allowed large quantities of organic and/or bentonite clay drilling muds to flow into the geologic formations where the well screens were installed. The organic and bentonite clay drilling muds were used with the approval of the New Mexico Envrionment Department (NMED) Hazardous Waste Bureau (HWB).

Wells R-20, R-22 and R-32 were a multiple-screen design where no-purge water samples were collected with a Westbay sampling system. The proposed LANL Part B Permit does not allow the Westbay no-purge sampling systems in monitoring wells installed for the Permit. The NMED required the rehabilitation of monitoring wells R-20, R-22 and R-32. The rehabilitation required the removal of the Westbay sampling systems and installation of pumps to purge water samples from one or two screened intervals.

During cross-examination at the Part B Permit Hearing, Mr. James Bearzi, Chief of the NMED HWB admitted that the attempt to rehabilitate wells R-20 and R-32 was not successful and the only use for the two wells was the measurement of water levels. In fact, the attempt to rehabilitate wells R-20 and R-32 was a mistake because the information existed that the two wells could not be rehabilitated before the rehabilitation was attempted. The expensive and unsuccessful rehabilitation activities for wells R-20 and R-32 were a misspending of tax payer money.

In 2009, a field study was performed to investigate the feasibility to rehabilitate well R-22. The rehab activities are described in LANL report LA-UR-09-4936 (August 2009). The Westbay sampling system was removed from the multiple-screen well so that the source of the persistent measurement of tritium contamination in the no-purge water samples collected from the deepest screen (screen #5) could be determined. Pumping a large volume of water from screen #5 determined that the tritium contamination persistently detected in the no-purge water samples was because of the cross-flow of tritium contaminated groundwater during the drilling and construction of the multiple-screen well.

In addition to tritium, the no-purge water samples collected from screen #5 also contained a large number of RCRA hazardous organic constituents over a period of several years. The detected organic contaminants were listed in Table A-40 in the LANL *Characterization Well R-22 Geochemistry Report* (LA-13986-MS, September 2002). Table A-40 is attached to this public comment. The RCRA hazardous constituents detected in screen #5 were also from cross-flow of contaminated groundwater during the drilling and well construction activites. The aquifer zone(s) at the location of well R-22 that are contaminated with tritium and organic contaminants are not known but must be investigated by the installation of additional monitoring wells.

The attached figure from LANL Report LA-UR-04-677 (September 2004) is a summary of the Schlumberger geophysics for well R-22. The figure shows two aquifer zones with high permeability that are not monitored by well R-22. The two zones are located below screen #2 and above screen #3 in the approximate depth intervals of approximately 1030 – 1065 feet below ground surface (ft bgs) and 1085 – 1135 ft bgs. In addition, the lithologic log in the LANL Well R-22 Completion Report (LA-13893-MS, February 2002) describes an aquifer zone with high permeability in the depth interval of 1188 – 1237 ft bgs. The three aquifer zones described in this paragraph must be investigated for the presence of contaminated groundwater by the installation of monitoring wells.

The 2009 field study determined that actively pumping water from screen #1 in well R-22 resulted in water samples that more closely resembled the expected chemistry of formation groundwater than the water samples produced over the period of nearly nine years from the Westbay no-purge sampling system. The improvement was no surprise. Also, the improvement from an arbitrary score of 44% in 2007 for no-purge samples to an arbitrary score of 88% in 2009 for samples collected after purging does not prove that the water samples collected in 2009 are reliable and representative for the detection of contamination from MDA G to the regional aquifer. The scores are arbitrary because they were derived from the badly flawed assessment methodology in the LANL *Well Screen Analysis Report – Revision 2* (WSAR-2) (LA-UR-07-2852, May 2007).

The great uncertainty in the assessment methodology in the WSAR-2 was the finding of 1). the National Research Council in the 2007 Final Report ***Plans and Practices for Groundwater Protection atthe Los Alamos National Laboratory*** and of 2) the four reports written over the years from 2005 to 2009 by the Environmental Protection Agency National Risk Management Research Laboratory in Ada, Oklahoma (EPA Kerr Lab). The pertinent excerpts from the EPA Kerr Lab report about the poor reliability of the WSAR-2 to determine LANL monitoring wells produced reliable and representative water samples are pasted below:

> Using criteria established in this report [i.e., the WSAR-2], an undesirable component of uncertainty will persist regarding screen impacts because it is not possible to understand all possible mineral-contaminant interactions solely by evaluating water chemistry (p.4).
>
> **Recommendations to Reduce Uncertainty**
> Due to uncertainties in the mineralogical alterations induced by the drilling additives, uncertainty in the utility of aqueous chemistry assessments for the determination of whether samples are fully representative of aquifer conditions, and the lack of appropriate data for the assessment of water quality immediately upgradient of the impacted characterization wells, it is recommended that additional laboratory/field studies be designed to reduce uncertainty and validate the results of the WSAR [i.e., the WSAR-2] (p. 5).

The NMED approval letter for the WSAR-2 also described the great uncertainty for the badly flawed assessment methodology in the WSAR-2. The pertinent excerpt from the approval letter is pasted below:

> NMED notes that the conclusions obtained in the Report [i.e., the WSAR-2] were derived mainly from analysis of extent data in the literature, possibly under conditions different from the Los Alamos National Laboratory's site (the site). The absence of critical site-specific data, such as adsorption properties, reaction kinetics and microbial activities, implies that there would be uncertainties and limitations in using the methodology developed in the Report to assess the quality of groundwater samples collected from monitoring wells installed at this site. NMED is especially concerned about the uncertainty with respect to monitoring certain potential contaminants of concern, such as the highly adsorptive radionuclides. NMED therefore suggests that the Permittees consider conducting proper laboratory and field studies to address the uncertainty regarding whether or not the monitoring wells installed as the monitoring network are capable of providing reliable data to monitor potential releases of the highly adsorptive radionuclides from operation of the Laboratory to groundwater (p.1-2).

The proper laboratory and field studies to address the uncertainty in the assessment methodology in the WSAR-2 were never performed. First, the NMED made a mistake to approve the WSAR-2 given the great uncertainty in the assessment methodology. Second, the NMED made a mistake to *"suggest"* LANL perform the proper laboratory and field studies to reduce the uncertainty. Instead, the NMED should have ordered LANL to perform the proper laboratory and field studies.

In fact, now it is very important for the NMED to order LANL to perform the proper laboratory and field studies for the entire network of monitoring wells displayed on

Katzman Testimony Exhibit 4 because the NMED has not required LANL to use drilling methods that prevent organic drilling foam from flowing into the sampling zones of any of the monitoring wells. The well completion reports for monitoring wells R-37, R-39 and R-40 show that organic drilling fluids were allowed to flow into the sampling zones in the three wells. Allowing the organic foams to contaminate the sampling zones is a serious mistake that can be prevented by temporarily or permanently installing steel casing to seal off the part of the borehole above the regional aquifer that was drilled with organic foam.

The 2005 EPA Kerr Lab Report on the LANL well drilling practices described the need to install casing to seal off the zones in the borehole that were drilled with foam. The pertinent excerpt from the 2005 report is pasted below:

> Drill boreholes using no bentonite or organic additives within screened intervals. Additives may be used in intervals above the target monitoring zone if a telescoping construction is used and the hole is adequately cleaned before drilling the final footage within the interval to be screened. Although this may require the use of significant quantities of water to control heaving in the saturated zone, the effects of potable water are minimal and can be mitigated during well development. This will likely necessitate the use of single-screen well completions. Such constructions allow for more effective development and greater confidence in both the chemical data and estimates of hydrogeologic parameters (p.10).

