

January 22, 2007

Dr. John Wiley
Study Director: National Academy of Sciences Study of the Los Alamos National
Laboratory Groundwater Protection Practices.
Washington, D.C.

Dear Dr. Wiley

Under your direction, the National Academy of Sciences (NAS) is currently performing a study of the plans and practices for groundwater protection at the Los Alamos National Laboratory (LANL). The Department of Energy (DOE) is the sponsor for the NAS study. In fact, the NAS study is managed by the staff in the DOE National Nuclear Security Administration (NNSA) at LANL who are responsible for the misspending of over \$100 million in the installation of a network of monitoring wells that hide knowledge of many LANL contaminants in the water samples produced from the wells, and especially the radionuclide contaminants. DOE is self-regulating for the radionuclide contaminants. The DOE has installed an expensive network of monitoring wells at LANL that hide detection of the highly toxic radionuclide contaminants produced by nuclear weapons research for which the DOE has the sole responsibility to protect the public health.

Because of the failure of the NAS to be prompt in addressing the problems with the drilling methods used by the DOE to install the monitoring wells, many new wells that hide knowledge of LANL contamination were installed during the period of the NAS study. Earlier reports both by the DOE Inspector General (IG) and the Environmental Protection Agency (EPA) Kerr Research Laboratory described the effects of the drilling additives to hide the detection of contamination in the water samples produced from the LANL wells. The scheme of DOE/NNSA to continue to allow drilling fluids to invade the monitoring wells installed during the NAS study is irresponsible, and shows the poor record of the DOE managers/regulators, LANL scientists, and NMED regulators as environmental stewards and as champions for wise spending of taxpayer money.

A reliable network of monitoring wells beneath LANL is a fundamental requirement for protection of the groundwater resources from the dangerous LANL wastes. Other fundamental requirements are

- 1). knowledge of the LANL wastes that pose a danger to contaminate the water resource,
- 2). knowledge of the hydrogeologic properties that control the travel of the wastes down through the vadose zone to the valuable water resource,
- 3). knowledge of the hydrologic and geologic properties that control the direction and the speed of travel of contaminant plumes in the regional aquifer, and
- 4). compliance with Federal and State laws.

I am the whistle-blower who brought attention to the fact that after a ten-year program at a cost of greater than \$100 million, the required knowledge listed above was not gained by the LANL scientists and the DOE/NNSA managers. Furthermore, the new large expensive network of more than 35 characterization wells installed in the regional aquifer beneath the Los Alamos National Laboratory are not reliable for the detection of the LANL contaminants.

My activities over the past three years were the impetus for the DOE NNSA to request the NAS to study the issues for groundwater protection at LANL. The NAS has recently published an *Interim Status Report on Plans and Practices for Groundwater Protection at the Los Alamos National Laboratory*. The NAS *Interim Status Report* is a token effort by a committee of “busy volunteers.” The topic of this letter is the important information that is missing from the NAS *Interim Status Report*.

- Missing Information in the NAS Report. On page 12, the NAS *Interim Status Report* makes the following statement:

“During the information-gathering portion of this study, the committee received approximately 60 reports and other written materials and heard some 25 presentations.”

However, the References section of the NAS *Interim Status Report* only lists a total of 24 reports, written materials, and presentations. I request

- 1). a list of all reports, other written materials, and presentations that the NAS committee received, and
- 2). the process used by the NAS committee for listing a total of only 24 reports, written materials, and presentations in the References section of the NAS *Interim Status Report*.

I am aware that much important information is missing from the text and References section of the NAS *Interim Status Report*. The report that I wrote in 2004 to bring attention to the mistakes made by the LANL Groundwater Protection Program is not mentioned in the NAS *Interim Status Report*. I presented my 2004 report to the DOE Inspector General (IG), the New Mexico Environment Department (NMED), Governor Richardson, and to the June 9, 2004 public meeting of the Northern New Mexico Citizens Advisory Board (CAB). My 2004 report and the LANL formal response are listed below:

Gilkeson, Robert H., 2004. “*Groundwater Contamination in the Regional Aquifer Beneath the Los Alamos National Laboratory*,” published in LANL Report “*Response to Concerns About Selected Regional Aquifer Wells at Los Alamos National Laboratory*,” by Bitner et al., (LA-UR-04-6777, September 2004).

The unsound science and the misrepresentation of LANL data in the LANL report by Bitner et al. required that I remain vigilant in bringing attention to the many problems with the LANL Groundwater Protection Program and the fact that the LANL scientists are installing a very expensive network of characterization wells that will not produce reliable knowledge concerning either aquifer properties or the presence of contamination.

