Drilling Work Plan for Well R-25c

Primary Purpose	Well R-25c will be installed approximately 100 ft west of well R-25 (Broxton et al. 2002, 072640). Figure 1 shows the locations of R-25, R-25b (work plan previously submitted to and approved by the New Mexico Environment Department [NMED], U.S. Environmental Protection Agency ID#NM0890010515), and R-25c. Both R-25b and R-25c are located upgradient of R-25, to minimize the potential for any impacts of R-25 on the new wells. The purpose of well R-25c is to replace screen #3 in R-25, which collapsed during construction of R-25. The planned screened interval for R-25c will be from approximately 1040 to 1060 ft below ground surface (bgs). Note that another well, R-25b, is being drilled 50 ft west of R-25 (Figure 1) as a replacement for screen #1 at R-25 (as directed by NMED in a letter, 2007, 095394). The proposed approach is to drill the deeper well (R-25c) first, and if no water is encountered at the 1040 to 1060 ft depth (as suggested by transducer data), the borehole will be backfilled with bentonite to a depth of 800 ft, and R-25b will be set in the same borehole at the shallower depth. Figure 2 shows the stratigraphy for R-25 and the proposed well design for R-25c. 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-25c.
Conceptual Model	A key goal of monitoring the upper saturated zone at R-25c is to demonstrate that monitored natural attenuation of high explosives (HE) is occurring at this location. Screen #3 had the highest HE concentrations during initial drilling. Screen #3 was subsequently drilled out; however, the Westbay sampling system cannot be safely removed from the well because of damage to the screen.
Drilling Approach	Drilling will be conducted according to methods that are 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 1100 ft bgs 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 to 630 ft bgs. • A 10-in. casing will be advanced to the TD of 1100 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 (the Laboratory) 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 • 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 Occurrence and Detection	• Observations during the drilling of R-25 indicate that the upper saturated zone, a thick perched zone above the regional aquifer, extended from approximately 747 to 1132 ft bgs (see Figure 2 and 3). Methods for groundwater detection may include driller's observations, water-level measurements, and borehole videos.
Core Sampling	Core sampling is not proposed for R-25c.
Groundwater Screening Sampling	A screening water sample will be collected from the screened interval following well 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 chemistry laboratory.
Groundwater Characterization Sampling	Groundwater samples will be collected from the completed well between 10 and 60 d after well development in accordance with the Compliance Order on Consent. These samples will be analyzed for the full suite of Technical Area 16-related 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" (LANL 2005, 088789).
Geophysical Testing	The Laboratory's borehole video camera, natural gamma, and induction tools will be used if open-hole conditions allow logging in the R-25c borehole before each casing string is introduced. If borehole conditions are stable, the 10-in. casing will be pulled back from TD to expose the entire saturated interval for borehole logging by Schlumberger.
Well Completion Design	The proposed well design is presented in 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 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 are 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 (October 2007). Other wastes associated with the project, such as contaminated personal protective equipment, disposable sampling equipment, decontamination waste, or other materials contaminated by drilling activities, will be characterized and managed in accordance with the waste characterization strategy forms and standard Laboratory procedures.

REFERENCES

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID number. This information is also included in text citations. ER ID numbers are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

Broxton, D., R. Warren, P. Longmire, R. Gilkeson, S. Johnson, D. Rogers, W. Stone, B. Newman, M. Everett, D. Vaniman, S. McLin, J. Skalski, and D. Larssen, March 2002. "Characterization Well R-25 Completion Report," Los Alamos National Laboratory report LA-13909-MS, Los Alamos, New Mexico. (Broxton et al. 2002, 072640)

LANL (Los Alamos National Laboratory), May 2005. "Interim Facility-Wide Groundwater Monitoring Plan," Los Alamos National Laboratory document LA-UR-05-3443, Los Alamos, New Mexico. (LANL 2005, 088789)

NMED (New Mexico Environment Department), April 5, 2007. "Well Evaluations for Intermediate and Regional Wells," New Mexico Environment Department letter to D. Gregory (DOE LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2007, 095394)

