Permit 3/18/10

ENTERED

STATE OF NEW MEXICO
BEFORE THE SECRETARY OF ENVIRONMENT

IN THE MATTER OF:

APPLICATION OF THE UNITED STATES	)	
DEPARTMENT OF ENERGY AND	)	
LOS ALAMOS NATIONAL SECURITY, LLC	)	**No. HWB 09-37(P)**
FOR A HAZARDOUS WASTE FACILITY	)	**HWB 10-04(P)**
PERMIT FOR LOS ALAMOS NATIONAL	)	
LABORATORY	)	

TESTIMONY OF DANNY KATZMAN

Introduction

My name is Danny Katzman. I am currently a Program Manager for Environmental Investigations in the Engineering and Technology Division at Los Alamos National Laboratory (the Laboratory). My responsibilities include management of the technical work that is implemented for the Laboratory's environmental programs. I have worked for the Laboratory since 1998 and was a consultant to the Laboratory's environmental program for 5 years prior to 1998. From 1991 to 1993, I worked for the New Mexico Environment Depart (the Department). I have been working specifically in the groundwater program since 2004.

My testimony addresses the groundwater monitoring program at the Laboratory specifically as it relates to monitoring of Resource Conservation and Recovery Act (RCRA)-regulated units at Technical Area (TA)-54. Site-wide groundwater monitoring at LANL is a requirement of the March 1, 2005 Compliance Order on Consent (Consent Order) , which states: "Implementation of the groundwater monitoring requirements of this Consent Order will fulfill the groundwater monitoring requirements of the Hazardous Waste Regulations, 20.4.1.500 NMAC (incorporating 40 C.F.R. Part 264, Subpart F." Consent Order Section IV.A.1. The Laboratory is implementing the requirements of the Consent Order. Ongoing implementation of Consent Order ground water monitoring requirements meets RCRA requirements under Subpart F as described in section 11.3.1. of the Proposed Permit. See also Consent Order sections III.A and III.W.2.A.

The development of a groundwater monitoring network at a hydrogeologically complex site, such as TA-54, is implemented in multiple phases under NMED direction to ensure that the monitoring network can intercept potential groundwater contaminants and identify the source(s) of contaminants that may be present. This testimony briefly summarizes the development of the TA-54 groundwater monitoring network and discusses the main technical principles that are important factors in establishing an effective network for TA-54.

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My testimony describes the main technical principles that are important factors in establishing an effective network for TA-54, how the current monitoring program at TA-54 has evolved, the current status of the monitoring program, and ongoing expansions of the TA-54 groundwater monitoring network.

Overview of the Groundwater Setting at Los Alamos National Laboratory

Groundwater at Los Alamos National Laboratory (the Laboratory) occurs in three modes or zones:

- Shallow alluvial (sand and gravel) deposits at the bottom of canyons;
- Perched zones at intermediate depths beneath the ground surface; and
- The regional aquifer deep beneath the ground surface (Figure 1).

The shallow alluvial groundwater generally ranges in depth from a few feet to as much as 100 feet. The extent of the alluvial groundwater is limited to the narrow deposits that lie within the finger-like canyon and mesa topography. The down-canyon extent of alluvial groundwater is highly variable from canyon to canyon, and is seasonally dependent on variations in the source of recharge water (i.e., rainfall, snowmelt, and treated effluent).

Perched-intermediate groundwater is also highly localized (limited in extent) and is associated with perching of groundwater that infiltrates from overlying alluvial groundwater. Perched-intermediate groundwater bodies are generally only a few to tens of feet thick and occur at depths ranging from approximately 150 feet to 900 feet beneath the ground surface. Perched-intermediate groundwater is generally surrounded by unsaturated rocks and sediment, known as the vadose zone. Observations from the Laboratory's drilling program are that perched-intermediate groundwater almost always occurs at locations directly underlying "wet" canyons. Wet canyons are those that have a persistent source of surface water and alluvial groundwater. Perching occurs on and within geologic layers that have contrasting and lesser porosity and/or permeability than overlying geologic layers.

