Attachment 4. The Need to Plug and Abandon the Old LANL Test Wells, including DT-5A, DT-9 and DT-10 at TA-49, and Install New Characterization Wells

There is a large untapped groundwater resource across the southern region of Los Alamos National Laboratory (LANL), including beneath Technical Area 49 (TA-49) where the hydronuclear research was performed in the early 1960's. The research produced a large amount of radionuclide and chemical contamination, including 88 pounds of plutonium buried at depths up to an estimated 100 feet below the ground surface and many mobile chemical contaminants. The four test areas for the hydronuclear research at TA- 49 are designated as LANL solid waste management unit (SWMU) Material Disposal Area (MDA) AB. The danger of the buried wastes produced by the hydronuclear research to contaminate the regional aquifer has never been monitored and is not a monitoring requirement of the New Mexico Environment Department (NMED) Consent Order for LANL.

In fact, at the present time there are no monitoring wells across the southern region of the laboratory that produce reliable and representative water samples. The large groundwater resource in the southern region of the laboratory is even a larger resource than where the network of drinking water supply wells for Los Alamos County is located. The emerging presence of LANL contaminants in the regional aquifer in the northern region of the laboratory may require installation of supply wells in the southern region of the laboratory. Because of the failure of LANL to determine the danger of the hexavalent chromium contamination and radionuclide contaminants to the Los Alamos County drinking water wells, a wise water management strategy would be to install a minimum of three drinking water supply wells in the southern region of LANL at this time.

Three test wells were drilled in 1960 in preparation for the hydronuclear tests conducted at MDA AB. They were drilled with the mud rotary method that masks the detection of contamination. Information on the locations and construction of the three wells, known as DT-5A, DT-9 and DT-10, are shown on the enclosed Figures IX-U and IX-V from the LANL report, *Geologic and Hydrologic Records of Observation Wells, Test Holes, Test Wells, Supply Wells, Springs and Surface Water Stations in the Los Alamos Area,* by W.D. Purtyman (LA-12883-MS, January 1995).

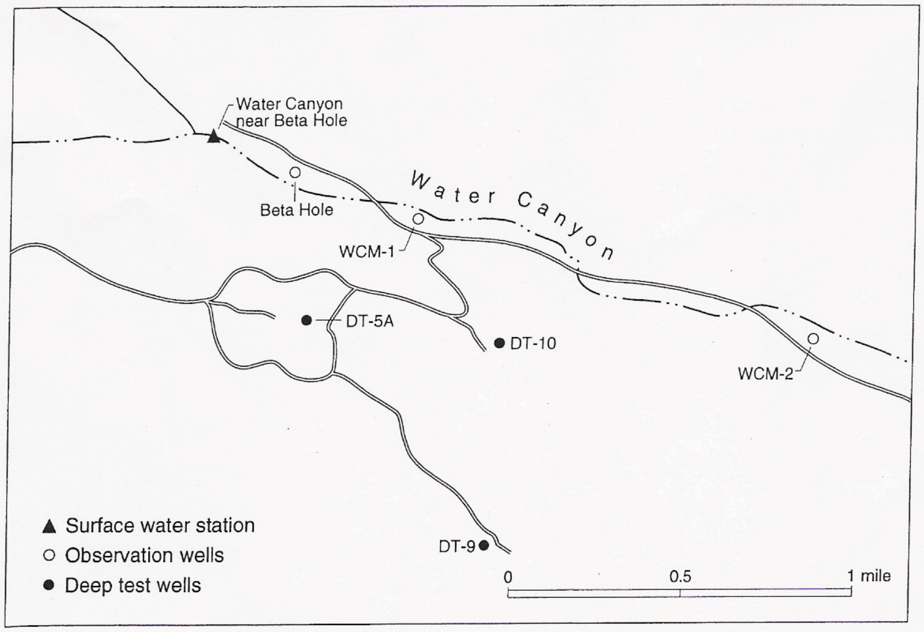

Fig. IX-U. Locations of wells, holes, and a surface water sampling station in Water Canyon north of TA-49.