In addition, the EPA Kerr Lab recommended for LANL to install monitoring wells with only one well screen. The NAS Final Report also recommended for LANL to install monitoring wells with one screened interval and to prevent drilling additives from being present in the monitoring zone. The pertinent excerpt from the NAS report is pasted below:

> ***Recommendation:*** *LANL should design and install new monitoring wells with the following attributes:*
> • *A borehole drilled through the monitoring zone without the introduction of drilling muds or additives (i.e., use air or water),*
> • *One screened interval that targets a single saturated zone, and*
> • *A carefully planned design (length and depth) of the well screen, which is confirmed with information collected in the drilling process* (p. 69).

The continuing practice of drilling with organic foam and large amounts of water is unnecessary and must stop.

The boreholes for monitoring wells may be drilled using only air as a drilling fluid. Many test holes and monitoring wells at LANL were drilled using only air as a drilling fluid. Characterization wells R-9 and R-12 are two examples of where the boreholes were drilled through the entire distance of the vadose zone and into the top of the regional aquifer with only the use of air as a drilling fluid.

- For well R-9, the total depth of the borehole that was drilled using only air as a drilling fluid was 710 feet below ground surface (bgs). The water table of the regaional aquifer was at a depth of 688 ft bgs.

- For well R-12, the total depth of the borehole that was drilled using only air as a drilling fluid was 847 ft bgs. The water table of the regional aquifer was at a depth of 805 ft bgs.

Current drilling practices are allowing organic foam to flow into the sampling zones in the monitoring wells. The testimony of the NMED Environmental Scientist Jersey Kulis at the LANL Proposed Part B Permit Hearing described the NMED acceptance of drilling boreholes for the LANL monitoring wells with organic foam. The pertinent excerpt from the Kulis testimony is pasted below:

> [c]ertain drilling additives, for example, foaming agents, may be used in the drilling interval above the expected groundwater table. In the last 100 to 150 feet above the water table, and below the water table, only municipal water may be used as a drilling additive (p.6).

However, there are many reports are evidence that stopping the use of organic drilling foams at a distance of 100 to 150 feet above the regional aquifer is not preventing the organic foam from flowing down the open borehole and into the regional aquifer. The NMED must require LANL to install temporary of permanent steel casing in borehole intervals that are drilled with organic foam.

LANL monitoring wells R-36 and R-42 are two examples where organic foam was used for drilling through most of the vadose zone. However, stopping the use of drilling with organic foam at a distance above the water table of the regional aquifer did not prevent the foam from flowing into the regional aquifer and impacting the water samples collected from the single-screen monitoring wells.

The pertinent excerpt from the well R-36 completion report (LA-UR-08-2610 April 2008) is pasted below:

> The R-36 borehole was drilled using dual-rotary air-drilling methods. Drilling fluid additives used included potable water and foam. Foam-assisted drilling was used only in the vadose zone; no drilling fluid additives other than small amounts of potable water added to the air were used within the regional aquifer. Additive-free drilling provides minimal impacts to the groundwater and aquifer materials. The borehole was successfully completed to total depth using casing-advance drilling methods (p. v).

Figure 5.1-1 in the well R-36 completion report shows that the use of organic foam stopped at a depth of 700 feet below ground surface which was a distance of only ~50 feet above the water table of the regional aquifer. The fact that the organic drilling foam has impacted the chemical quality of water samples collected from well R-36 is documented in the LANL 2009 Interim Facility Wide Groundwater Monitoring Plan (the Interim Plan) (LA-UR-09-1340, May 2009). The pertinent excerpt from the 2009 Interim Plan is pasted below:

> Minor presence of residual organic drilling products is steadily clearing up. Continue to monitor in accordance with the 2009 Interim Plan and evaluate the stability of water-quality parameters over a longer period of record (p. F-60).

The pertinent excerpt from the well R-42 completion report (LA-UR-09-0217 January 2009) is pasted below:

The R-42 borehole was drilled using dual-rotary air-drilling methods. Drilling fluid additives used included potable water and foam. Foam-assisted drilling was used only in the vadose zone; no drilling-fluid additives other than small amounts of potable water added to the air below 790 ft depth, which is 128 ft above the top of regional saturation. Additive-free drilling provides minimal impacts to the groundwater and aquifer materials. The borehole was successfully completed to total depth using casing-advance drilling methods (Executive Summary).

The fact that the distance of 128 ft did not prevent the organic drilling foam from impacting the chemical quality of water samples collected from well R-42 is documented in the LANL 2009 Interim Facility Wide Groundwater Monitoring Plan (the Interim Plan) (LA-UR-09-1340, May 2009). The pertinent excerpt from the 2009 Interim Plan is pasted below:

> Minor presence of residual organic drilling products is steadily clearing up. Continue to monitor in accordance with the 2009 Interim Plan and evaluate the stability of water-quality parameters over a longer period of record (p. F-62).

Given the record of organic drilling fluid contamination in the water samples produced from wells R-36 and R-42, it is a disappointment that NMED did not require LANL to either 1). install steel casing in the borehole interval drilled with organic foam or 2) drill boreholes without the use of any drilling additive other than air.

Monitoring wells R-39 and R-40 at TA-54 are additional examples of where the organic drilling foam has flowed into the sampling zones. The pertinent excerpt from an NMED memo (AR 32132) about well R-39 is pasted below:

> 1) Section 2.2.1: This section (of the Well R-39 Completion Report) states that a foaming agent \vas not used during the drilling sequence between 707 feet (ft) to total at 896 ft helov\' brround surface (bgs). Review of the open-hole borehole video log, taken 011 November 13,2008, shows that an abundance of foam was present from 706 ft to the water table at 820 ft bgs. In the video, the foaming agent was recorded floating on the \vater table. The Report states on page 4 that only four gallons of foam was used at 707 ft bgs and that no additional foam was used past this depth.

At well R-40, the organic foam was allowed to flow into the screened interval in the regional aquifer and also into two screened intervals installed in perched zones of saturation. Figure 3.1-1 in the well R-40 Completion Report (AR 32366) shows that organic foam was used for drilling through the upper perched zone and to a depth of 750 ft bgs which is only ~10 ft above the water table of the second perched zone of saturation and ~100 ft above the water table of the regional aquifer.

The pertinent excerpts from the well R-40 completion report that describe the impacted water samples produced from well R-40i installed in the upper perched zone are pasted below:

> The first perched groundwater recovered from R-40i was 12 gal. bailed on January 12, 2009. The sample was characterized as light brown and emitted a slight sulfur odor (p. 12). [Note: the light brown color and slight sulfur odor are evidence that the

the organic drilling foam is creating a new mineralogy in the sampling zone with strong properties to mask the detection of LANL contaminants.]

At the end of the aquifer testing in R-40i, water-quality parameters were turbidity at 1 NTU and TOC at 11.22 mg/L. Turbidity was below the development threshold of 5 NTUs, ***but TOC was above the development threshold of 2 ppm (mg/L) due to the presence of drilling foam*** [emphasis added] (p. 13). [NOTE: The drilling foam caused error in the permeability value measured by the aquifer test. In addition, the presence of drilling foam at the time of the aquifer test is evidence that the well development activities did not remove the drilling foam and that the drilling foam was present in the sampling zone of well R-40i for a period of six months before additional well development activities were performed to remove the residual foam. The six month period allowed large changes in the mineralogy of the screened interval. There is a need to replace well R-40i with a monitoring well installed using only air as a drilling fluid.

The amount of organic drilling foam that was allowed to flow into the deeper perched zone and into the sampling zone in the regional aquifer is not known but both screened zones in well R-40 may be impacted because the borehole was not sealed to prevent this from happening.

