Drilling Work Plan for Intermediate Aquifer Well R-25b

Primary Purpose	Intermediate well R-25b is being installed to satisfy a requirement in the New Mexico Environment Department (NMED) letter dated April 5, 2007, "Well Evaluations for Intermediate and Regional Wells Los Alamos National Laboratory," to install a replacement screen at a depth equivalent to Screen #1 at R-25. The proposed site for R-25b is approximately 50 ft west of existing well R-25 (Figure 1). R-25b is proposed to penetrate the upper zone of saturation at approximately 730 ft below ground surface (bgs) and will have a 20-ft-long screen (Figure 2). Figure 2 shows the stratigraphy for R-25 and the proposed well design for R-25b. Figure 3 is a geologic cross section that shows the distribution of hydrostratigraphic units in the vicinity of well R-25 and the predicted geology at R-25b.
Conceptual Model	Elevated levels of nickel and chromium observed in R-25 screens #1 and #2 are likely due to corroding stainless steel. During well construction, screen #3 collapsed and was drilled out. The finely ground stainless steel was flushed from screen #3 during the operation and exited the well through screens #1 and #2. The Westbay sampling system cannot be safely removed from the well because of the damage to screen #3. Instead of trying to rehabilitate these upper screens, a new well will be installed next to R-25 to monitor and sample the uppermost part of the upper zone of saturation. A key goal of this sampling is to demonstrate that monitored natural attenuation of high explosives (HE) is occurring. Currently observed degradation of HE could be due to the presence of metal fragments, which are a reducing agent.
Drilling Approach	Drilling will be conducted with methods selected to optimize the potential of completing the well without the use of any drilling additives in the zone of saturation. Specifically, efforts will be made to meet the target depth (TD) of approximately 800 ft, or 70 ft into the uppermost zone of saturation, and to provide a stable borehole environment for constructing the well. The primary method for advancing the borehole will be a combination of open-hole air-rotary and casing-advance with air-rotary. The following is a summary of the proposed methods by depth interval: A 16-in. surface casing will be set to 20 ft bgs. A 15–in. open borehole will be advanced with fluid-assisted air-rotary to the top of the Cerro Toledo at 384 ft bgs. A 12–in. casing will be lowered into the open borehole and advanced with fluid-assisted air-rotary through the Cerro Toledo to 630 ft bgs. A 10–in. casing will be advanced to TD = 800 ft without the use of drilling fluid additives. Municipal water may be added to cool the drill bit.
Potential Drilling Fluids, Composition, and Use	The following fluids and additives that may be used are consistent with those previously used in the drilling program at Los Alamos National Laboratory (LANL) and have been characterized geochemically. potable water from the municipal water supply to aid in delivery of other drilling additives; QUIK-FOAM™, a blend of alcohol ethoxy sulfates, to be used as a foaming agent; and AQF-2™, an anionic surfactant, to be used as a foaming agent.
Geochemical Objective	The geochemical objective is to provide a groundwater sampling point free of drilling-fluid and screen-repair potential effects.
Potential Groundwater	The recent (October 2006) water-level measurement from R-25 screen #1 indicates that the top of saturation is approximately 728 ft bgs.

Occurrence & Detection	Methods for groundwater detection may include driller's observations, water-level measurements, and borehole video.
Core Sampling	Core sampling is not proposed for R-25b.
Groundwater Screening Sampling	A screening water sample will be collected from the screen at the end of development. The screening sample will be analyzed for cations/metals (dissolved and total), anions (dissolved), and select HE compounds (total) by the Earth and Environmental Sciences Group (EES-6) chemistry laboratory.
Groundwater Characterization Sampling	Groundwater samples will be collected from the completed well between 10 and 60 days after well development in accordance with the Consent Order. These samples will be analyzed for the full suite of constituents including: tritium; metals/cations; general inorganic chemicals; volatile organic compounds; semivolatile organic compounds; HE compounds including RDX (research department explosives [hexahydro-1,3,5-trinitro-1,3,5-triazine]) and related degradation products; and stable isotopes. Subsequent groundwater samples will be collected under the "Interim Facility-Wide Groundwater Monitoring Plan."
Geophysical Testing	LANL's borehole video camera, natural gamma, and induction tools will be used if open-hole conditions allow logging in the R-25b borehole. If borehole conditions are stable, the 10–in.casing will be pulled back from TD to expose the entire saturated interval for borehole logging.
Well Completion Design	The proposed well design is included as Figure 2.
Well Development	The well may be developed by both mechanical and chemical means. Mechanical means include swabbing, bailing, and pumping. Chemical means include the use of sodium acid pyrophosphate or AQUA-CLEAR PFD™ to remove natural and added clays and/or chlorination to kill bacteria introduced during well completion. Chemical means will only be employed after additional discussions with and approval by the NMED. After initial swabbing and bailing, the well will be pumped to complete the development. Water-quality parameters to be monitored are as follows: pH, specific conductance, temperature, turbidity, and total organic carbon (TOC), and acetone or ethylene glycol, as applicable. Target water-quality parameters are as follows: turbidity <5 nephelometric turbidity units, TOC <2 parts per million, other parameters stable.
Hydraulic Testing	No aquifer testing is planned.
Investigation-Derived Waste Management	Fluids produced during drilling will be managed and disposed of in accordance with the NMED-approved Notice of Intent Decision Tree: Drilling, Development, Rehabilitation, and Sampling Purge Water (November 2006). Cuttings produced during drilling will be managed and disposed of in accordance with the Decision Tree for Management of Investigation-Derived Waste solids from Drilling Operations, which is pending review and approval from the NMED.

