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LANL Reports

M E M O R A N D U M

To: File, Ground Water Protection & Remediation Bureau

From: W. Stone, Remediation Section/DOE Oversight Program

Date: 20 Oct 93

Subject: Recent ground-water tritium results, LANL

STATE OF NEW MEXICO
ENVIRONMENT DEPARTMENT

INTRODUCTION

Analyses of ground water samples taken by LANL during their 1993 Annual Surveillance effort are by now complete and provide some interesting information on tritium (T) content. The purpose of this memo is to briefly summarize the findings and discuss their significance. Information presented comes from a fact sheet distributed by LANL at a briefing for Kathleen (5 Oct 93) and their news release on the findings of the same date.

Representatives of the Drinking Water, Hazardous and Radioactive Materials, Ground Water Protection and Remediation and Surface Water Quality Bureaus met 19 Oct 93 to discuss the ramifications of the T data. Although a summary of the discussion at that meeting will be provided to LANL, this memo was prepared independently for the file and use of the Ground Water Bureau.

REPORTED FINDINGS/LANL'S INTERPRETATION

LANL grouped the findings into three categories that are utilized herein as well. They are based on what might be expected from a knowledge of the wells, previous releases of T by the lab and regional hydrogeology. T values given here are rounded to the nearest whole pCi/L. TD = total depth of well, WL = water-level depth below the surface, ND = none detected. Copies of maps accompanying LANL's fact sheet are attached for reference.

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UNEXPECTED/QUESTIONABLE

PM-3, Sandia Canyon - 1 pCi/L (Aug 92); 7 pCi/L (May 93) TD = 2,547 ft well within main aquifer, screened 956 - 2,547 ft, WL = 770 ft

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LANL says a plausible source is contaminated water in the alluvium of Mortandad Canyon, 1 mi to the west, but doubts that it could have moved fast enough or in great enough quantity to show up at this location at this concentration. The lack of detectable T in nearby wells, such as PM-1, PM-5 and O-4, is cited as further evidence that this is a very anomalous reading.

TW-4, mesa east of Acid Canyon - 11 pCi/L (May 93)
TD = 1,200 ft in very top of main aquifer, WL = 1190 ft

LANL notes that adjacent Acid Canyon received untreated influent in the past and that water introduced during drilling, but perhaps never fully purged from the well, is an additional possible source of T.

EXPECTED

TW-1, Pueblo Canyon - 349 pCi/L (Aug 92); 362 (May 93)
TD = 642 ft in Puye Conglomerate

LANL suspects contamination by hydraulic communication with a nearby ungrouted shallow well (TW-1A, TD = 225 ft in intermediate perched ground water body associated with basalt between tuff and main aquifer) or with the shallow alluvium directly via the ungrouted annulus of TW-1.

TW-2A, Pueblo Canyon - 2,200 pCi/L (Oct 92 and May 93)
taps intermediate perched ground water

LANL says these results are consistent with previously reported levels. Furthermore, the lack of measurable T in an adjacent deep well (TW-2, tapping main aquifer) indicates that its seal is sufficient to prevent downward migration of contaminated shallow water.

NEW BUT NOT SURPRISING

LA-1A, lower Los Alamos Canyon - 63 pCi/L (May 93)
TD = 400 ft into upper part of main aquifer (construction uncertain, but not believed to be grouted)

LA-1B, lower Los Alamos Canyon - ND (Oct 91 and May 93)
Cased to 1,750 ft in alluvium and main aquifer, screen = 326 - 1,750 ft

LA-2, lower Los Alamos Canyon - 13 pCi/L (May 93)
TD = 882 in alluvium and main aquifer, screen = 105 - 882 ft

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LANL cites downward movement of contaminated surface water as the source of T in LA-1A and LA-2. An effective seal and greater depth of screen are considered responsible for the lack of measurable T in LA-1B.

Otowi House, lower Los Alamos Canyon - 145 pCi/L (May 93)
TD unknown but probably does not reach main aquifer

Halladay House, lower Los Alamos Canyon - ND (Feb 92 and May 93)
TD unknown but water quality is consistent with a main aquifer completion

LANL believes the Otowi House well taps shallow contaminated water (in the alluvium) whereas the Halladay well does not.