The regional aquifer is the large body of saturation that underlies all portions of the Laboratory. It lies between approximately 800 and 1200 feet below ground surface and provides the water supply to the Laboratory and the surrounding communities of Los Alamos and White Rock. The regional aquifer is recharged from the uplands west of the Laboratory as well as from canyons within the Laboratory property. Observations of some mobile constituents along the flowpath to each of these groundwater zones are one indication of their hydrologic connection.

Guiding Principles for Establishing a Groundwater Monitoring Network

Groundwater monitoring beneath TA-54 takes place within alluvial, perched-intermediate, and regional groundwater beneath the mesa and in the adjacent canyons.. Further development of the

monitoring network is underway. Establishing a monitoring network at complex sites such as TA-54 often requires an iterative approach where "adaptive management" principles are used to continuously refine the efficacy of the network based on new knowledge obtained as each new well is installed and data are obtained and integrated from new and existing wells. The types of data most important to this iterative process include water-level and water-quality data from monitoring wells and the relation of those data to what is known about the behavior and location of contaminants contained within, and released from, near-surface sources.

The Groundwater Monitoring Well Network at TA-54

There are currently 9 alluvial wells, 5 perched-intermediate well screens, and 15 regional groundwater monitoring wells with 26 screens in place on the mesa top at TA-54 and in the adjacent canyons. An additional 3 wells with a total of 6 screens are planned to be completed by September 2010. Figure 2 shows a simplified well diagram and an example of a well with two screens. The wells at TA-54 have been sited based on the complex stratigraphy and hydrogeology in the area following an iterative approach based on information collected as wells were drilled. The overall objective of the network of wells is to detect any contaminant released from TA-54 into any of the groundwater zones and to distinguish contaminants which may be associated with activities and sources upgradient of TA-54.

Development of the present-day groundwater monitoring network at TA-54 began under the Hydrogeologic Work Plan (HWP), which was prepared in response to a requirement from the Department in 1995. The objectives of the HWP were to collect geologic and hydrologic information and use it to refine the understanding of the large-scale hydrogeologic system beneath the Laboratory and to provide a framework for future work on designing area-specific monitoring networks.

Twenty five regional wells and six perched-intermediate wells were installed across the Laboratory during the period 1998 – 2004. Six of the wells, R-20, R-21, R-22, R-32, R-23, and R-23i were installed around TA-54. Five of these wells were installed between December 2000 and January 2003, and R-23i was installed in November 2005. Investigations of sites at TA-54 were ongoing prior to and concurrent with installation of these wells. These investigations included deep coring to characterize contamination that may have migrated from sources at TA-54, and installation of vapor monitoring wells within the unsaturated zone beneath TA-54 to characterize and monitor vapor-phase contaminants such as volatile organic compounds (e.g., trichloroethane) that have been identified. These vapor-phase constituents have the potential to migrate in the unsaturated zone and could transfer from the vapor phase into groundwater.

The Consent Order, which was signed in March 2005, included specific requirements for installation of additional characterization coreholes, vapor monitoring wells, and groundwater monitoring wells at TA-54.

Alluvial groundwater adjacent to TA-54 is also monitored and was an explicit part of the Consent Order requirements for TA-54. The alluvial groundwater monitoring well network was enhanced via installation of 6 additional wells that were installed adjacent to TA-54 in Pajarito Canyon in 2008 under an NMED-approved work plan.

In April 2007 the NMED directed the Laboratory to conduct a series of groundwater monitoring well network evaluations. The evaluations, which included perched-intermediate and regional wells, were to consider the efficacy of area-specific monitoring well networks from the following three perspectives:

1. Physical condition of existing wells;
2. Each well's ability to provide representative data for the constituents known, or suspected, to be groundwater contaminants; and
3. The number and location of wells needed to meet monitoring objectives.

The network evaluation for TA-54 recommended rehabilitation and conversion of three of the six existing wells, and installation of seven additional groundwater monitoring wells to supplement monitoring down gradient of potential sources of contamination from TA-54 (Figure 3). The Department approved the recommendations on October 29, 2007. Rehabilitation of wells involves conducting several operations along one or more well screens in a well with the goal of removing residual materials such as drilling muds that may remain in the aquifer near the well screen. Residual amounts of materials such as drilling muds in the aquifer can result in data that may not be representative of the actual condition in the groundwater.