R-25b Tentative Drill Schedule
Proposed Start Date October 1, 2007

Activity	Duration (days)
Drilling and Completion of Borehole (includes mob and site prep)	45
Collection of Borehole Geophysics	1
Development of R-25b	5
Characterization Sampling of R-25b	10 to 60 following development
Site Restoration at R-25b	7

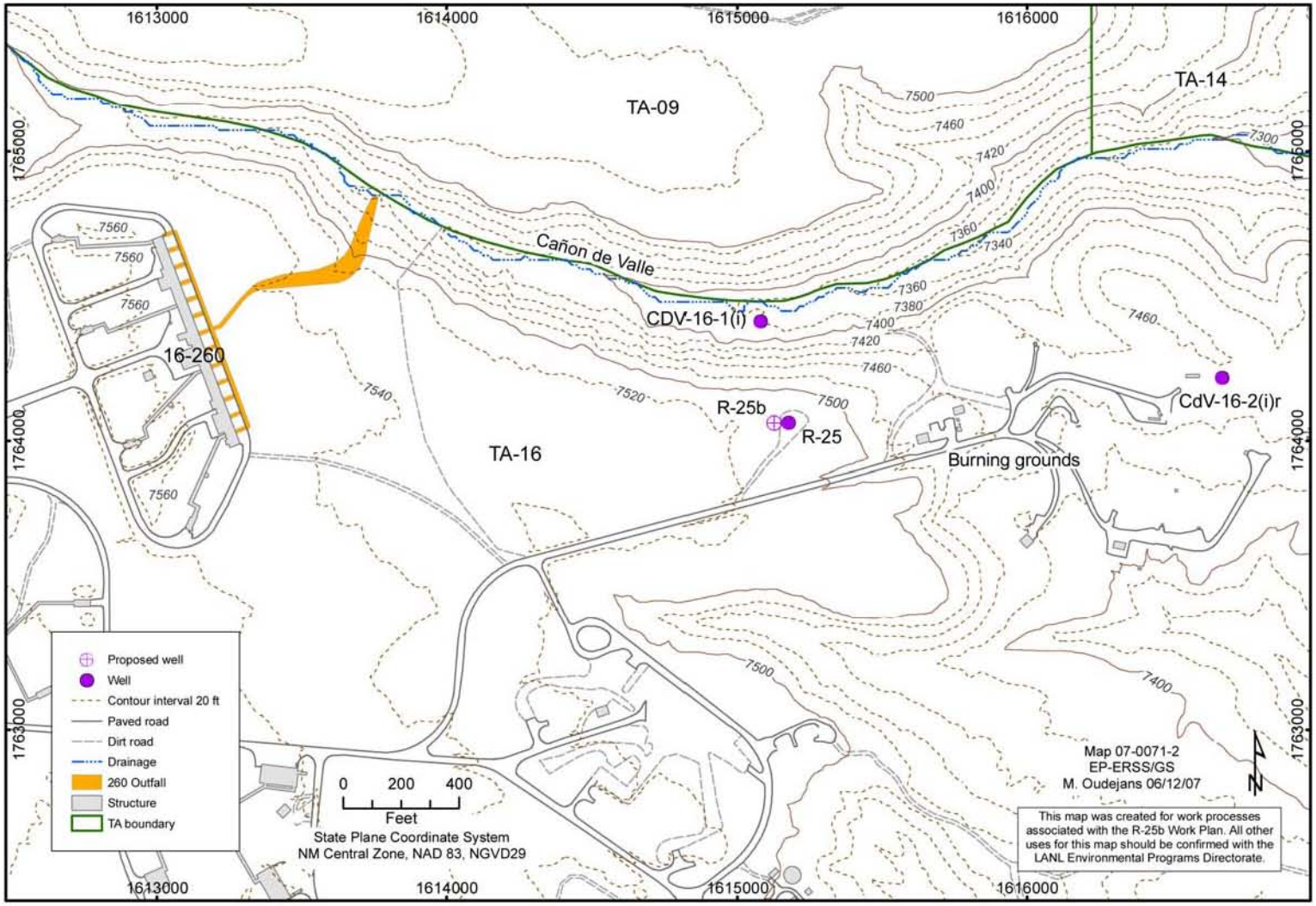

Figure 1 Site location map showing the proposed location of R-25b relative to well R-25