GROUND-WATER AGE

LANL's preliminary interpretation of seven Carbon-14 (C14) analyses is that the minimum age of main-aquifer ground water is 1,000 years in the western part of the Pajarito Plateau and 30,000 years near the Rio Grande (see map). This is used to assert that there is virtually no recharge through the hundreds of feet of "dry" Bandelier Tuff and basin fill between the land surface and the regional water table associated with the main aquifer.

FUTURE WORK PLANNED BY LANL

In an effort to resolve questions raised by these results, LANL has planned to resample all wells, taking special care during the collection, handling and analysis steps to avoid any cross contamination. Additionally, samples of water from several discrete depths will be taken from PM-3, using a straddle packer, to isolate the T source and determine its concentration.

DISCUSSION

GENERAL

Although all T values are well below drinking-water standard (20,000 pCi/L) and thus do not pose a health threat, the new data are nonetheless very significant. They serve as a flag that the main aquifer is not as isolated from the surface as it is commonly characterized to be in LANL's conceptual hydrogeologic model of the Pajarito Plateau.

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Additionally, these findings underscore the need for a current water-level map, as noted in our report for Oversight Action 8. Flow directions from possible sources cannot be confirmed without this. Al Stoker reported to me on 19 Oct that the recent transducer measurements of water level are being incorporated into a map and will eventually be computerized via their FIMAD system.

LANL's use of the University of Miami lab for T analyses is highly commendable. From my own experience, that is probably the best tritium facility in the country, if not the world. Their detection limit is the lowest available and just what is needed for early warning of T in water of the main aquifer at LANL.

LANL'S INTERPRETATIONS

PM-3 - I feel the Mortandad Canyon source is not unreasonable, especially in view of the probable flow direction toward the Pajarito well field. Lack of T in PM-1, PM-5 and O-4 may be explained when a current water-level map is available.

TW-4 - the Acid Canyon source seems reasonable.

TW-1 - noting water-level response in the shallow well while pumping the deep well or use of a tracer test employing harmless dye should readily test hydraulic connection. If connection is confirmed, logging the well by TV and geophysical methods, to determine the integrity of the casing and show the character of the annulus behind the casing, should indicate whether communication is by leakage along the well bore or through the geologic media. If the annulus at this or any other well is found to be a pathway by which contaminated surface or shallow ground water can reach the main aquifer, the well should be properly decommissioned. In such a case, it will be of no further use as a monitoring well anyway.

TW-2A - LANL's conclusions are logical.

Lower Los Alamos Canyon wells - LANL interpretations of the results for these wells are appropriate in view of information available.
LANL's assessment of ground-water age is still incomplete. C14 results to date are consistent with flow from a western recharge area toward an eastern discharge area (see map). The notion that the main aquifer is isolated from the surface is brought into serious question by the recent ground-water T data. The presence of any detectable T in the water indicates very recent recharge, more specifically, less than 40 years ago. If

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these values are real, there must be some connection with the surface, at least locally.

FURTHER WORK PLANNED

Resampling to make sure the elevated numbers are not the result of cross contamination is the obvious first step. Plans to compare analytical results with data from other ongoing hydrogeologic investigations (ground water dating, isotopes, etc) also makes good sense.

The inescapable conclusion, however, is that some new wells are needed to better monitor the various ground water bodies of the Pajarito Plateau. This arises in part from the need for more properly constructed wells to replace old ones giving the questionable data discussed above and in part from a need to fill in gaps in the present monitoring network. As stated in the Action 8 deliverable, the need for and location of additional monitoring wells can only be properly determined from a map showing both the probable sources of contamination and recent water-level contours.
The availability of such maps are apparently not far off. LANL is to be commended for its timely reporting of these findings to both the Department and the public via the news media. However, lacking knowledge of the subject, the public is bound to over-react. Perhaps a public meeting should be held to clarify the real significance of the results. If this is not done by the NMED/AIP, it should certainly be done by LANL, if only at its next regularly scheduled public meeting.

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