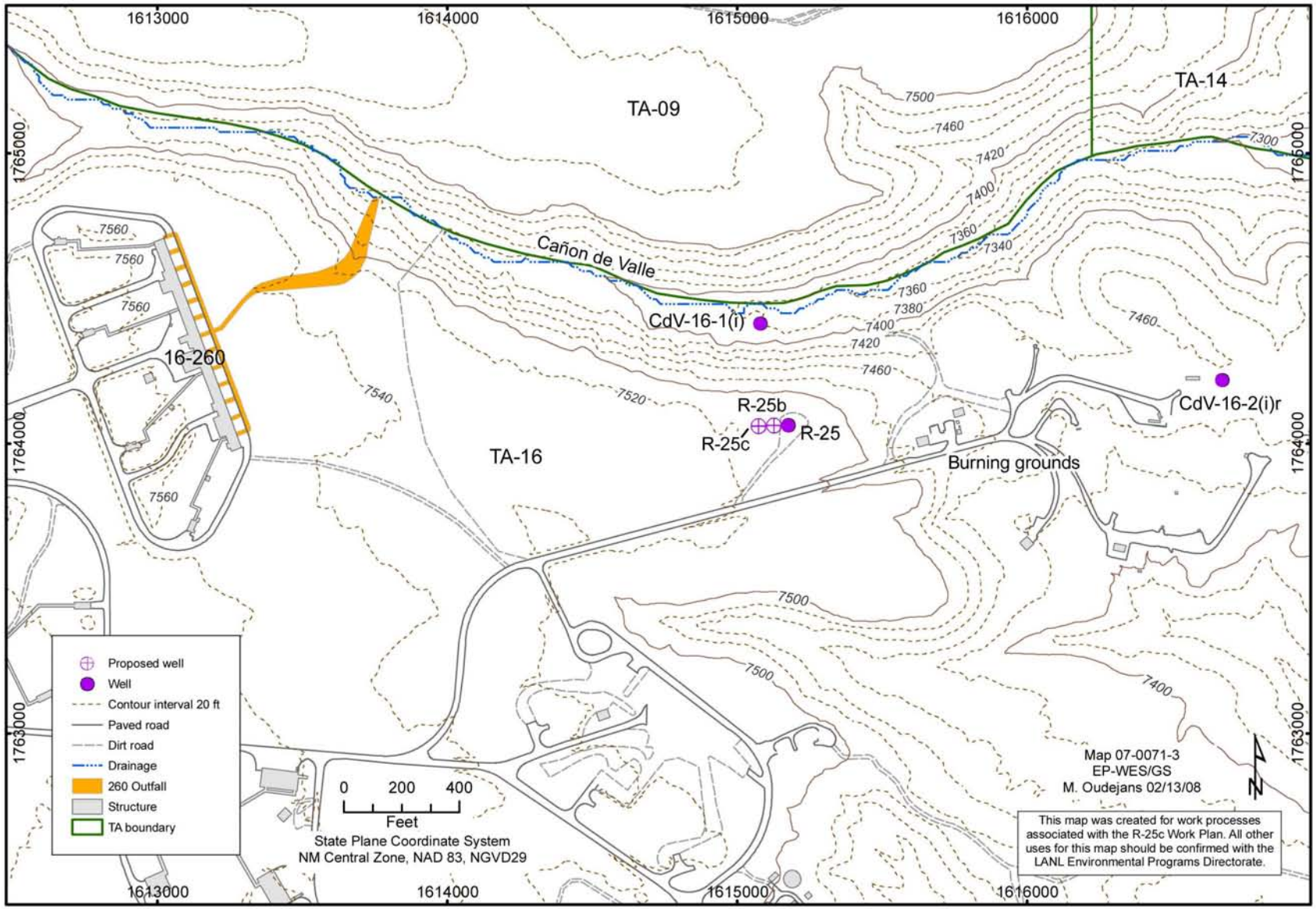

Figure 1 Proposed location of R-25c relative to wells R-25 and R-25b

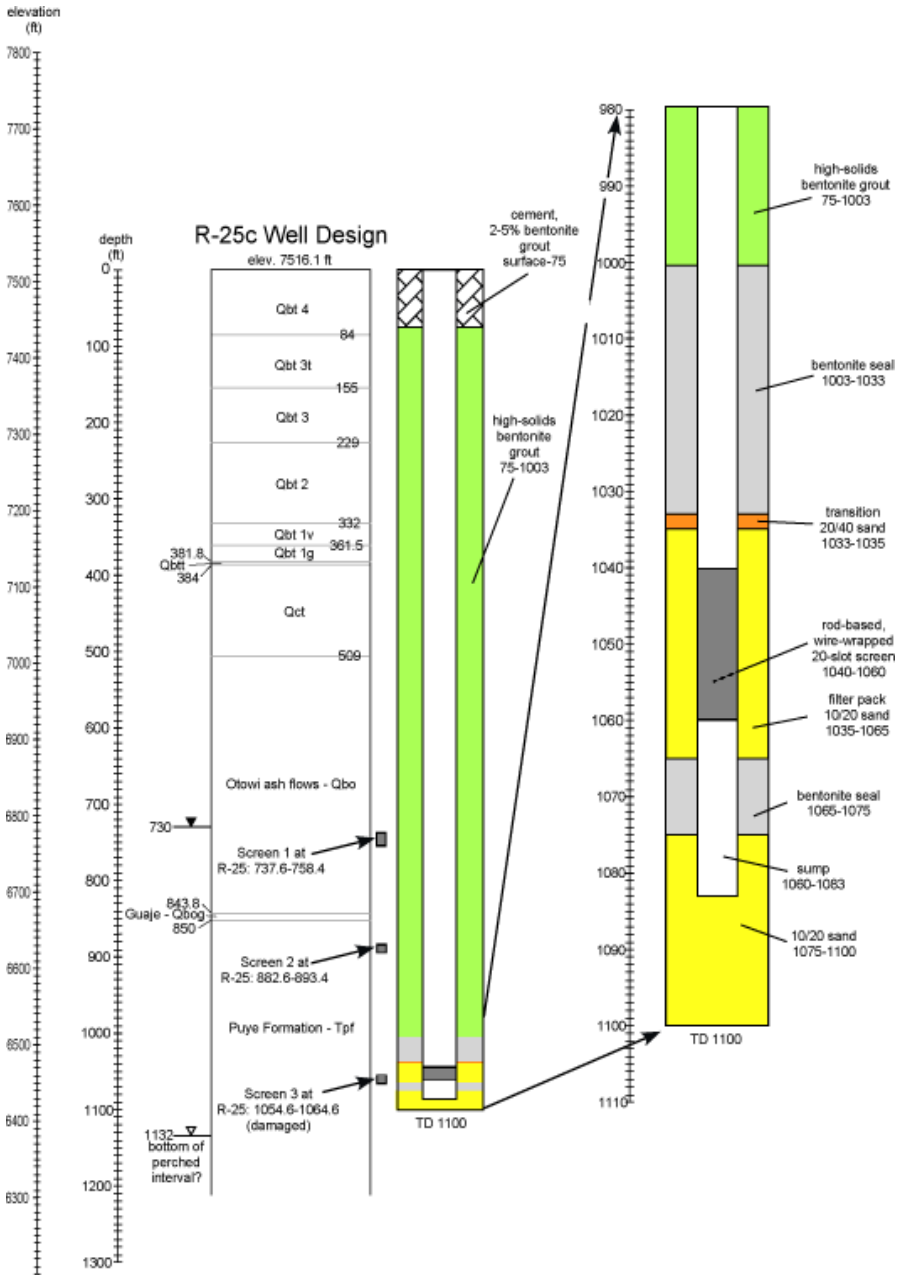

Figure 2 **Proposed well design for R-25c in relation to local stratigraphy: (Qbt = unit 4, 3t, 3, 2, 1v, or 1g) of the Tshirege Member of the Bandelier Tuff; Qbtt = Tsankawi Pumice of the Tshirege Member; Qct = Cerro Toledo Interval; Qbo = Otowi Member of the Bandelier Tuff; Qbog = Guaje Pumice of the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