At TA-54, the wells affected in that manner had also been initially equipped with sampling systems manufactured by a company called Westbay. The Westbay sampling systems do not allow purging of groundwater (removal via pumping) from within the well casing or from the formation surrounding the well screen prior to sampling. The ability to purge prior to sampling can assist in the removal of residual materials in the aquifer. As part of the rehabilitation effort, the Westbay sampling systems were removed and systems that allow for purging of groundwater in the surrounding aquifer were installed.

Rehabilitation and conversion of two of the wells, R-20, and R-32 occurred on December 2007 and September 2007. Rehabilitation has begun on R-22, but the well is currently in a standby mode waiting for data from new wells and further feedback from NMED on the final disposition of the well.

Installation of the seven new groundwater monitoring wells that resulted from the network evaluation occurred between December 2008 and June 2009. The location of each new groundwater monitoring well was approved by NMED prior to installation. A key objective for these wells was to ensure a high-probability of detection before a contaminant would arrive at a

water-supply well or the Laboratory boundary. Further discussion on the placement of these wells is provided in a later section of this written testimony.

Water-level data collected from the seven newly installed wells (11 well screens) led to substantial refinements in the understanding of the hydrogeologic environment beneath TA-54. A key finding has been the new information on water-table elevations and the implications of this information on determining groundwater flow directions. The presence of volcanic rocks, as opposed to more porous gravel and sand deposits, is the likely cause for locally significant changes to the Laboratory's prior understanding of groundwater flow direction. The updates to the conceptual understanding of groundwater flow directions obtained from installation of the wells under the network evaluation report led the Laboratory to recommend on October 14, 2009 that seven additional monitoring wells be installed at TA-54. (Figure 4) The goal of the new wells is to enhance upgradient and downgradient monitoring for each of the waste management areas at TA-54 by supplementing existing wells. Installation of these wells is in progress and scheduled for completion by September 2010.

The configuration of the groundwater monitoring well network for TA-54 is guided by an objective to have upgradient and downgradient wells for each of MDAs H, L, and G. The proximity of wells to the potential source areas is driven by an assumption of complex pathways within the vadose zone that could divert water, and associated contaminants, laterally instead of allowing vertical downward-only transport. RCRA groundwater monitoring wells are often located immediately downgradient of regulated disposal locations. At TA-54, this approach is modified, as approved by NMED, to address the thick vadose zone and the potential for diffusion processes to laterally spread vapor-phase contaminants and for lateral movement of water and contaminants along one or more of the geologic layers present beneath the sites.

As shown in Figure 4, upon installation of the current set of wells, the network will include at least one upgradient well and at least three downgradient wells for each of MDAs H, L, and G with screens at multiple depths within the perched-intermediate and regional groundwater zones. It is important to note that monitoring within perched-intermediate and regional groundwater zones is supplemented by extensive vadose zone monitoring for vapor-phase contaminants and tritium.

Performance of Current Network

Monitoring of wells within the existing monitoring network at TA-54 is ongoing. Sampling occurs on a quarterly basis for a comprehensive suite of contaminants under the NMED-approved annual iteration of the Interim Facility-wide Groundwater Monitoring Plan. Results are reported in quarterly periodic monitoring reports and can be found within the Risk Analysis Communication Evaluation and Reduction (RACER) database.

Data collected from the current network at TA-54 show low concentrations below groundwater standards of several constituents, including acetone, toluene, and trichloroethene. These

constituents are known to be present at TA-54. However, they may also be from other sources including downhole sampling systems (e.g., pumps, packers, tubing materials), or legacy contaminant sources upgradient of TA-54. Ongoing monitoring from existing and planned wells should help distinguish possible sources.