The Consent Order (AR 16255) does not allow installation of wells with screens installed in a perched zone of saturation and also in the regional aquifer. The pertinent excerpt from the Consent Order is pasted below:

X.B DRILLING METHODS
Groundwater monitoring wells and piezometers must be designed and constructed in a manner which will yield high quality samples, ensure that the well will last the duration of the project, and ***ensure that the well will not serve as a conduit for contaminants to migrate between different stratigraphic units or aquifers*** [emphasis added] (p. 194).

A variety of methods are available for drilling monitoring wells. While the selection of the drilling procedure is usually based on the site-specific geologic conditions, the following issues shall also be considered:
• Contamination and cross-contamination of groundwater and aquifer materials during drilling shall be avoided. (p. 194).

The design and construction of groundwater monitoring wells shall comply with the guidelines established in various EPA RCRA guidance, including, but not limited to:
• U.S. EPA, *RCRA Groundwater Monitoring: Draft Technical Guidance*, EPA/530-R-93-001, November, 1992 (p. 194). NOTE: The requirements in the *EPA Draft Technical Guidance* are pasted below:

Extreme care should be taken when drilling into confining units so that the borehole does not create a pathway for the migration of contaminants between upper and lower hydraulically separated saturated zones (p. 4-10).

LANL monitoring wells R-37 and R-40 are two examples of where the NMED has approved drilling methods and well construction practices that have allowed cross-flow of groundwater from perched zones of saturation into the regional aquifer. The NMED has not enforced the requirement in the Consent Order to prevent the cross-flow.

Organic drilling foams may prevent the detection of perched zones of saturation. The drilling record for LANL monitoring well R-40 is an example of where the use of organic drilling foam in the second borehole prevented the detection of the upper perched zone of saturation which was detected in the first borehole that was drilled using only air as a drilling fluid. The pertinent excerpt from the R-40 completion report (AR 32366) is pasted below:

> Because of injection of municipal water and foaming agent in the second borehole, the perched groundwater encountered at 594 ft bgs in the first borehole was obscured (p. 3).

Drilling with water may prevent the detection of perched zones of saturation. The drilling record for LANL monitoring well R-37 is an example of where the water used for drilling the third borehole prevented the detection of a perched zone of saturation. The perched zone was detected in the second borehole this borehole was abandoned because it was unstable. The excerpts pasted below from the well R-37 completion report (AR 31964) document that water used for drilling the third borehole prevented the detection of the perched zone of saturation:

> In the third borehole, the perched water zone was not apparent because of injecting large amounts of municipal water to aid drilling (p. 18).

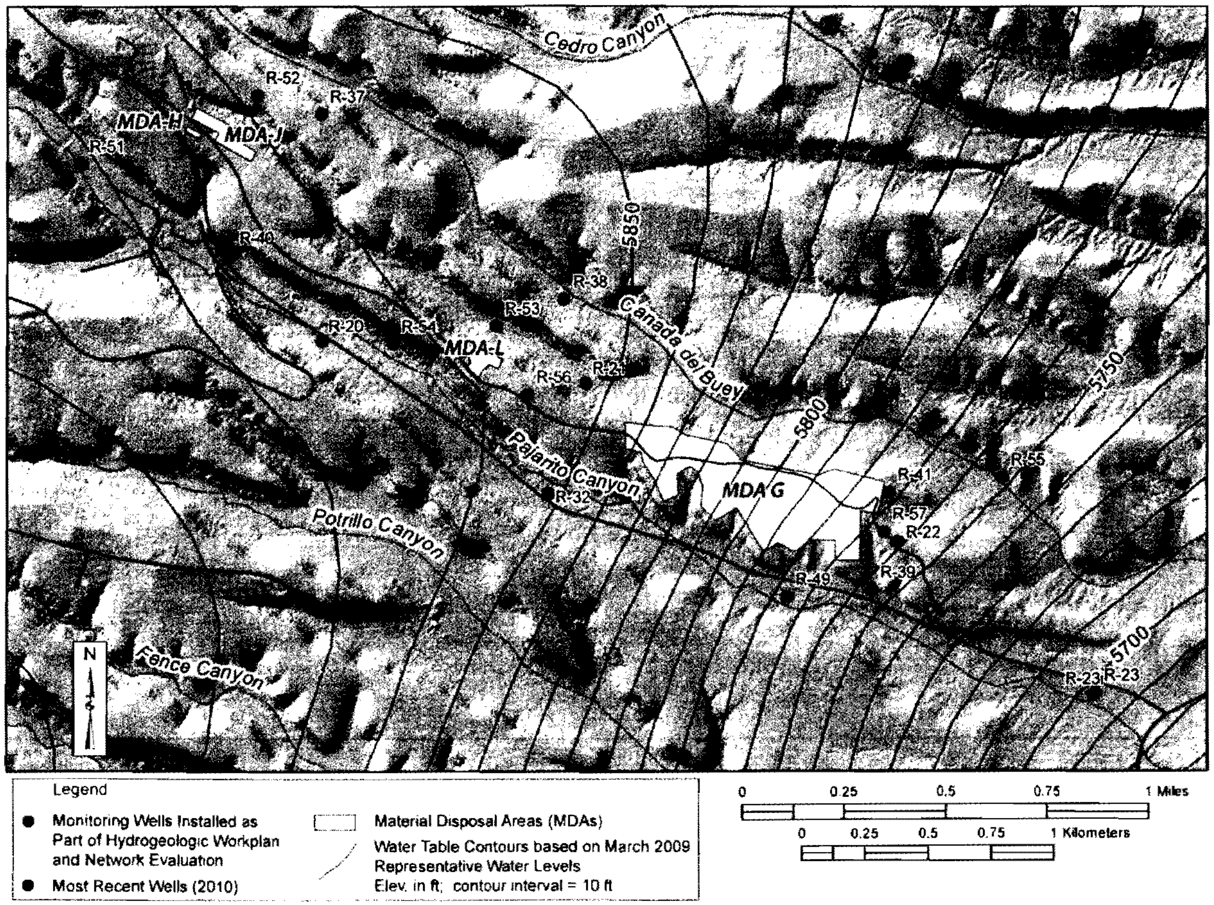


Figure 4. Map of TA-54 area showing updated water-table contours following installation of seven new monitoring wells between December 2008 and June 2009. Note the change to the prior water-table map (Figure 3) is the apparent north, northeastern component of flow in the vicinity of MDA H.

Table A-40
Regional Well R-22 Screen 5 Third Round Sample Results: Data Summary for Detected Organic Chemicals

Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Non-detected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Acenaphthene	5	1448	12/10/01	NF[e]	1	1	0.42	—[f]	—	—	—	—
Acenaphthylene	5	1448	12/10/01	NF	1	1	0.4	—	—	—	—	—
Anthracene	5	1448	12/10/01	NF	1	1	0.36	—	—	—	—	—
Benzo(a)pyrene	5	1448	12/10/01	NF	1	1	0.24	—	0.2	1/1	0.7	0/1
Benzo(b)fluoranthene	5	1448	12/10/01	NF	1	1	0.41	—	—	—	—	—
Benzo(k)fluoranthene	5	1448	12/10/01	NF	1	1	0.38	—	—	—	—	—
Bis(2-ethylhexyl)phthalate	5	1448	12/10/01	NF	1	1	1	—	6	0/1	—	—
Chloronaphthalene[2-]	5	1448	12/10/01	NF	1	1	0.46	—	—	—	—	—
DDT[4,4'-]	5	1448	12/10/01	NF	1	1	0.024	—	—	—	—	—
Diethylphthalate	5	1448	12/10/01	NF	1	1	1.3	—	—	—	—	—
Fluoranthene	5	1448	12/10/01	NF	1	1	0.38	—	—	—	—	—
Fluorene	5	1448	12/10/01	NF	1	1	0.42	—	—	—	—	—
Methylnaphthalene[2-]	5	1448	12/10/01	NF	1	1	0.42	—	—	—	—	—
Pentachlorophenol	5	1448	12/10/01	NF	1	1	6.2	—	1	1/1	—	—
Phenanthrene	5	1448	12/10/01	NF	1	1	0.4	—	—	—	—	—
Pyrene	5	1448	12/10/01	NF	1	1	0.49	—	—	—	—	—
Toluene	5	1448	12/10/01	NF	1	1	0.78	—	1000	0/1	750	0/1
Total Organic Carbon	5	1448	12/10/01	NF	1	1	4880	—	—	—	—	—

[a] The static water level for the regional aquifer at R-22 was 683 ft when the well was drilled.