The report that I wrote in 2005 to bring attention to the unsound science and the misrepresentation of groundwater contamination in the LANL report by Bitner et al. is not mentioned in the NAS *Interim Status Report*. My report written in response to Bitner et al. is titled “*Groundwater Contamination in the Regional Aquifer Beneath the Los Alamos National Laboratory, Part Two*.”

Soon after my presentation to the June 9, 2004 meeting of the CAB, a company under contract to LANL (e.g., RACER^R) released a report by Dr. Shanahan to discredit the findings in my report. I wrote a report to explain the unsound science in the Shanahan report, and that the Shanahan report misrepresented the technical literature, and even the LANL data on groundwater contamination in the LANL wells. The NAS *Interim*

Status Report does not acknowledge either the Shanahan report, the report by Bitner et al., or my reply to the two reports.

Shanahan, Pete., June 25, 2004. Review of Robert Gilkeson Report presented to the June 9, 2004 meeting of the Northern New Mexico Citizens Advisory Board: Memorandum to the RACER Project Files.

Gilkeson, R. H., 2004. Reply to the June 25, 2004 Review by Dr. Shanahan of the Report –“*Groundwater Contamination in the Regional Aquifer Beneath the Los Alamos National Laboratory*”, version June 9, 2004 by Robert H. Gilkeson.

Unfortunately, the Shanahan report and also the report by Bitner et al. did not recognize the well-known chemical properties of the drilling additives to form a new mineralogy on the strata that surround the screened intervals in the LANL wells. The new mineralogy have properties to preferentially remove many LANL contaminants from the water produced from the wells, and especially the radionuclide contaminants produced by nuclear weapons research.

Both the Shanahan report and the report by Bitner et al. make the mistake of describing the drilling fluids as having only a temporary effect on the ability of the LANL wells to produce representative water samples. In reality, the effects of the new mineralogy will mask the detection of LANL contaminants over the planned 50-year life of the wells.

I am aware that the NMED is providing copies of the Shanahan report to the citizens of New Mexico. Apparently, the NMED staff are unable to recognize both unsound science and unsound practices for concerns of groundwater contamination.

The NAS committee need to bring attention to the unsound science in the two reports that were written to discredit my report, and the committee needs to make a request that the reports be retracted. This is a very important issue because the 2006 LANL report – “*Environmental Surveillance at Los Alamos During 2005*” (LA-14304-ENV, September, 2006), continues to cite the unsound science in the LANL reports that the effects of the drilling additives are only temporary. From page 131 of the LANL surveillance report:

“Most Pajarito Plateau groundwater is under chemically oxidizing conditions, meaning that free oxygen is dissolved in the water. Addition of organic matter in drilling fluids into the aquifer stimulates bacterial activity, which reduces available oxygen and changes the chemical behavior of several constituents found in groundwater and adjacent aquifer materials. With reducing conditions, (absence of oxygen), the solubility of metals such as manganese and iron increases, and they are dissolved from the surface of minerals that make up the aquifer’s rock framework or possibly from well fittings. Several other chemical constituents may also increase or decrease in concentration as a result of the **mainly temporary effect of the drilling fluids** on the region near the well [Emphasis Added] (Bitner 2004, ERSP 2005).”

The LANL surveillance report does not inform the reader that the “chemical constituents” that decrease in concentration and become not detected because of the effects of the drilling fluids are the LANL contaminants.

The above “ERSP 2005” citation is a reference to the LANL “*Well Screen Analysis Report*” which also presents the technically incorrect position that the drilling additives only have a temporary effect on the ability of the new LANL wells to produce representative groundwater samples.

Indeed, the presentations by the LANL scientists to the NAS committee continued the scientifically unsound position that the drilling additives were only a temporary effect on the water quality data produced from the LANL wells, and that the water quality data show the wells are capable of “self cleaning.”

I am disappointed with the **passive response** of the NAS study committee to the technically incorrect presentations by the LANL scientists that are not supported by the common knowledge in chemistry text books, in the scientific literature, and even in the LANL water quality data. The failure of the NAS committee to point out the unsound science is now allowing LANL to continue to misrepresent the long-term effects of the drilling additives in new reports written under the watch of the NAS committee. One example is the misinformation in the 2006 LANL Surveillance Report cited above.

I am disappointed that the NAS *Interim Status Report* did not cite the chemical text books and scientific literature that describe the new mineralogy formed by the drilling additives, and the special properties of the new mineralogy to hide knowledge of many LANL contaminants produced by nuclear weapons research.