FURTHER AFFIANT SAYETH NAUGHT

Danny Katzman

STATE OF NEW MEXICO)
) ss.
COUNTY OF LOS ALAMOS)

SUBSCRIBED, SWORN TO AND ACKNOWLEDGED before me this 18th day of March, 2010

Julie A. Garcia
NOTARY PUBLIC

My Commission Expires:

4-16-12

JULIE A. GARCIA
NOTARY
PUBLIC
STATE OF NEW MEXICO

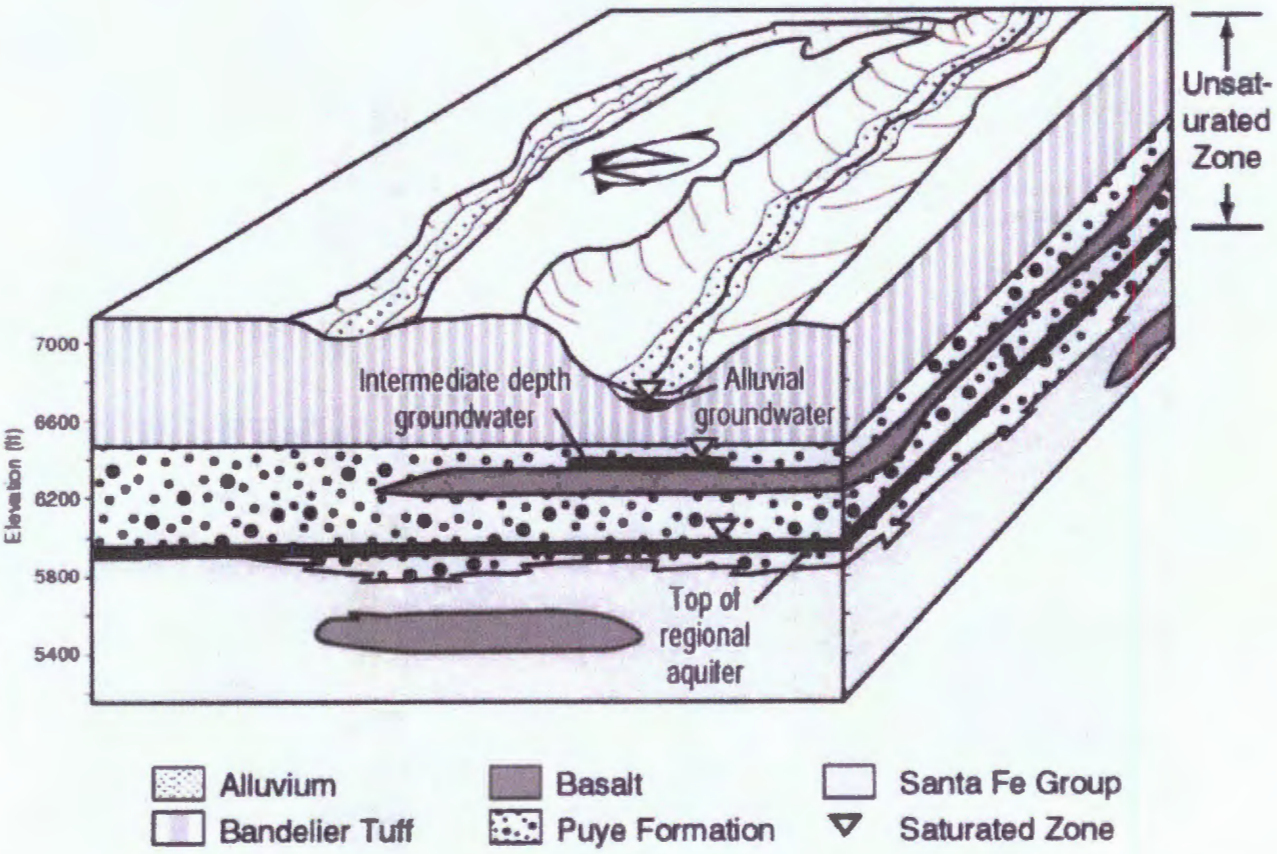

Figure 1. Simplified diagram showing groundwater occurrences at Los Alamos National Laboratory.