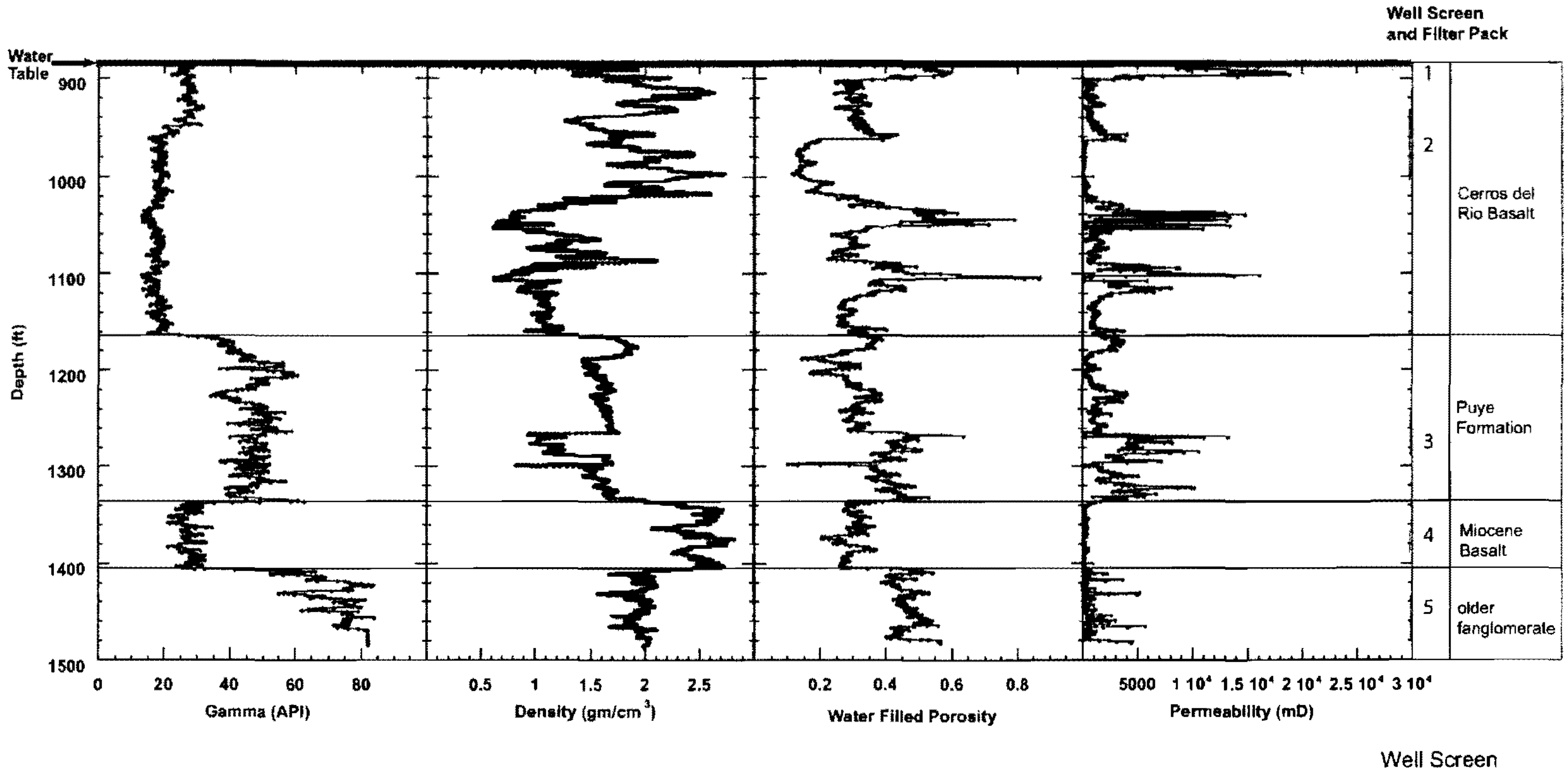
[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.



Schlumberger[R] Geophysics for LANL Well R-22.
Source: LANL Report LA-UR-04-677 (September 2004). AR 13899

Kieling, John, NMENV

From: Rhgilkeson@aol.com

Sent: Sunday, May 09, 2010 2:16 PM

To: Kieling, John, NMENV

Cc: rhgilkeson@aol.com; jarends@nuclearactive.org; dave@radfreenm.org; mccoydb01@msn.com

Subject: Gilkeson public comment was sent to incorrect e-mail address for John Kieling

Attachments: RHG Public Comment on May 7, 2010.doc

Mr. Kieling - I sent my public comment to the wrong address on Friday, May 7. The transcript that the e-mail was undeliverable is pasted below:

The public comment in in the attachment. I have used redline strikeout to correct a mistake about the date for the 2009 report from the EPA Kerr Lab. The e-mail with the public comment that was sent to you on Friday was also sent to my e-mail address. I have forwarded that email to you to show my attempt to send you the public comment on Friday at 5:30 p.m mountain time.

Bob Gilkeson

*** ATTENTION ***

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----- Transcript of session follows -----
550 5.1.2 <John_Kieling@nmenv.state.nm.us>... Host unknown (Name server: mx533.us.emailfiltering.com.nmenv.state.nm.us.: host not found)

Final-Recipient: RFC822; John_Kieling@nmenv.state.nm.us
Action: failed
Status: 5.1.2
Remote-MTA: DNS; mx533.us.emailfiltering.com.nmenv.state.nm.us
Last-Attempt-Date: Fri, 7 May 2010 19:31:32 -0400

Return-Path: <Rhgilkeson@aol.com>
Received: from imo-da03.mx.aol.com (imo-da03.mx.aol.com [205.188.169.201])

by imr-ma02.mx.aol.com (8.14.1/8.14.1) with ESMTP id o47NVAbN012633
for <John_Kieling@nmenv.state.nm.us>; Fri, 7 May 2010 19:31:10 -0400
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by imo-da03.mx.aol.com (mail_out_v42.9.) id 8.dba.85c8332 (55712);
Fri, 7 May 2010 19:31:06 -0400 (EDT)
Received: from magic-m21.mail.aol.com (magic-m21.mail.aol.com [172.20.22.194]) by cia-md01.mx.aol.com (v128.3) with ESMTP id MAILCIAMD013-d9a04be4a2b2380; Fri, 07 May 2010 19:30:58 -0400
From: Rhgilkeson@aol.com
Message-ID: <33674.5a62e98.3915fcb2@aol.com>
Date: Fri, 7 May 2010 19:30:58 EDT
Subject: RHG public comment
To: John_Kieling@nmenv.state.nm.us
CC: rhgilkeson@aol.com
MIME-Version: 1.0
Content-Type: multipart/mixed; boundary="part1_33674.5a62e98.3915fcb2_boundary"
X-Mailer: AOL 9.0 VR sub 5203
X-AOL-ORIG-IP: 209.193.85.247
X-AOL-IP: 172.20.22.194
X-AOL-VSS-CODE: clean
X-AOL-VSS-INFO: 5400.1158/0
X-Spam-Flag:NO
X-AOL-SENDER: Rhgilkeson@aol.com

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- The drilling record shows that organic foam and water may prevent the detection of perched zones of saturation and possibly, even the water table of the regional aquifer. Therefore, the preferred drilling method is air rotary with only the use of air as a drilling fluid. The use of organic foam or polymer drilling additives shall be only in borehole intervals where drilling only with air is not possible.