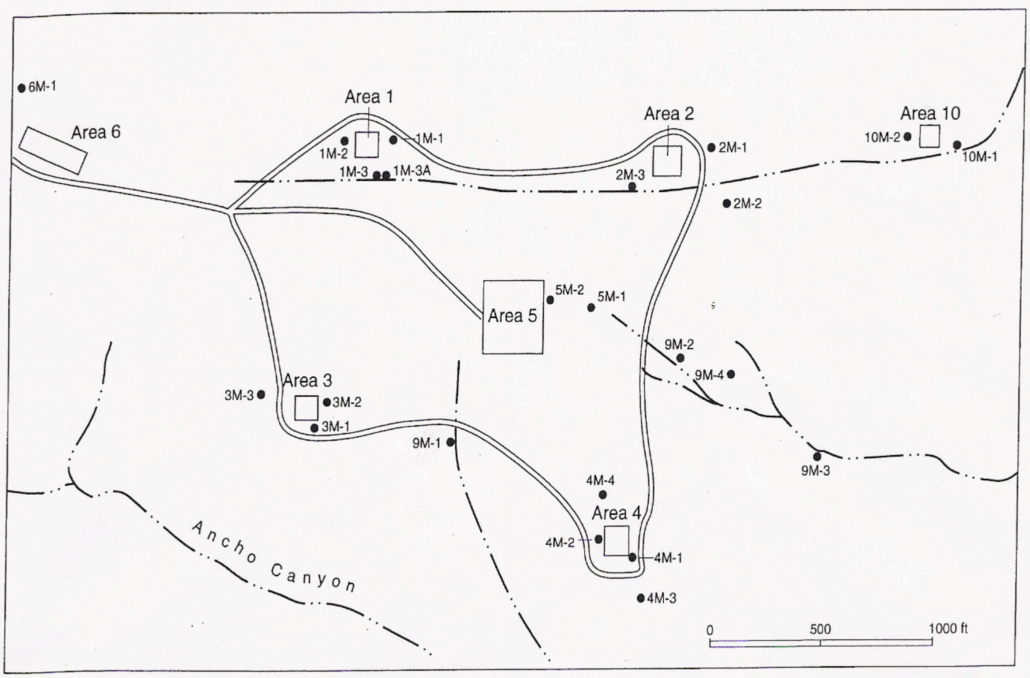

Fig. IX-V. Locations of moisture-access holes at TA-49.

The presence of groundwater contamination from MDA AB in the regional aquifer is not known because LANL relies on water samples collected from the three old LANL test wells that do not produce reliable and representative water samples.

The wells have never met the standard industry practice for monitoring wells to detect the contaminants of concern at TA-49. Nevertheless, LANL has written reports for over the past 40 years that describe the water quality data from the test wells as reliable and representative. Unfortunately, the NMED/LANL Consent Order allows LANL to continue to use the old test wells for the present interim monitoring and also for long-term monitoring.

The factors that prevent the wells from producing reliable and representative water samples for the detection of contamination from the four test areas at MDA AB at TA-49 include the following:

1. The wells are not at appropriate locations as shown by intercomparison of Figures IX-U and IX-V in the Purtyman report. Well DT-5A is located within Area 5 and at a distance of approximately 1000 feet from Areas 1 and 3 and approximately 900 feet from Areas 2 and 4. In addition, well DT-5A is located upgradient of the direction of groundwater travel beneath Areas 2 and 4. Well DT-9 is located approximately 3500 feet to the east of Area 2 and well DT-10 is located approximately 4500 feet to the southeast of Area 4. The regional direction of groundwater flow is shown on an enclosed map.

2. The three test wells were drilled with the mud rotary drilling method that allowed a very large quantity of bentonite clay drilling mud to invade the screened intervals.

3. The three test wells have very long screened intervals. All three have torch cut slots to form screens for a distance of:

DT-5A	649 feet
DT-9	461 feet
DT-10	329 feet

Because of concerns for dilution in long screens, the general requirements of RCRA and the NMED/LANL Consent Order are for screens to be no longer than 10 feet for monitoring wells. From the Consent Order:

> The selection of the well screen length depends upon the objective of the well. Piezometers and wells where only a discrete flow path is monitored are generally completed with short screens (two ft or less). While monitoring wells are usually constructed with longer screens (usually five to ten ft), they shall be kept to the minimum length appropriate for intercepting a contaminant plume. Page 195.

The long screen lengths in the old test wells are a reason to plug and abandon the wells.

