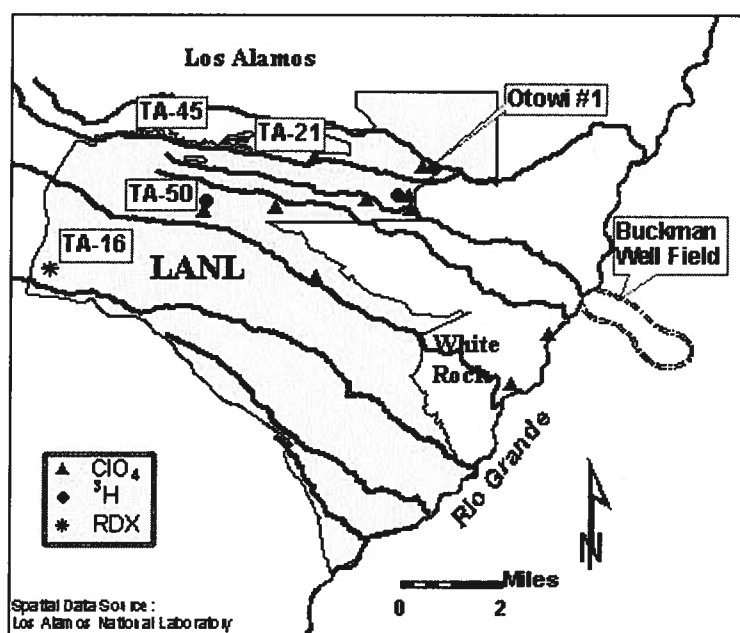


GROUND-WATER CONTAMINATION AT LOS ALAMOS NATIONAL LABORATORY (LANL)

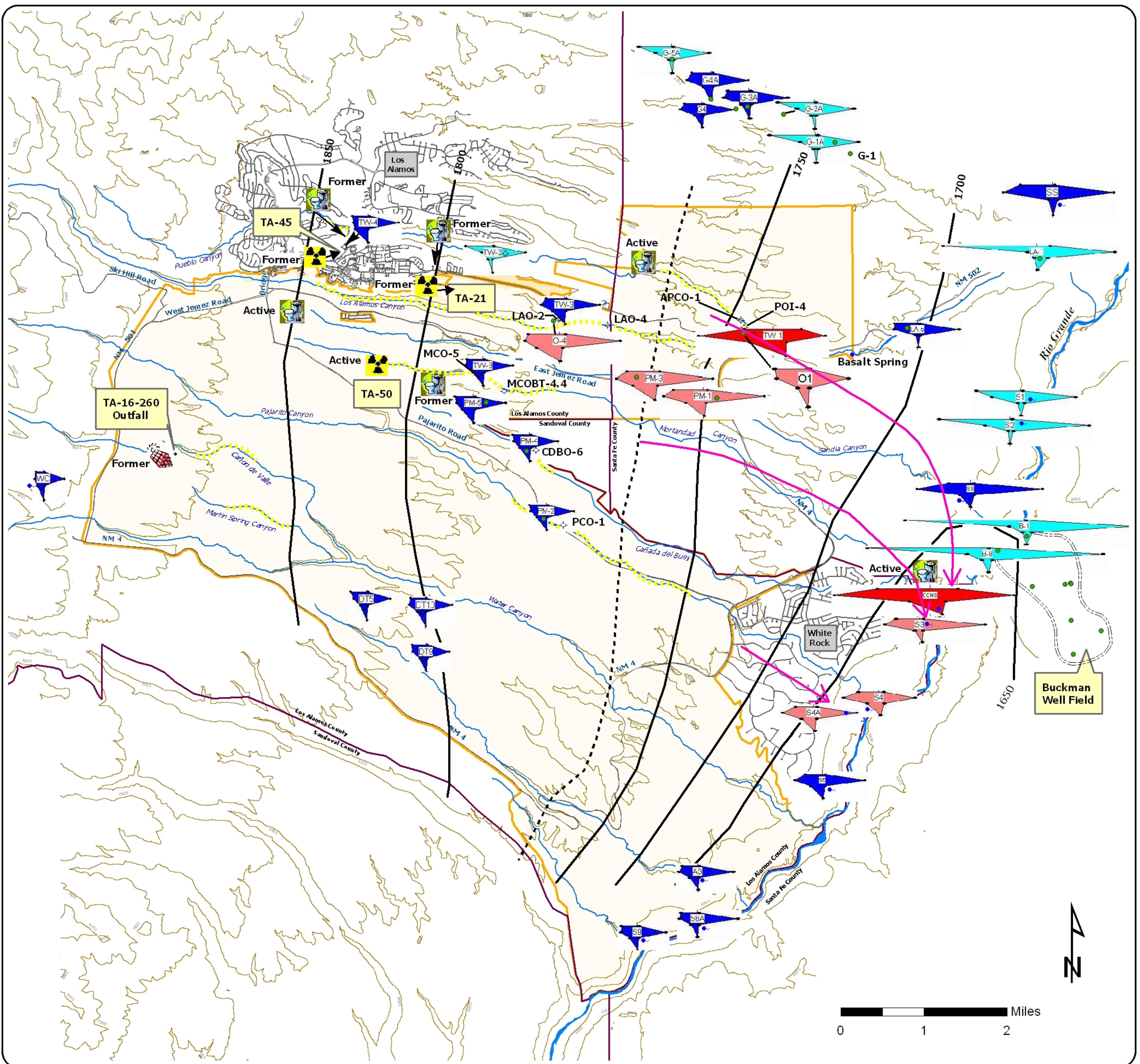
McQUILLAN, Dennis, DALE, Michael, YOUNG, John, and GRANZOW, Kim, New Mexico Environment Department, P.O. Box 26110, Santa Fe, NM 87502, full paper and author e-mail: http://www.nmenv.state.nm.us/gwb/GWQ Atlas/GWQ_Atlas.html