All of the LANL characterization wells were drilled with methods that allowed organic drilling additives to invade all of the screened intervals. The organic additives caused well understood chemical processes that facilitated microbial activity to generate coatings of iron precipitates of sulfides, ferric oxyhydroxides and hydrous iron oxides (HFO) on the strata in a zone surrounding the well screens. The fresh coatings of iron precipitates have very strong sorption and coprecipitation properties to hide the detection of many LANL contaminants including high explosives, trace metals, and the strongly sorbing LANL radionuclides. The iron coatings have sorption properties that are even greater than the strong sorption properties of bentonite clay.

From page 538 of *Aqueous Environmental Geochemistry* by Langmuir (1996):

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

For comparison, Table 10.4 in *Aqueous Environmental Geochemistry* lists a cation exchange capacity (meq/100 grams) for bentonite clay of 150 compared to the markedly higher value of 740 for ferric oxyhydroxides.

The discussion below from pages 461 to 462 of *Aqueous Environmental Geochemistry* describes the microbial processes that flourish because of the organic drilling additives:

- “Sulfur and iron-oxidizing bacteria flourish at the oxidized side of redox interfaces. They are important especially because they catalyze and thus greatly accelerate reactions that are thermodynamically favored, but may be abiotically slow. All iron bacteria are aerobic – Their favored pH range is 5 to 8, the same range in which inorganic rates are also fast and the oxidation product is precipitated HFO. Many of the bacteria are filamentous and can accumulate up to 500 times their cell weight in precipitated HFO – they are found wherever they can access Fe^{2+} at the oxidizing side of a redox interface. They are especially a problem in fouling of well screens. They can cause a loss of up to 90% in the productivity of a well.”

Given the knowledge in the technical literature that the organic drilling additives prevent monitoring wells from producing water samples that are valid for the detection of many radionuclide contaminants, it was irresponsible for DOE/NNSA to continue up to the present time in directly managing the installation of monitoring wells at LANL with drilling methods that invade the screened intervals with the organic drilling additives.

In January 2005, the Northern New Mexico Citizens Advisory Board (CAB) requested EPA to review certain issues in my 2004 report. The EPA Kerr Lab wrote three reports about groundwater protection issues at LANL. The References section of the NAS *Interim Status Report* only acknowledges the EPA report that was written because of the continuing concerns of the EPA for the unsound science in the LANL *Well Screen Analysis Report*. However, the text of the NAS Report provides little discussion of all the concerns of the EPA Kerr Lab report.

The two EPA Kerr Lab reports that are missing from the NAS *Interim Status Report* are the draft and final versions of the report that was written to address the issues raised by the CAB about the effect of drilling fluids on the water quality data from the LANL characterization wells. The references for the two EPA reports are below:

Ford, R., S.D. Acree, and R.R. Ross. 2006. Memorandum to Richard Mayer, U.S. EPA, Region 6: Los Alamos National Laboratory, Los Alamos, NM (05RC06-001) Impacts of Hydrogeologic Characterization Well Construction Practices. Ada, Oklahoma: United States Environmental Protection Agency, National Risk Management Research Laboratory, Ground Water and Ecosystems Restoration Division. Final Report, February 10, 2006.

Ford, R., S.D. Acree, and R.R. Ross. 2005. Memorandum to Richard Mayer, U.S. EPA, Region 6: Los Alamos National Laboratory, Los Alamos, NM (01RC06-001) Impacts of Well Construction Practices. Ada, Oklahoma: United States Environmental Protection Agency, National Risk Management Research Laboratory, Ground Water and Ecosystems Restoration Division. Draft Version, September 30, 2005.

The draft version of the EPA Kerr Lab Report described the technical deficiencies in the scheme used by the LANL scientists to assess the water quality produced from the LANL wells months before LANL published the technically incorrect findings in the LANL *Well Screen Analysis Report*. It is inexcusable that the NAS *Interim Status Report* did not discuss the important findings in the EPA reports.

Fortunately, on September 18, 2006, the NMED issued a Notice of Disapproval (NOD) for the LANL *Well Screen Analysis Report*. I am disappointed at the late date for the NMED NOD. Nevertheless, the EPA Reports were the impetus for the NMED NOD. The concerns of the EPA for the LANL well construction practices are captured below in the notes by LANL scientist Jean Dewart from a telephone conference call on November 8, 2005 that was attended by representatives from EPA, EPA Kerr Labs, LANL, DOE/NNSA, NMED, CAB, and CCNS.