4. Corrosion products of the common steel casing and galvanized steel well fittings in the three old test wells have strong properties to mask detection of contaminants in the water samples produced from the three wells. The effects of corrosion products to prevent detection of contaminants are summarized in the *EPA RCRA Groundwater Monitoring: Draft Technical Guidance Document:*

> Corrosion products include iron, manganese, and trace metal oxides as well as various metal sulfides (Barcelona et al., 1983). Under oxidizing conditions, the principal products are solid hydrous metal oxides; under reducing conditions, high concentrations of dissolved metallic corrosion products can be expected (Barcelona et al., 1983). The products of corrosion of galvanized steel include iron, manganese, zinc, and traces of cadmium (Barcelona et al., 1983).
>
> The presence of corrosion products represents a high potential for the alteration of groundwater sample chemical quality. The surfaces where corrosion occurs also present potential sites for a variety of chemical reactions and adsorption. These surface interactions can cause significant changes in dissolved metal or organic compounds in ground-water samples (Marsh and Lloyd, 1980).
>
> According to Barcelona et al. (1983), even purging the well prior to sampling may not be sufficient to minimize this source of sample bias because the effects of the disturbance of surface coatings or accumulated corrosion products in the bottom of the well are difficult, if not impossible, to predict.
>
> On the basis of these observations, the use of carbon steel, low-carbon steel, and galvanized steel in monitoring well construction is not recommended in most natural geochemical environments.

The above factors greatly reduce the likelihood that the old test wells will detect contamination from MDA AB. Nevertheless, the LANL reports over the past 30 years, describe the water quality data from the old test wells as proof that MDA AB has not contaminated the ground water. We provide examples from LANL reports below of such statements, along with excerpts from four recent *LANL Environmental Surveillance Reports* (2002 through 2005) that present water quality data from the three old test wells as valid for the detection of groundwater contamination from the four Test Areas at MDA AB.

From page 7-2 of the *LANL Interim Facility-Wide Groundwater Monitoring Plan:*

> **7.4 Scope of Activities – Ancho Canyon.** Monitoring locations in Ancho Canyon are situated near or downstream from areas of past Laboratory weapons-testing

> activities. Most monitoring locations in Ancho Canyon access the regional aquifer. Three decades of water quality records from regional wells in this area (DT-5A, DT-9, and DT-10), and recent data from R-31, show no substantial changes in water chemistry or the presence of Laboratory contaminants in the regional aquifer.

The 1999 final LANL SWEIS contradicts the *Interim Groundwater Monitoring Plan* by describing LANL contaminants in the regional aquifer at TA-49:

> Organic compounds have been detected in samples taken from main aquifer test wells at TA-49 (DT-5A, DT-10, and DT-9; Figure 4.3.2.1-2). The largest detection was for pentachlorophenol from the TA-49 test well DT-9 (Figure 4.3.2-1) of 110 parts per billion [1993 ESR]. The EPA [Safe Drinking Water Act] SDWA standard for pentachlorophenol is 1 part per billion. The sources of the contaminants detected in the TA-49 test wells are not known (LANL 1993b [ESR 91], LANL 1994b [ESR 92], LANL 1995f [ESR 93], **LANL 1996e [ESR 94],** and LANL 1996i [ESR 95]). [Emphasis added.] Test well DT-9 was retested in 1996, and no organic compounds were detected. However, the LANL Hydrogeologic Workplan (LANL 1998b) proposes the installation of borehole R-27 to further characterize the source of these contaminants. The TA-49 test wells are approximately 2 miles (3.2kilometers) away and cross-gradient of the nearest public water supply well (PM2) (Figure 4.3.2.1-2), and no public supply wells exist down-gradient of the TA-49 test wells. Therefore, the presence of organic compounds in these samples does not suggest a danger to the existing public water supply (Purtymun 1995). p. 4-76.

