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EMERGENCY

LANL Groundwater
Chromium Plume
Sandia and Mortandad
Canyons

Subject: Offsite Chromium Migration, Los Alamos National Laboratory

Date: 26 March 2013

Hexavalent chromium (or chromium) measured in the regional sole-source drinking-water aquifer beneath Mortandad Canyon has likely migrated past the boundary between Los Alamos National Laboratory (LANL) and Pueblo de San Ildefonso (Pueblo). Hexavalent chromium is considered to be a human carcinogen. The chromium originated from LANL during the mid 1950s through the early 1970s as part of historical discharges from Technical Area (TA)-02, TA-03, and TA-48 cooling towers. The regional aquifer in the vicinity of monitoring well R-50, located in Mortandad Canyon near the LANL property boundary with the Pueblo (see attached map), contains concentrations of chromium greater than the cleanup standard.

Regional aquifer well R-50 was drilled in late 2009 and completed in early 2010. NMED directed LANL to install the well with the primary objective being to assess offsite migration of chromium contamination at the Pueblo boundary. The well is located approximately 360 feet north of the property boundary and positioned to intercept the known chromium plume(s) residing beneath LANL in Mortandad and Sandia canyons (see map). The highest level of chromium measured to date in the chromium plume is approximately 1250 ug/L or 1250 ppb at well R-42, which is 25 times the New Mexico Water Quality Standard of 50 ug/L and 12 1/2 times the US Environmental Protection Agency's (US EPA) standard of 100 ug/L. Based on knowledge of chromium discharge sources originating from LANL, it is probable that concentrations of chromium at the regional water table, and possibly deeper, are greater than 1250 ug/L.

Characterization of the plume has shown that hexavalent chromium has traveled at least 2800 feet since it entered the aquifer. NMED and LANL estimate that the chromium is traveling at a rate between 131 and 164 feet per year. The observed rapid transport of chromium from northwest to southeast along the groundwater-flow path towards Pueblo de San Ildefonso is corroborated by radiocarbon



groundwater-age data collected at regional-aquifer wells located in the Mortandad and Sandia Canyons watersheds.

The R-50 boundary well was constructed with two screens, one located near the regional water table and the other at a depth of about 100 feet below the regional water table. The first groundwater sample collected from the upper screen was in March 2010. Hexavalent chromium was detected in this sample at 70 ug/L, exceeding the NM State standard of 50 ug/L. Since then, chromium levels have increased to 100 ug/L, twice the State standard and equal to the US EPA standard. Based on chromium distributions in the plume upgradient of R-50, it is likely that chromium levels at R-50 will continue to increase with time. Due to the lack of groundwater monitoring wells located south of R-50 on the Pueblo, it is unknown how far the chromium plume has migrated past R-50 and onto Pueblo land. The short distance of 360 feet from R-50 to the property boundary and the high mobility of chromium strongly suggest that this contaminant has migrated south in Mortandad Canyon past the Pueblo boundary probably between 2001 and 2013, based on data indicating that the plume has already migrated at least 2800 feet from its assumed starting point at R-42 (see map).