Ex Y

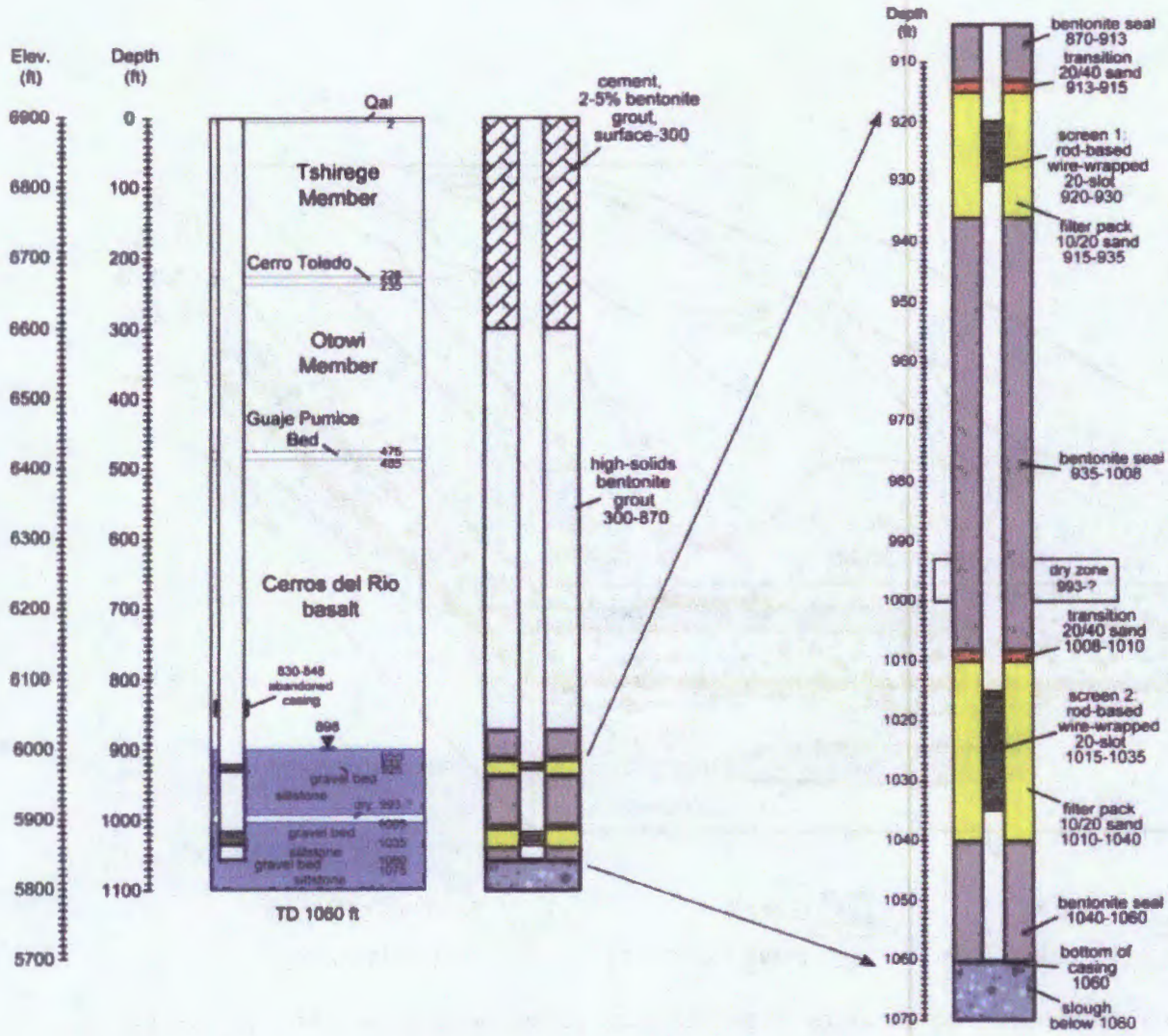

Figure 2. Simplified monitoring well diagram showing typical two-screen construction.