- The findings in reports of the National Research Council (AR 30802) and the Environmental Protection Agency (AR 14175 and ~~Sept~~ March 30, 2009 report with no AR)

The network of monitoring wells installed or proposed for the regional aquifer at Technical Area 54 (TA-54) at Los Alamos National Laboratory (LANL) are shown in the attached Figure 4 from the Katzman Testimony Exhibit 4 at the public hearing for the LANL proposed Part B Permit. Except for well R-23i, all of the monitoring wells displayed on Figure 4 are installed in the regional aquifer. Well R-23i is a well with two screens that are installed in perched zones of saturation.

The first regional aquifer monitoring wells at TA-54(e.g., wells R-20, R-21, R-22, R-23 and R-32) were installed as an activity of the LANL Hydrogeologic Workplan. Well R-23i was also installed as an activity of the LANL Hydrogeologic workplan. The drilling methods used for all of the Hydrogeologic Workplan monitoring wells allowed large quantities of organic and/or bentonite clay drilling muds to flow into the geologic formations where the well screens were installed. The organic and bentonite clay drilling muds were used with the approval of the New Mexico Envrionment Department (NMED) Hazardous Waste Bureau (HWB).

Wells R-20, R-22 and R-32 were a multiple-screen design where no-purge water samples were collected with a Westbay sampling system. The proposed LANL Part B Permit does not allow the Westbay no-purge sampling systems in monitoring wells installed for the Permit. The NMED required the rehabilitation of monitoring wells R-20, R-22 and R-32. The rehabilitation required the removal of the Westbay sampling systems and installation of pumps to purge water samples from one or two screened intervals.

During cross-examination at the Part B Permit Hearing, Mr. James Bearzi, Chief of the NMED HWB admitted that the attempt to rehabilitate wells R-20 and R-32 was not successful and the only use for the two wells was the measurement of water levels. In fact, the attempt to rehabilitate wells R-20 and R-32 was a mistake because the information existed that the two wells could not be rehabilitated before the rehabilitation was attempted. The expensive and unsuccessful rehabilitation activities for wells R-20 and R-32 were a misspending of tax payer money.

In 2009, a field study was performed to investigate the feasibility to rehabilitate well R-22. The rehab activities are described in LANL report LA-UR-09-4936 (August 2009). The Westbay sampling system was removed from the multiple-screen well so that the source of the persistent measurement of tritium contamination in the no-purge water samples collected from the deepest screen (screen #5) could be determined. Pumping a large volume of water from screen #5 determined that the tritium contamination persistently detected in the no-purge water samples was because of the cross-flow of tritium contaminated groundwater during the drilling and construction of the multiple-screen well.
In addition to tritium, the no-purge water samples collected from screen #5 also contained a large number of RCRA hazardous organic constituents over a period of several years. The detected organic contaminants were listed in Table A-40 in the LANL *Characterization Well R-22 Geochemistry Report* (LA-13986-MS, September 2002). Table A-40 is attached to this public comment. The RCRA hazardous constituents detected in screen #5 were also from cross-flow of contaminated groundwater during the drilling and well construction activites. The aquifer zone(s) at the location of well R-22 that are contaminated with tritium and organic contaminants are not known but must be investigated by the installation of additional monitoring wells.

The attached figure from LANL Report LA-UR-04-677 (September 2004) is a summary of the Schlumberger geophysics for well R-22. The figure shows two aquifer zones with high permeability that are not monitored by well R-22. The two zones are located below screen #2 and above screen #3 in the approximate depth intervals of approximately 1030 – 1065 feet below ground surface (ft bgs) and 1085 – 1135 ft bgs. In addition, the lithologic log in the LANL Well R-22 Completion Report (LA-13893-MS, February 2002) describes an aquifer zone with high permeability in the depth interval of 1188 – 1237 ft bgs. The three aquifer zones described in this paragraph must be investigated for the presence of contaminated groundwater by the installation of monitoring wells.

The 2009 field study determined that actively pumping water from screen #1 in well R-22 resulted in water samples that more closely resembled the expected chemistry of formation groundwater than the water samples produced over the period of nearly nine years from the Westbay no-purge sampling system. The improvement was no surprise. Also, the improvement from an arbitrary score of 44% in 2007 for no-purge samples to an arbitrary score of 88% in 2009 for samples collected after purging does not prove that the water samples collected in 2009 are reliable and representative for the detection of contamination from MDA G to the regional aquifer. The scores are arbitrary because they were derived from the badly flawed assessment methodology in the LANL *Well Screen Analysis Report – Revision 2* (WSAR-2) (LA-UR-07-2852, May 2007).

The great uncertainty in the assessment methodology in the WSAR-2 was the finding of 1). the National Research Council in the 2007 Final Report ***Plans and Practices for Groundwater Protection atthe Los Alamos National Laboratory*** and of 2) the four reports written over the years from 2005 to 2009 by the Environmental Protection Agency National Risk Management Research Laboratory in Ada, Oklahoma (EPA Kerr Lab). The pertinent excerpts from the EPA Kerr Lab report about the poor reliability of the WSAR-2 to determine LANL monitoring wells produced reliable and representative water samples are pasted below:

> Using criteria established in this report [i.e., the WSAR-2], an undesirable component of uncertainty will persist regarding screen impacts because it is not possible to understand all possible mineral-contaminant interactions solely by evaluating water chemistry (p.4).
>
> **Recommendations to Reduce Uncertainty**
> Due to uncertainties in the mineralogical alterations induced by the drilling additives, uncertainty in the utility of aqueous chemistry assessments for the determination of whether samples are fully representative of aquifer conditions, and the lack of appropriate data for the assessment of water quality immediately upgradient of the impacted characterization wells, it is recommended that additional laboratory/field studies be designed to reduce uncertainty and validate the results of the WSAR [i.e., the WSAR-2] (p. 5).

The NMED approval letter for the WSAR-2 also described the great uncertainty for the badly flawed assessment methodology in the WSAR-2. The pertinent excerpt from the approval letter is pasted below:

> NMED notes that the conclusions obtained in the Report [i.e., the WSAR-2] were derived mainly from analysis of extent data in the literature, possibly under conditions different from the Los Alamos National Laboratory's site (the site). The absence of critical site-specific data, such as adsorption properties, reaction kinetics and microbial activities, implies that there would be uncertainties and limitations in using the methodology developed in the Report to assess the quality of groundwater samples collected from monitoring wells installed at this site. NMED is especially concerned about the uncertainty with respect to monitoring certain potential contaminants of concern, such as the highly adsorptive radionuclides. NMED therefore suggests that the Permittees consider conducting proper laboratory and field studies to address the uncertainty regarding whether or not the monitoring wells installed as the monitoring network are capable of providing reliable data to monitor potential releases of the highly adsorptive radionuclides from operation of the Laboratory to groundwater (p.1-2).

The proper laboratory and field studies to address the uncertainty in the assessment methodology in the WSAR-2 were never performed. First, the NMED made a mistake to approve the WSAR-2 given the great uncertainty in the assessment methodology. Second, the NMED made a mistake to *"suggest"* LANL perform the proper laboratory and field studies to reduce the uncertainty. Instead, the NMED should have ordered LANL to perform the proper laboratory and field studies.