Reference LANL 1996e, which is the *Environmental Surveillance at Los Alamos during 1994,* LA-13047-ENV, UC 902, contradicts the above statement made in the above paragraph and identifies the source of these contaminants:

> The appearance of high lead levels in test wells at TA-49 is of concern because past underground tests at the site, involving high explosives and radioactive materials, raise the possibility of groundwater contamination (Purtymun 1987b). The tests were conducted in 1960 and 1961, at the direction of President Eisenhower, to evaluate safety aspects of certain nuclear weapons systems. Tests were carried out in large-diameter holes, up to 37 m (120 ft) deep. Materials dispersed by detonation of the high explosives remain at the bottom of the experimental holes. These materials include 40 kg (88 lb) of plutonium, 93 kg (205 lb) of enriched uranium, 82 kg (180 lb) of depleted uranium, and 90,000 kg (198,000 lb) of lead which was used as shielding (Purtymun 1987b; LANL 1992b). The area is considered to be a hazardous and radioactive material disposal area for purposes of compliance with DOE and EPA requirements. Environmental monitoring carried out since the time of the testing has indicated no contamination of the groundwater, which lies at a depth of 366 (1,200 ft) below TA-49. Age dating of

groundwater from test wells at TA-49 supports the conclusion that there is no component of recent recharge in this area (see Section VII.E.1.b). p. 249 – 250.

We point out these errors as an example of the lack of veracity in LANL documents provided to the public about annual impacts of LANL operations on public health, safety and the environment. We renew our request for the retraction of the *LANL Environmental Surveillance Reports.*

NMED/LANL Consent Order Requirements. A serious mistake in the NMED/LANL Consent Order is that DOE/LANL are not required to plug and abandon the three old test wells and install a reliable network of monitoring wells to investigate groundwater contamination beneath the four test areas at MDA AB. Instead, the Consent Order allows for the ongoing collection of spurious water samples from the old test wells to meet the

1. groundwater monitoring requirements in the NMED approved *LANL Interim Facility-Wide Groundwater Monitoring Plan,* and
2. long-term monitoring well requirements for the protection of the very large groundwater resource from the wastes buried at MDA AB.

In addition, the *Interim Plan* describes LANL characterization well R-31, a multiple screen well, as being at an important location for monitoring groundwater contamination from MDA AB. However, LANL characterization well R-31 does not produce reliable water quality data to assess groundwater contamination from the hydronuclear experiments at MDA AB because of the following factors:

1. Well R-31 is located at a distance of approximately three miles from MDA AB.
2. The screened intervals in well R-31 are contaminated with a new mineralogy of iron precipitates that were formed by the organic drilling additives. The iron precipitates have strong sorption properties to mask the detection of groundwater contamination from the buried waste at MDA AB.
3. Water samples are collected from well R-31 with the Westbay^{R} no-purge sampling equipment that collects stagnant water samples from the zone of new mineralogy that surrounds the well screens.

A basic issue is that NMED does not recognize that the groundwater requirements under RCRA Section 264 Subpart F are also the requirements for the LANL solid waste management unit (SWMUs), such as MDA AB, where very large volumes of chemical and radionuclide waste are buried above a very large and precious groundwater resource.

The position of EPA that the groundwater monitoring requirements under RCRA Subpart F also apply to MDA AB is summarized in an email to CCNS on February 20, 2007 from Richard Mayer, an EPA scientist in EPA Region 6:

The groundwater monitoring requirements for [solid waste management units] SWMUs should mirror the requirements for regulated units under Subpart F. The groundwater monitoring wells should be located (hydraulically down-gradient) close/near/next to the SWMU or regulated unit in adequate/sufficient numbers. Also, for the monitoring wells located next to the SWMU/regulated unit, the uppermost aquifer should be monitored (in addition, other deeper zones may need to be monitored according to site conditions, other factors, etc.). The site should also have a sufficient number of "background" groundwater monitoring wells in order to determine a release for natural occurring contaminants like metals and some radionuclides.

If contamination is found in the monitoring wells next to the SWMU/regulated unit, then further horizontal and vertical delineation of the groundwater plume is required with additional wells.

Also, the words sufficient or adequate can be interpreted differently. For example, if an SWMU/regulated unit was 300' by 300' and the groundwater flow direction was from Northwest to Southeast, two downgradient monitoring wells next to the unit (initial wells) would not be a sufficient/adequate number. Now if you had a unit that was 50' by 50', with groundwater flow from Northwest to Southeast, then 2 downgradient monitoring wells next to the unit/SWMU probably would be sufficient.

This is just a brief general summary. As you know, each site can have its own unique groundwater monitoring issues.

The above summary of groundwater requirements under RCRA demonstrates the need to plug and abandon the three old test wells and immediately installs a minimum of four characterization wells in the regional aquifer at the immediate downgradient boundary of each of the four test areas at MDA AB.