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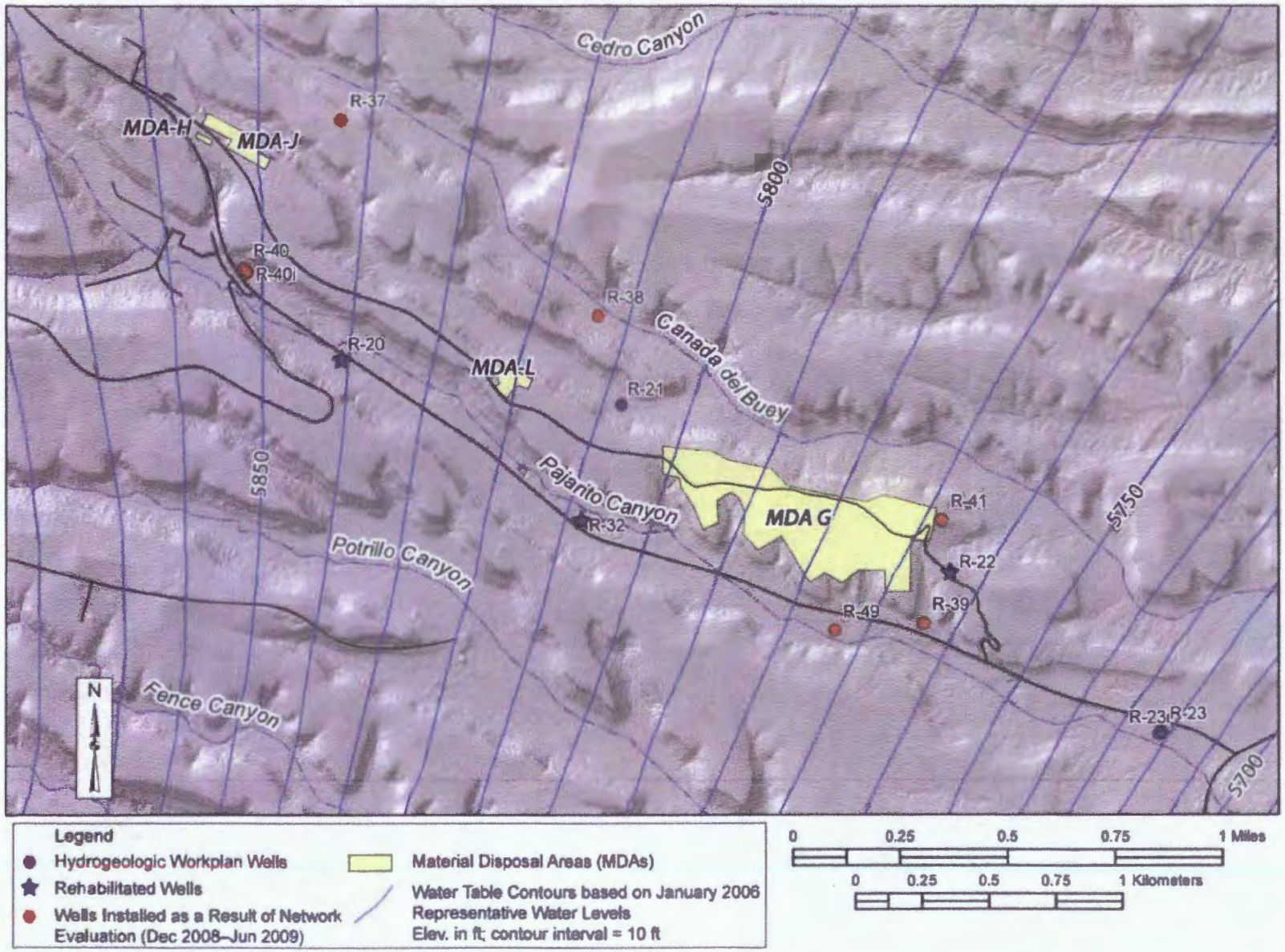

Figure 3. Illustration shows TA-54, MDAs H, L, and G. Symbols for wells show new wells and wells that were rehabilitated and converted as part of the recommendations in the TA-54 Well Evaluation and Network Recommendations, Rev. 1. Note that the water-table elevations indicate a relatively uniform easterly direction of flow throughout the TA-54 area.