In fact, now it is very important for the NMED to order LANL to perform the proper laboratory and field studies for the entire network of monitoring wells displayed on Katzman Testimony Exhibit 4 because the NMED has not required LANL to use drilling methods that prevent organic drilling foam from flowing into the sampling zones of any of the monitoring wells. The well completion reports for monitoring wells R-37, R-39 and R-40 show that organic drilling fluids were allowed to flow into the sampling zones in the three wells. Allowing the organic foams to contaminate the sampling zones is a serious mistake that can be prevented by temporarily or permanently installing steel casing to seal off the part of the borehole above the regional aquifer that was drilled with organic foam.

The 2005 EPA Kerr Lab Report on the LANL well drilling practices described the need to install casing to seal off the zones in the borehole that were drilled with foam. The pertinent excerpt from the 2005 report is pasted below:

> Drill boreholes using no bentonite or organic additives within screened intervals. Additives may be used in intervals above the target monitoring zone if a telescoping construction is used and the hole is adequately cleaned before drilling the final footage within the interval to be screened. Although this may require the use of significant quantities of water to control heaving in the saturated zone, the effects of potable water are minimal and can be mitigated during well development. This will likely necessitate the use of single-screen well completions. Such constructions allow for more effective development and greater confidence in both the chemical data and estimates of hydrogeologic parameters (p.10).

In addition, the EPA Kerr Lab recommended for LANL to install monitoring wells with only one well screen. The NAS Final Report also recommended for LANL to install monitoring wells with one screened interval and to prevent drilling additives from being present in the monitoring zone. The pertinent excerpt from the NAS report is pasted below:

> ***Recommendation:*** *LANL should design and install new monitoring wells with the following attributes:*
> • *A borehole drilled through the monitoring zone without the introduction of drilling muds or additives (i.e., use air or water),*
> • *One screened interval that targets a single saturated zone, and*
> • *A carefully planned design (length and depth) of the well screen, which is confirmed with information collected in the drilling process* (p. 69).

The continuing practice of drilling with organic foam and large amounts of water is unnecessary and must stop.

The boreholes for monitoring wells may be drilled using only air as a drilling fluid. Many test holes and monitoring wells at LANL were drilled using only air as a drilling fluid. Characterization wells R-9 and R-12 are two examples of where the boreholes were drilled through the entire distance of the vadose zone and into the top of the regional aquifer with only the use of air as a drilling fluid.

- For well R-9, the total depth of the borehole that was drilled using only air as a drilling fluid was 710 feet below ground surface (bgs). The water table of the regaional aquifer was at a depth of 688 ft bgs.

- For well R-12, the total depth of the borehole that was drilled using only air as a drilling fluid was 847 ft bgs. The water table of the regional aquifer was at a depth of 805 ft bgs.

Current drilling practices are allowing organic foam to flow into the sampling zones in the monitoring wells. The testimony of the NMED Environmental Scientist Jersey Kulis at the LANL Proposed Part B Permit Hearing described the NMED acceptance of drilling boreholes for the LANL monitoring wells with organic foam. The pertinent excerpt from the Kulis testimony is pasted below:

> [c]ertain drilling additives, for example, foaming agents, may be used in the drilling interval above the expected groundwater table. In the last 100 to 150 feet above the water table, and below the water table, only municipal water may be used as a drilling additive (p.6).

However, there are many reports are evidence that stopping the use of organic drilling foams at a distance of 100 to 150 feet above the regional aquifer is not preventing the organic foam from flowing down the open borehole and into the regional aquifer. The NMED must require LANL to install temporary of permanent steel casing in borehole intervals that are drilled with organic foam.

LANL monitoring wells R-36 and R-42 are two examples where organic foam was used for drilling through most of the vadose zone. However, stopping the use of drilling with organic foam at a distance above the water table of the regional aquifer did not prevent the foam from flowing into the regional aquifer and impacting the water samples collected from the single-screen monitoring wells.

The pertinent excerpt from the well R-36 completion report (LA-UR-08-2610 April 2008) is pasted below:

> The R-36 borehole was drilled using dual-rotary air-drilling methods. Drilling fluid additives used included potable water and foam. Foam-assisted drilling was used only in the vadose zone; no drilling fluid additives other than small amounts of potable water added to the air were used within the regional aquifer. Additive-free drilling provides minimal impacts to the groundwater and aquifer materials. The borehole was successfully completed to total depth using casing-advance drilling methods (p. v).

Figure 5.1-1 in the well R-36 completion report shows that the use of organic foam stopped at a depth of 700 feet below ground surface which was a distance of only ~50 feet above the water table of the regional aquifer. The fact that the organic drilling foam has impacted the chemical quality of water samples collected from well R-36 is documented in the LANL 2009 Interim Facility Wide Groundwater Monitoring Plan (the Interim Plan) (LA-UR-09-1340, May 2009). The pertinent excerpt from the 2009 Interim Plan is pasted below:

> Minor presence of residual organic drilling products is steadily clearing up. Continue to monitor in accordance with the 2009 Interim Plan and evaluate the stability of water-quality parameters over a longer period of record (p. F-60).

The pertinent excerpt from the well R-42 completion report (LA-UR-09-0217 January 2009) is pasted below:

> The R-42 borehole was drilled using dual-rotary air-drilling methods. Drilling fluid additives used included potable water and foam. Foam-assisted drilling was used only in the vadose zone; no drilling-fluid additives other than small amounts of potable water added to the air below 790 ft depth, which is 128 ft above the top of regional saturation. Additive-free drilling provides minimal impacts to the groundwater and aquifer materials. The borehole was successfully completed to total depth using casing-advance drilling methods (Executive Summary).

The fact that the distance of 128 ft did not prevent the organic drilling foam from impacting the chemical quality of water samples collected from well R-42 is documented in the LANL 2009 Interim Facility Wide Groundwater Monitoring Plan (the Interim Plan) (LA-UR-09-1340, May 2009). The pertinent excerpt from the 2009 Interim Plan is pasted below:

> Minor presence of residual organic drilling products is steadily clearing up. Continue to monitor in accordance with the 2009 Interim Plan and evaluate the stability of water-quality parameters over a longer period of record (p. F-62).

Given the record of organic drilling fluid contamination in the water samples produced from wells R-36 and R-42, it is a disappointment that NMED did not require LANL to either 1). install steel casing in the borehole interval drilled with organic foam or 2) drill boreholes without the use of any drilling additive other than air.

Monitoring wells R-39 and R-40 at TA-54 are additional examples of where the organic drilling foam has flowed into the sampling zones. The pertinent excerpt from an NMED memo (AR 32132) about well R-39 is pasted below:

> 1) Section 2.2.1: This section (of the Well R-39 Completion Report) states that a foaming agent \vas not used during the drilling sequence between 707 feet (ft) to total at 896 ft helov\' brround surface (bgs). Review of the open-hole borehole video log, taken 011 November 13,2008, shows that an abundance of foam was present from 706 ft to the water table at 820 ft bgs. In the video, the foaming agent was recorded floating on the \vater table. The Report states on page 4 that only four gallons of foam was used at 707 ft bgs and that no additional foam was used past this depth.

At well R-40, the organic foam was allowed to flow into the screened interval in the regional aquifer and also into two screened intervals installed in perched zones of saturation. Figure 3.1-1 in the well R-40 Completion Report (AR 32366) shows that organic foam was used for drilling through the upper perched zone and to a depth of 750 ft bgs which is only ~10 ft above the water table of the second perched zone of saturation and ~100 ft above the water table of the regional aquifer.