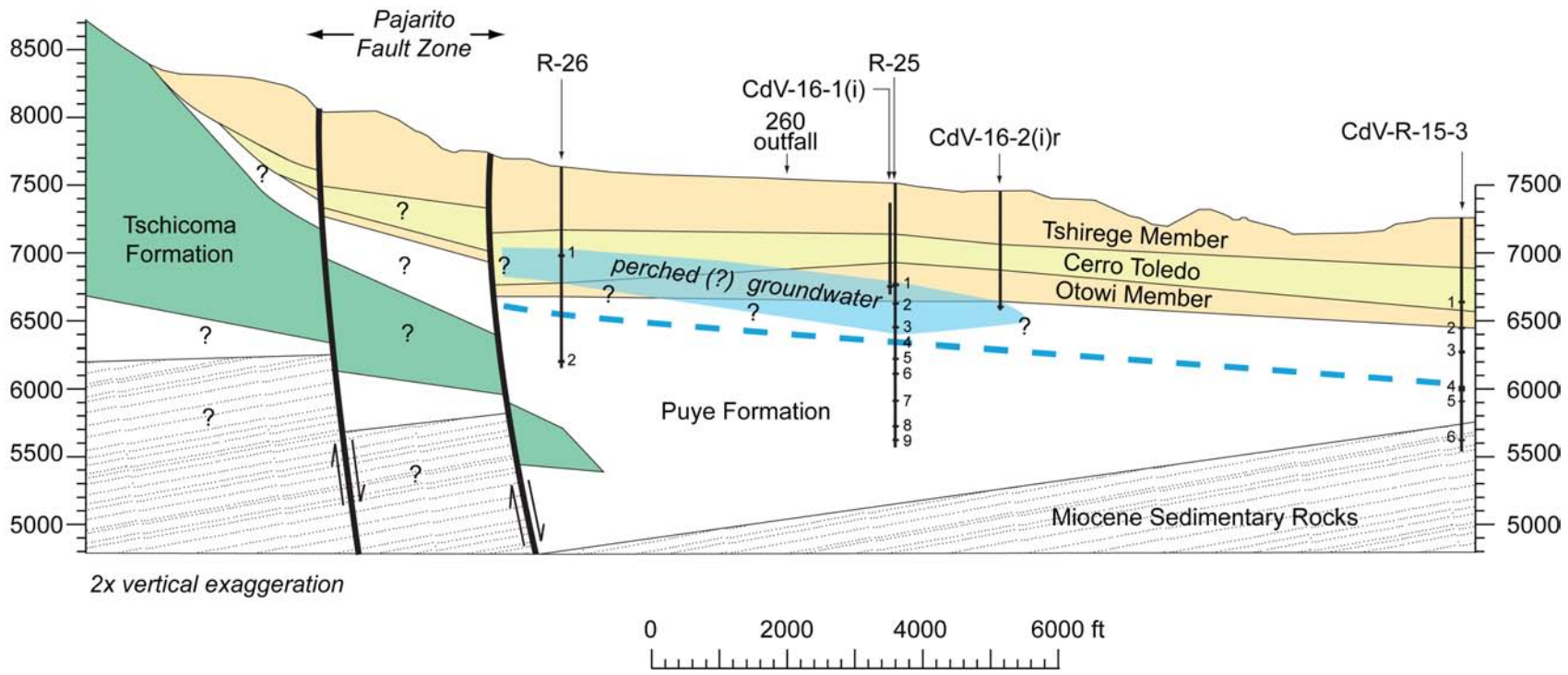

Figure 3 **Geologic cross section of the well R-25 area. Dashed blue line indicates possible top of regional saturation. Numbers indicate well screens in multiscreen wells. Perched groundwater (?) is shown as a continuous zone of saturation intersecting R-26, R-25, CdV-16-1(i), and CdV-16-2(i)r; however,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

R-25c Tentative Drill Schedule: Proposed Start Date April 1, 2008

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