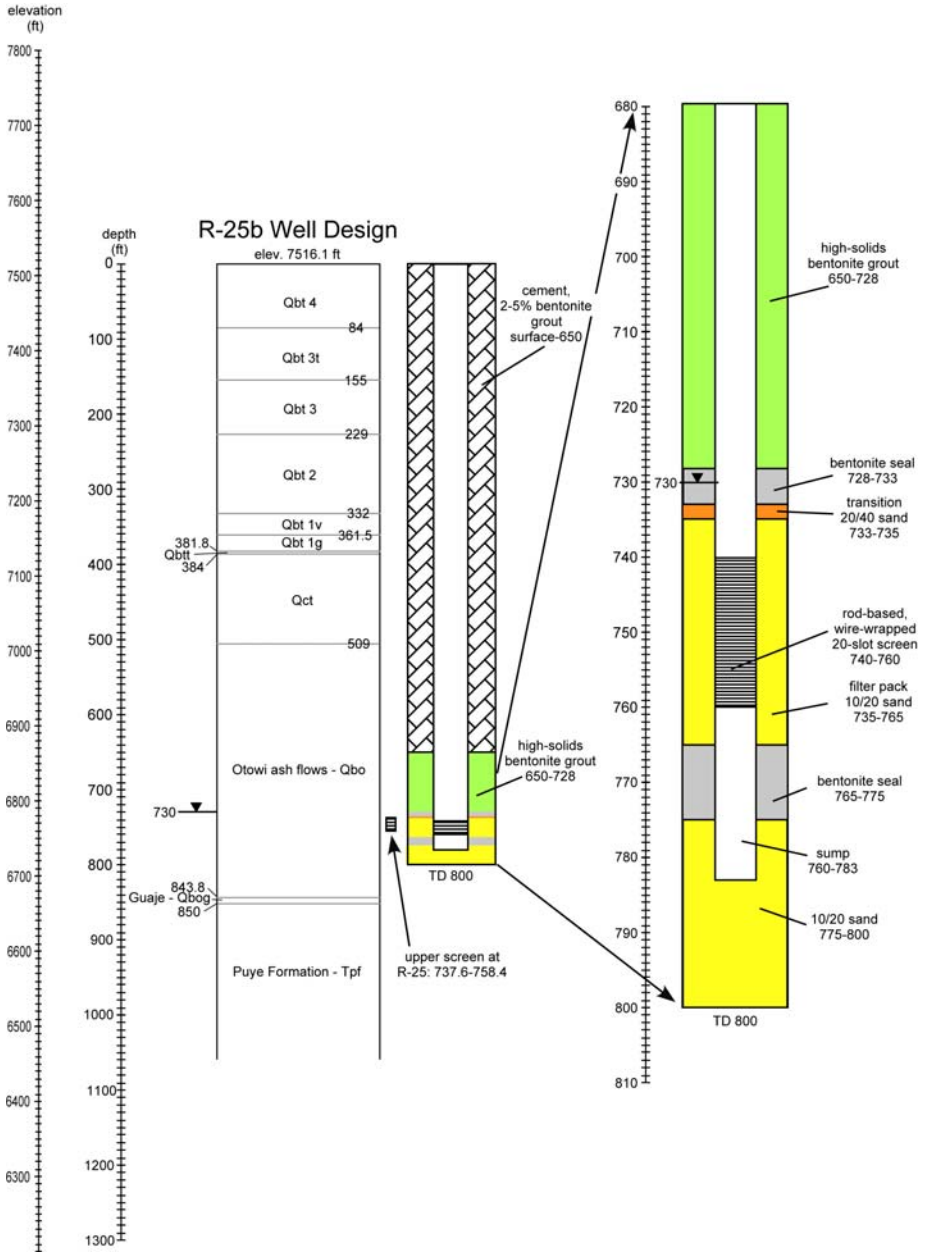

Figure 2 **Proposed well design for R-25 area. (Note: Qbt = Unit (4, 3t, 3, 2, 1v, or 1g)of the Tshirege Member of the Bandelier Tuff; Qbtt = Tsankawi Pumice of the Tshirege Member; Qct = Cerro Toledo Interval; Qbo = Otowi Member of the Bandelier Tuff; Qbog = Guaje Pumice of the Otowi Member of the Bandelier Tuff; Tpf = Puye Formation; TD = total depth.)**