The pertinent excerpts from the well R-40 completion report that describe the impacted water samples produced from well R-40i installed in the upper perched zone are pasted below:

The first perched groundwater recovered from R-40i was 12 gal. bailed on January 12, 2009. The sample was characterized as light brown and emitted a slight sulfur odor (p. 12). [Note: the light brown color and slight sulfur odor are evidence that the the organic drilling foam is creating a new mineralogy in the sampling zone with strong properties to mask the detection of LANL contaminants.]

At the end of the aquifer testing in R-40i, water-quality parameters were turbidity at 1 NTU and TOC at 11.22 mg/L. Turbidity was below the development threshold of 5 NTUs, ***but TOC was above the development threshold of 2 ppm (mg/L) due to the presence of drilling foam*** [emphasis added] (p. 13). [NOTE: The drilling foam caused error in the permeability value measured by the aquifer test. In addition, the presence of drilling foam at the time of the aquifer test is evidence that the well development activities did not remove the drilling foam and that the drilling foam was present in the sampling zone of well R-40i for a period of six months before additional well development activities were performed to remove the residual foam. The six month period allowed large changes in the mineralogy of the screened interval. There is a need to replace well R-40i with a monitoring well installed using only air as a drilling fluid.

The amount of organic drilling foam that was allowed to flow into the deeper perched zone and into the sampling zone in the regional aquifer is not known but both screened zones in well R-40 may be impacted because the borehole was not sealed to prevent this from happening.

The Consent Order (AR 16255) does not allow installation of wells with screens installed in a perched zone of saturation and also in the regional aquifer. The pertinent excerpt from the Consent Order is pasted below:

X.B DRILLING METHODS

Groundwater monitoring wells and piezometers must be designed and constructed in a manner which will yield high quality samples, ensure that the well will last the duration of the project, and ***ensure that the well will not serve as a conduit for contaminants to migrate between different stratigraphic units or aquifers*** [emphasis added] (p. 194).

A variety of methods are available for drilling monitoring wells. While the selection of the drilling procedure is usually based on the site-specific geologic conditions, the following issues shall also be considered:
• Contamination and cross-contamination of groundwater and aquifer materials during drilling shall be avoided. (p. 194).

The design and construction of groundwater monitoring wells shall comply with the guidelines established in various EPA RCRA guidance, including, but not limited to:
• U.S. EPA, *RCRA Groundwater Monitoring: Draft Technical Guidance*, EPA/530-R-93-001, November, 1992 (p. 194). NOTE: The requirements in the *EPA Draft Technical Guidance* are pasted below:

Extreme care should be taken when drilling into confining units so that the borehole does not create a pathway for the migration of contaminants between upper and lower hydraulically separated saturated zones (p. 4-10).

LANL monitoring wells R-37 and R-40 are two examples of where the NMED has approved drilling methods and well construction practices that have allowed cross-flow of groundwater from perched zones of saturation into the regional aquifer. The NMED has not enforced the requirement in the Consent Order to prevent the cross-flow.

Organic drilling foams may prevent the detection of perched zones of saturation. The drilling record for LANL monitoring well R-40 is an example of where the use of organic drilling foam in the second borehole prevented the detection of the upper perched zone of saturation which was detected in the first borehole that was drilled using only air as a drilling fluid. The pertinent excerpt from the R-40 completion report (AR 32366) is pasted below:

> Because of injection of municipal water and foaming agent in the second borehole, the perched groundwater encountered at 594 ft bgs in the first borehole was obscured (p. 3).

Drilling with water may prevent the detection of perched zones of saturation. The drilling record for LANL monitoring well R-37 is an example of where the water used for drilling the third borehole prevented the detection of a perched zone of saturation. The perched zone was detected in the second borehole this borehole was abandoned because it was unstable. The excerpts pasted below from the well R-37 completion report (AR 31964) document that water used for drilling the third borehole prevented the detection of the perched zone of saturation:

> In the third borehole, the perched water zone was not apparent because of injecting large amounts of municipal water to aid drilling (p. 18).

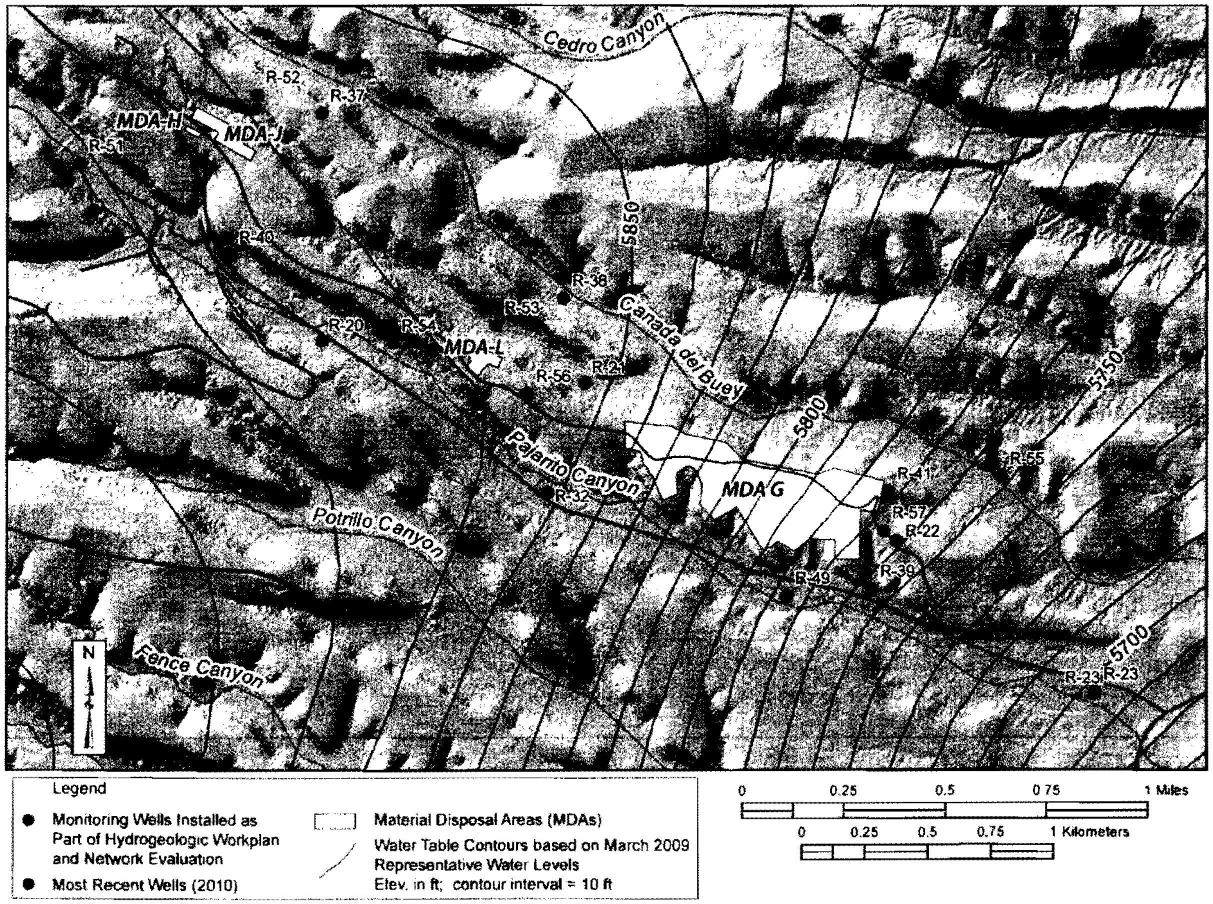


Figure 4. Map of TA-54 area showing updated water-table contours following installation of seven new monitoring wells between December 2008 and June 2009. Note the change to the prior water-table map (Figure 3) is the apparent north, northeastern component of flow in the vicinity of MDA H.

