5. The NAS Committee Approval of the LANL Scheme for Monitoring and Data Quality is a Mistake that Must be Corrected in the NAS Final Report.

The formal statement of task instructed the NAS committee to answer the following two questions concerning specific data quality issues:

> Is the laboratory following established scientific practices in assessing the quality of its groundwater monitoring data?
>
> Are the data (including qualifiers that describe data precision, accuracy, detection limits, and other items that aid correct interpretation and use of the data) being used appropriately in the laboratory's remediation decision making?

In the prepublication copy, the NAS committee makes contradictory statements in the answer to the first question:

> The short answer to the first item is a qualified yes. LANL is using good practices in terms of having the proper quality assurance and quality control (QA/QC) plans and documentation in place, but falls short of consistently carrying out all the procedures cited in the plans. [Emphasis Added.] Well drilling and completion methods are continuing to evolve, and the site is only beginning to implement its groundwater monitoring program under the Consent Order. Many if not all of the wells drilled into the regional aquifer under the Hydrogeologic Workplan appear to be compromised in their ability to produce water samples that are representative of ambient groundwater for the purpose of monitoring. p. 79.

The answer to the first item is clearly "no" because having the proper quality assurance and quality control plans and documentation in place is meaningless when the NAS committee observes that the LANL scientists "fall short" in carrying out the QA/QC requirements. An example is the correspondence between Andrew Phelps, Associate Director of Environmental Programs at LANL, and CCNS this past winter. We request that the correspondence be referenced in the revision to the prepublication copy of the NAS report.

In addition, the answer to the first question is clearly "no" as demonstrated by the findings of the NAS committee that the LANL scientists are unwilling or unable to even make the assessment of the ability of the discrete screened intervals in the "many if not all compromised wells" to produce reliable and representative water quality data. Indeed, the NAS committee found that the scheme used by the LANL scientists to assess the impact of drilling fluids on the discrete screened intervals to be scientifically and statistically invalid:

> During this study the committee was presented a good deal of information indicating that most or all wells into the regional aquifer at LANL (R-wells) are flawed for the purpose of monitoring. The committee did not disagree, but rather

> found a lack of basic scientific knowledge that could help ensure future success. Evidence about the conditions prevalent around the screens in the compromised wells is indirect—relying on plausible but unproven[3] chemical interactions, general literature data, analyses of surrogates, and apparent trends in sampling data that may not be statistically valid. p. 97.

Also, to the present time, the LANL scientists have not performed the detailed study of each discrete screened interval that was requested by DOE. The established scientific practice is to fully understand the performance of each discrete screened interval to produce reliable and representative water quality data within a period of 18 months after the well is installed and LANL has not met this practice for <u>any</u> of the characterization wells installed in the regional aquifer.

Furthermore, 70% of the screened intervals are in multiple-screen wells where <u>no-purge</u> water samples are collected. The NAS committee recognizes the need to pump a continuous flow of groundwater from each screened interval as <u>an established scientific process</u> to assess the quality of the groundwater data produced from the screened interval:

> Given that drilling and well construction inevitably causes disturbance of the subsurface formation, industry experience is that typically the native geochemical and hydrological conditions tend to re-establish as groundwater flows around and through the well screen. To help ensure this re-equilibration, application of proper purging techniques in both well development and groundwater sampling is necessary for collection of representative groundwater samples, especially in the regional aquifer. The most trustworthy sampling technique includes purging three or more well volumes from the monitoring well before sample collection (ASTM D 4448, 1992). While this method requires containment and potential treatment of much more water that the minimum-purge techniques, it better ensures that samples from the developed wells represent the conditions in the nearby aquifer. p. 90.

The answer of the NAS committee to the second question follows:

> The short answer to the second question, as it is written, is no. Although <u>LANL appears to be generating sound analytical data</u> [emphasis added], the results reported in databases and LANL reports often do not carry the proper qualifiers according to good QA/QC practices. This especially applies to analytical results near or below the limits of practical quantitation and detection, near the natural background, or both. The difficulty here is that reported detection of contamination that is not statistically significant may be taken as real by regulators and other stakeholders—with concomitant concerns and calls for remedial actions.

The NAS committee supplied a correct answer of "no" to the second question but the statement by the NAS committee that "LANL appears to be generating sound analytical data" is in direct contradiction with the many statements in the prepublication copy that the LANL characterization wells do not produce valid water quality data. A major factor is that LANL/DOE invaded all of the screened intervals with organic and/or bentonite clay drilling muds that have well known properties to mask the detection of the LANL radionuclide contaminants produced by nuclear weapons research and manufacture. The poor performance of the LANL scientists to follow good QA/QC practices increases the uncertainty of the analyses on poor quality of the water samples produced from the compromised wells.