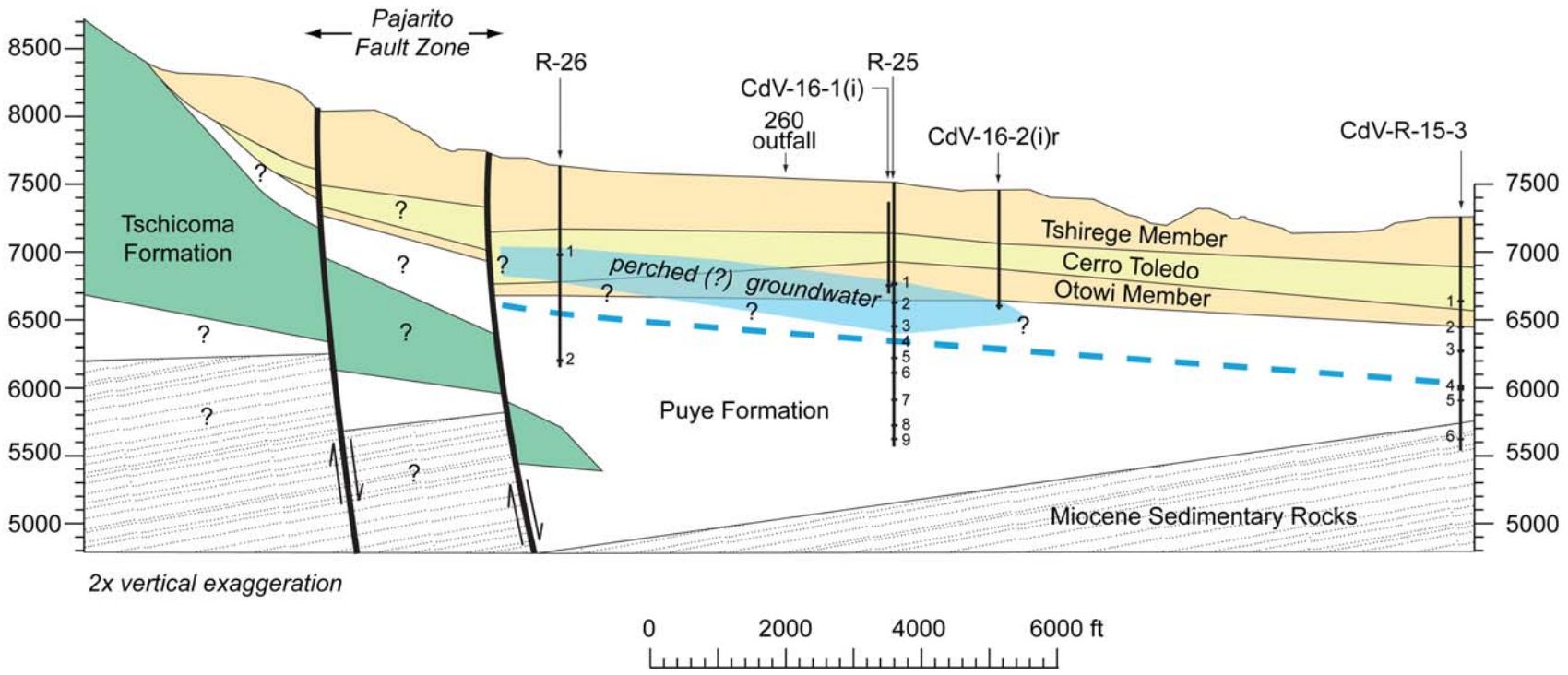

Figure 3 **Geologic cross section of the well R-25 area. Dashed blue line indicates possible top of regional saturation. Numbers indicate well screens in multiscreen wells. Perched groundwater (?) is shown as a continuous zone of saturation intersecting R-26, R-25, CdV-16-1(i), and CdV-16-2(i)r; however, other interpretations about the distribution of groundwater are also possible.**