Conference Call November 8, 2005

Attendance: Scott Ellinger (EPA), Steve Acree (Kerr Labs), Robert Ford (Kerr Labs), James Bearzi (NMED), Michael Dale (NMED-OB), John Young (NMED), J.D. Campbell (NMCAB), Robert Gilkeson (consultant), Joni Arends (NMCCNS), LANL: Charlie Nylander,

Jean Dewart, Pat Longmire, Mat Johansen, Armand Groffman, Ardyth Simmons, Danny Katzman

- 1) **conceptual model – LANL and EPA agree on the groundwater chemical component of the conceptual model for demonstrating groundwater** representativeness and reliability following well development, as shown in Figures 1 and 2 of the EPA report. The disagreement lies in demonstrating that the aquifer minerals surrounding the well have returned to equilibrium in their original state prior to drilling. EPA maintains that both components are necessary to demonstrating the absence of drilling fluid impacts, whereas LANL uses only the groundwater chemistry component in its well screen analysis. The use of reactive transport models was discussed in terms of an additional line of evidence that might be used to demonstrate that the aquifer had returned to predrilling mineralogy. EPA maintained that it was easier to model the effects of bentonite than those of organic drilling fluids that introduced more complicating factors. EPA also thought that iron minerals would not return to predrilling conditions in the foreseeable future. EPA pointed out that equilibrium testing of aquifer minerals is reported in the literature but that there is no quantifiable measure of success and that multiple lines of evidence would need to be used to demonstrate representativeness. 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 [Emphasis Added].
- 2) In the regulatory arena, EPA stated that it might be possible to avoid some of the issues at hand by drilling new wells, but the question of drilling without using fluids remains. EPA further stated that its analysis is a technical response to the CAB's request for review and does not represent a regulatory position.
- 3) DQOs – the purpose of the well and what it is designed to measure falls within the Data Quality Objective (DQO) process. J.D. Campbell expressed that the representativeness of sample should be placed more in that context.
- 4) Background – EPA felt that LANL's use of background chemistry was too broad in location, spreading across the Pajarito Plateau, and was not specific enough to the lithologic horizon of interest. They recommended that the precision of background chemistry be improved.
- 5) NAS – It was mentioned that the National Academy of Sciences will weigh in on the issue of drilling fluid impacts during its review in 2006. Steve Acree expressed the opinion that the NAS will not come up with a better review than that performed by EPA/Kerr [Emphasis Added].
- 6) The November 30 CAB meeting will have a presentation of the report from EPA/Kerr, a response from LANL, and public comment.
- 7) LANL requested, based on the conference call, that EPA include the following information in their report (EPA agreed):

DQOs are essential to establish means to obtain representative samples and data, EPA will say that there are no “perfect samples” – that are representative of the gw in the aquifer. Multiple lines of evidence are important in evaluating representativeness of samples. EPA’s report presents a technical analysis responding to the CAB’s request and does not represent the regulatory position of EPA.

The telephone conference notes show that LANL expects the NAS committee to “weigh in on the issue of drilling fluid impacts during its review in 2006.” It is of critical importance for the NAS committee to address this issue in the NAS Final Report, and accordingly, to address the findings in the EPA Reports.

Other reports that are missing from the NAS *Interim Status Report* include the following:

- The body of technical literature that describe the properties of the new mineralogy surrounding the well screens to mask the detection of many LANL contaminants.
- Many journal articles that address the mobility of the LANL radionuclides for transport as dissolved species and colloids. One example is – *Reaction of Plutonium Dioxide with Water: Formation and Properties of PuO_{2+x}* by John M. Haschke, Thomas H. Allen, Luis A. Morales, Science, January 14, 2000. The NAS Final Report must address if PuO_{2+x} increase the mobility of plutonium for downward travel in the well-oxygenated wet environments below the canyon settings at LANL. The NAS Final Report must bring attention to the failure of the LANL scientists to gain the required knowledge of the travel of the LANL radionuclide contaminants in groundwater as colloids.
- Rice, George, 2004. *New Mexico’s Right to Know: The Potential for Groundwater Contaminants from LANL to Reach the Rio Grande*, a CCNS publication written by groundwater hydrologist George Rice.
- Many of my reports that I have provided to the NAS, including
 - 1). my response to Jean Dewart’s *Current Knowledge and Status of Groundwater Protection at LANL*, presented to the NAS on August 14, 2006,
 - 2). my case history report on the misrepresentation by LANL scientists for the casing advance drilling methods, and the fact that the casing advance methods were often the last resort when the fluid-assisted drilling methods failed to provide a stable borehole for the construction of the LANL wells,
 - 3). my response to the Public Forum on Area G, the active LANL disposal facility for radioactive waste, that was sponsored by the Northern New Mexico Citizens Advisory Board. The public meeting did not inform the citizens of New Mexico that the LANL scientists and DOE/NNSA managers had installed a network of monitoring wells that would hide detection of contamination released from Area G. Indeed, the public meeting did not inform the citizens that the wastes buried in Area G were already contaminating the valuable drinking water resource, and
 - 4). many other of my reports that are described throughout this letter.

I hope this letter assists the NAS committee in resolving the missing information in the NAS *Interim Status Report*.

Sincerely,

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