Ex 4A

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Ex. 22

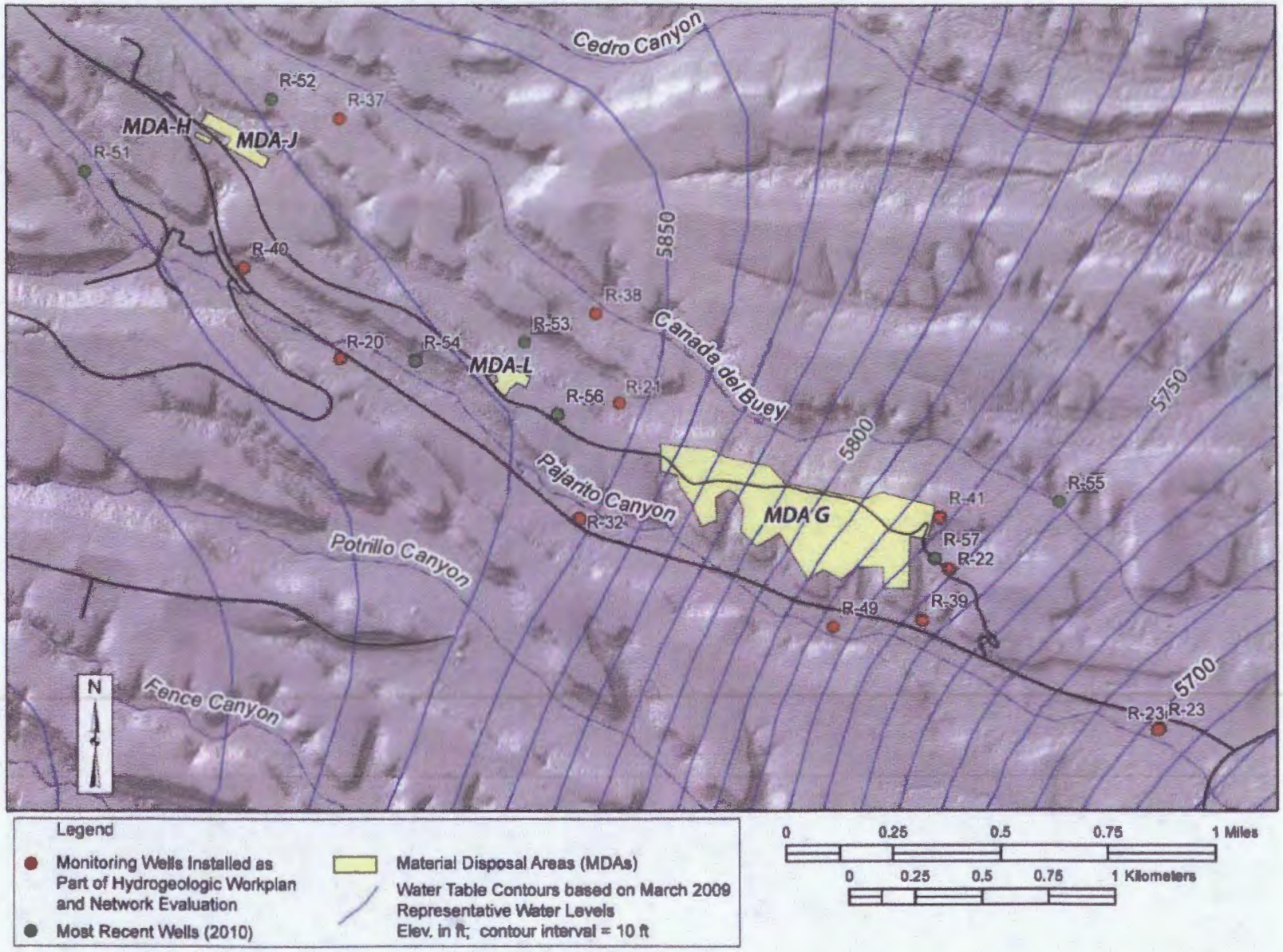
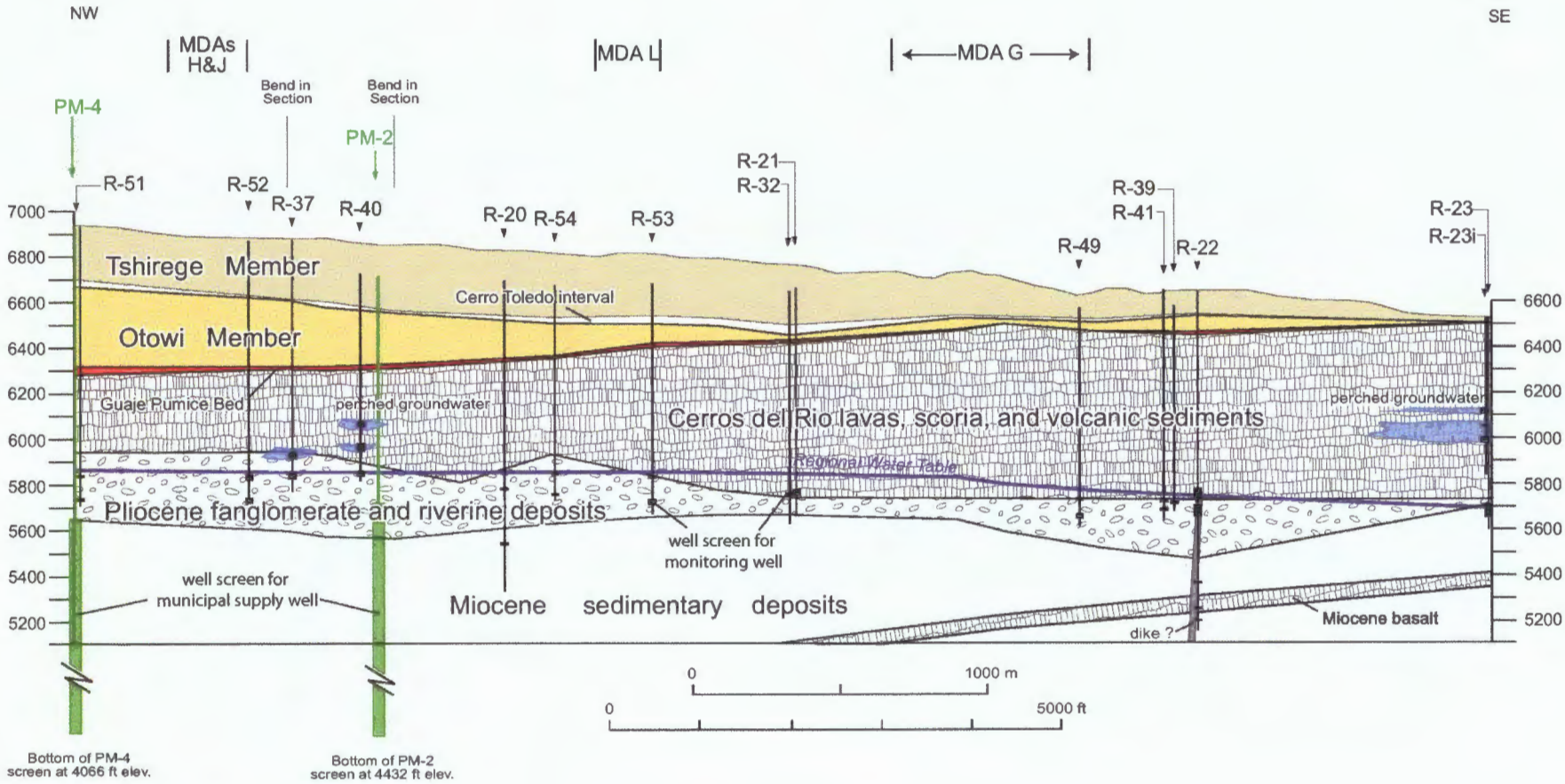


Figure 4. Map of TA-54 area showing updated water-table contours following installation of seven new monitoring wells between December 2008 and June 2009. Note the change to the prior water-table map (Figure 3) is the apparent north, northeastern component of flow in the vicinity of MDA H.



Vertical Exaggeration = 2.5