Table A-40
Regional Well R-22 Screen 5 Third Round Sample Results: Data Summary for Detected Organic Chemicals

Analyte	Screen	Depth (ft)[a]	Collection Date	Field Preparation	Number of Analyses	Number of Detects	Detected Value (µg/L)	Non-detected Value (µg/L)	Drinking Water MCL[b] (µg/L)	Frequency of Detects > Drinking Water MCL	NMED[c] Groundwater Standard[d] (µg/L)	Frequency of Detects > NMED Groundwater Standard
Acenaphthene	5	1448	12/10/01	NF[e]	1	1	0.42	—[f]	—	—	—	—
Acenaphthylene	5	1448	12/10/01	NF	1	1	0.4	—	—	—	—	—
Anthracene	5	1448	12/10/01	NF	1	1	0.36	—	—	—	—	—
Benzo(a)pyrene	5	1448	12/10/01	NF	1	1	0.24	—	0.2	1/1	0.7	0/1
Benzo(b)fluoranthene	5	1448	12/10/01	NF	1	1	0.41	—	—	—	—	—
Benzo(k)fluoranthene	5	1448	12/10/01	NF	1	1	0.38	—	—	—	—	—
Bis(2-ethylhexyl)phthalate	5	1448	12/10/01	NF	1	1	1	—	6	0/1	—	—
Chloronaphthalene[2-]	5	1448	12/10/01	NF	1	1	0.46	—	—	—	—	—
DDT[4,4'-]	5	1448	12/10/01	NF	1	1	0.024	—	—	—	—	—
Diethylphthalate	5	1448	12/10/01	NF	1	1	1.3	—	—	—	—	—
Fluoranthene	5	1448	12/10/01	NF	1	1	0.38	—	—	—	—	—
Fluorene	5	1448	12/10/01	NF	1	1	0.42	—	—	—	—	—
Methylnaphthalene[2-]	5	1448	12/10/01	NF	1	1	0.42	—	—	—	—	—
Pentachlorophenol	5	1448	12/10/01	NF	1	1	6.2	—	1	1/1	—	—
Phenanthrene	5	1448	12/10/01	NF	1	1	0.4	—	—	—	—	—
Pyrene	5	1448	12/10/01	NF	1	1	0.49	—	—	—	—	—
Toluene	5	1448	12/10/01	NF	1	1	0.76	—	1000	0/1	750	0/1
Total Organic Carbon	5	1448	12/10/01	NF	1	1	4880	—	—	—	—	—

[a] The static water level for the regional aquifer at R-22 was 883 ft when the well was drilled.

[b] MCL = Maximum contaminant level. US Environmental Protection Agency (EPA) MCLs are from *National Primary Drinking Water Regulations*, 40 CFR Part 141. US EPA secondary MCLs are from *National Secondary Drinking Water Regulations*, 40 CFR Part 143. State of New Mexico MCLs are from *Drinking Water Regulations*, 20 NMAC 7.1.

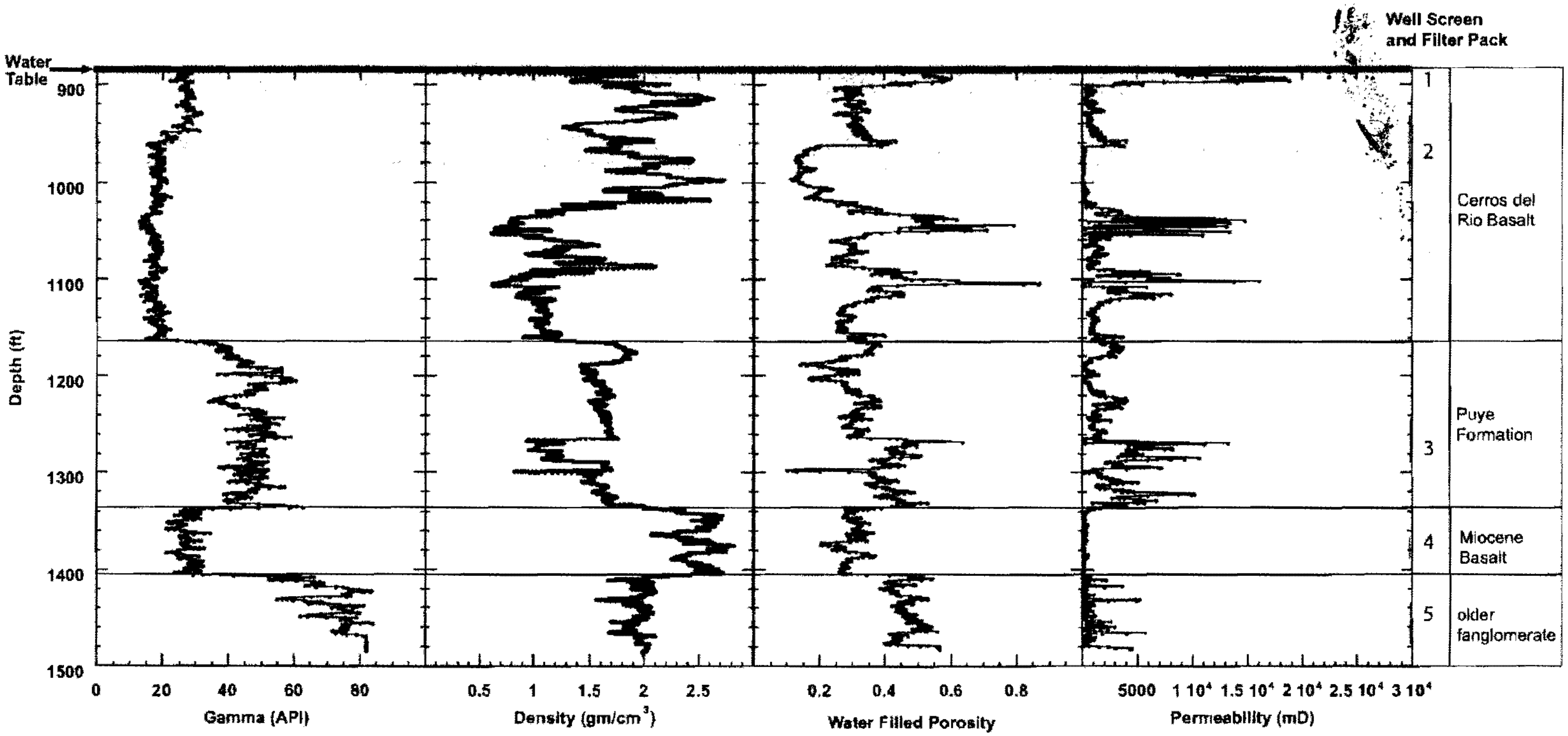
[c] NMED = New Mexico Environment Department.

[d] State of New Mexico groundwater standards are from *New Mexico Water Quality Control Commission Regulations, Ground and Surface Water Protection*, 20 NMAC 6.2.

[e] NF = Nonfiltered.

[f] — = Not available or not applicable.

Schlumberger[R] Geophysics for LANL Well R-22.
Source: LANL Report LA-UR-04-677 (September 2004). AR 13899


Well Screen and Filter Pack
Water Table
Depth (ft)
900
1000
1100
1200
1300
1400
1500
0 20 40 60 80
Gamma (API)
0.5 1 1.5 2 2.5
Density (gm/cm³)
0.2 0.4 0.6 0.8
Water Filled Porosity
5000 1 10⁴ 1.5 10⁴ 2 10⁴ 2.5 10⁴ 3 10⁴
Permeability (mD)
1
2
Cerros del Rio Basalt
3
Puye Formation
4
Miocene Basalt
5
older fanglomerate

Well Screen