LANL has discharged wastewater to surface watercourses since 1943. Untreated radioactive waste was released at TA-45 from 1943-51. Treated wastewater was discharged at TA-16, TA-45 (1951-64), TA-21 (1952-86), and at TA-50 (1963-present). These discharges contaminated alluvial ground water with chloride (Cl^-), nitrate (NO_3^-), fluoride, perchlorate (ClO_4^-), high explosives (e.g., RDX), and radioisotopes ^{241}Am , ^{137}Cs , ^3H , $^{238,239,240}\text{Pu}$, ^{90}Sr , ^{99}Tc , and U. Alluvial aquifers recharge perched ground-water zones, which recharge the regional aquifer. These recharge pathways transport the highly mobile contaminants Cl^- , NO_3^- , ClO_4^- , and ^3H into the regional aquifer. LANL has greatly reduced contaminant levels in its wastewater discharges, and concentrations in alluvial aquifers have subsequently decreased. Contaminants that once created high levels in alluvial aquifers, however, have migrated deeper into the subsurface.



ClO_4^- has emerged as a major issue because of widespread detections in ground water, sometimes at concentrations of human-health concern (e.g., up to $3180 \mu\text{g/L}$ in the alluvial aquifer). ClO_4^- has been detected in Los Alamos supply wells Otowi #1 (up to $5 \mu\text{g/L}$), and Pajarito #1, 2, 3 & 5 (up to $0.5 \mu\text{g/L}$). Los Alamos tap water contained $0.2 \mu\text{g/L}$ ClO_4^- on 11/25/02. ClO_4^- also has been detected in White Rock Canyon springs (up to $0.5 \mu\text{g/L}$) that intercept the regional aquifer. These springs also contain elevated Cl^- and NO_3^- .

The regional direction of ground-water flow is to the southeast. LANL has suggested that the source of ClO_4^- in Otowi #1, first detected in 1997, may be waste discharged at TA-45. Otowi #1 and the City of Santa Fe's Buckman well field are located approximately 25,000 ft and 50,000 ft down-gradient from TA-45, respectively. If TA-45 is the source of ClO_4^- in Otowi #1, then ClO_4^- has migrated (via surface water, vadose zone and/or ground water) approximately 5 mi, half the distance to Buckman, in 54 years or less. The specific source of ClO_4^- in White Rock Canyon springs has not been determined. These trace-level detections, along with elevated Cl^- and NO_3^- , represent the leading edge of LANL ground-water contamination. ClO_4^- has not been detected in the Buckman well field, which captures about 1/3 of its production from west of the Rio Grande.



Ground-Water Contamination at Los Alamos National Laboratory (LANL)

Regional Aquifer Stiff Diagrams
 (see separate stiff diagram figure for alluvial and intermediate aquifers)

LEGEND:

- | | | | | |
|--|-----------------------------------|-----------------|--------------------------------------|--------------------------------------|
| ◆ Monitoring Wells | — Groundwater Flow Path | — Roads | — 500' Contour | ☼ High Explosive Discharge |
| • Springs | — Water Table Contour | ▭ County Line | ▨ Contaminated Alluvial Ground Water | ☢ Radioactive Liquid Waste Discharge |
| • Supply Wells | — Drainage | ▬ LANL Boundary | | ☒ Sewage Effluent Discharge |
| ← Cations mg/L | ← Anions mg/L | | | |
| ← calcium or calcium-sodium bicarbonate ground water | ← sodium-bicarbonate ground water | | ← groundwater contaminated by LANL | |

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State of New Mexico
 Environment Department



DATA SOURCES:
 Water Table Contours: Nylander, et al. 2002
 Los Alamos National Laboratory
 NMED DOE Oversight Bureau

PROJECTION:
 New Mexico State Plane Coordinate System
 Central Zone
 North American Datum 1983

Map Produced by Kim Granzow, March, 2003
 NMED DOE Oversight Bureau

Ground Water Quality Bureau