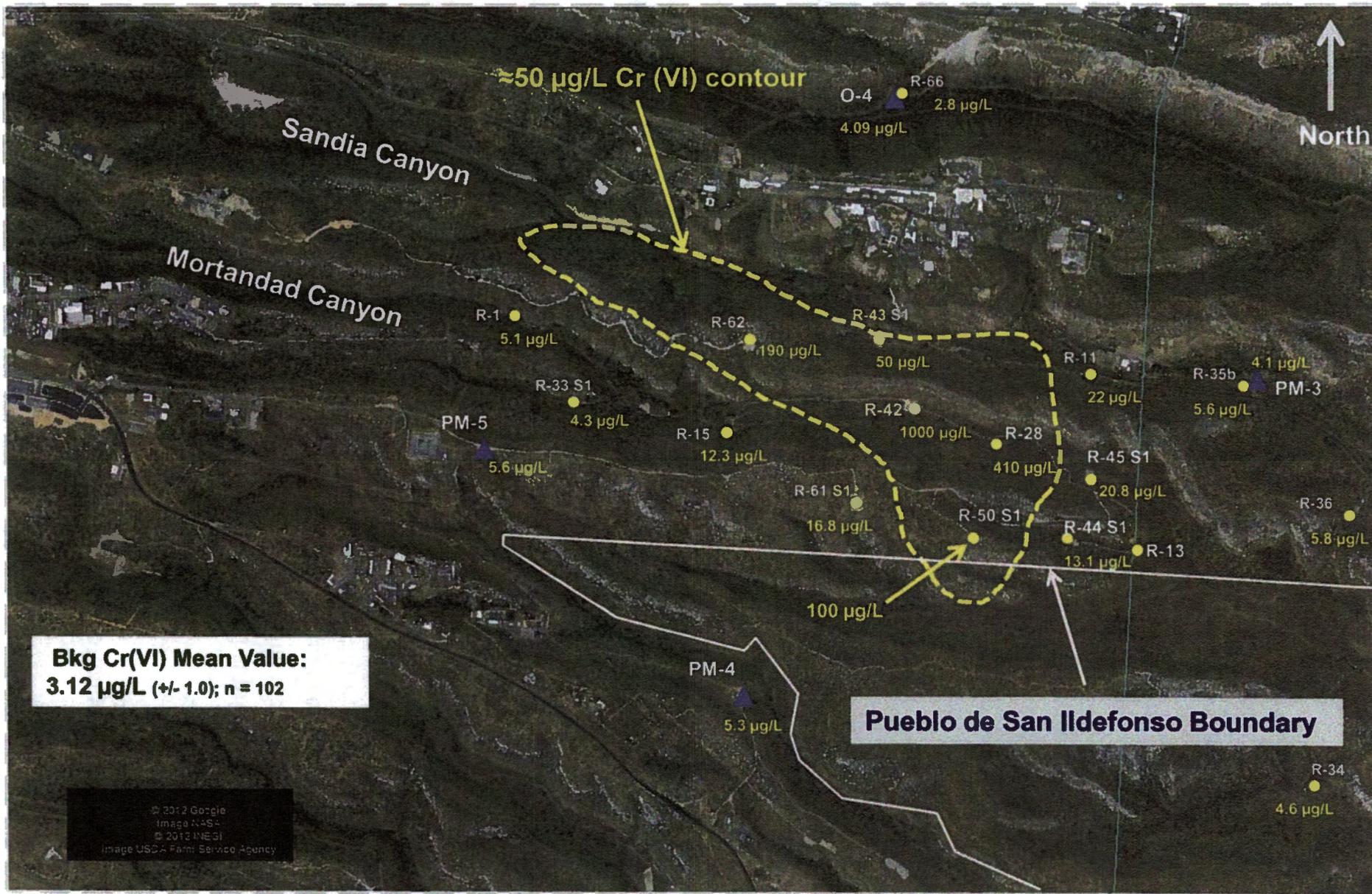
Some empirical evidence has recently been gathered that suggests that offsite migration of chromium has occurred at some point after 2001. One way to determine if offsite migration has occurred is to estimate groundwater and chromium-transport velocities and travel times near R-50. Two techniques can be used for determining chromium travel time from R-50 to the property boundary: 1) hydraulic properties data collected at wells located near R-50 and 2) measuring direct chromium travel time from a single point-source well (starting point or contaminant arrival location) in the plume to outlying wells located downgradient and along the front of the plume. Calculations of flow velocities and travel time using these techniques were performed and extrapolated to the area between R-50 and the Pueblo boundary with LANL. In summary, the estimated travel times from well R-50 to the Pueblo boundary are in the range of three to 10 years, with a more

realistic value being less than five years, and the estimated offsite migration of chromium occurring between 2001 and 2013.

LANL recently published a chromium investigation report that presents an estimate on plume-migration travel time. The report states that the travel time between wells R-42 and R-28 (see map) would be at a minimum of 8 yr with a travel distance of 1310 feet or a rate of 164 feet per year. If this chromium transport rate is extrapolated to the R-50 area then the calculated travel time from R-50 to the Pueblo boundary would be 2.2 yr, slightly faster but very similar to what is presented above. The LANL document that describes these results is titled "Phase II Investigation Report for Sandia Canyon", dated September 2012 and referenced by LA-UR-12-24593.

The extent of hexavalent chromium migration offsite and onto the Pueblo de San Ildefonso should be determined as soon as possible by installing a monitoring well south-southeast of R-50 within the Pueblo land. Methods of inhibiting or slowing down the migration of chromium must also be evaluated so that the long-term effects from chromium contamination in the regional drinking water aquifer are minimized.

Regional Aquifer Chromium(VI) Concentrations



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