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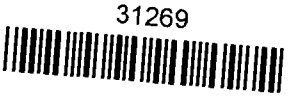
DRILLING PLAN FOR REGIONAL AQUIFER WELL R-42



Prepared by TPMC for the Environmental Programs Directorate

Drilling Plan for Regional Aquifer Well R-42

June 2008

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ACRONYM LIST

APS	Accelerator Porosity Sonde
bgs	Below ground surface
BMP	Best management practices
CD	Compact disc
CMR	Combinable Magnetic Resonance
DOE	Department of Energy
EES	Earth & Environment Science Division
EP-WSP	Environmental Programs Water Stewardship Program
ER-SOP	Environment and Remediation Standard Operating Procedure
ES&H	Environment, Safety and Health
FMI	Formation Microimager
ft	Feet
FTL	Field Team Leader
FOD	Facility Operations Director
gal	Gallons
gpm	Gallons per minute
HP	Horsepower
ID	Inside diameter
IDW	Investigation Derived Waste
IWD	Integrated Work Document
LANL	Los Alamos National Laboratory
LANS	Los Alamos National Security
M&O	Management and Operations
NMED	New Mexico Environment Department
NTU	Nephelometric turbidity units
OD	Outside diameter
OM	Operations Manager
PIC	Person in charge
PM	Project manager
ppm	Parts per million
PR-ID	Project Review and Requirements Identification
PVC	Polyvinyl chloride
RCT	Radiological control technician
RP-1	Radiological protection group
SMO	Sample management office
SOM	Shift Operations Manager

SOW	Statement of Work
STR	Subcontract Technical Representative
SWPPP	Storm Water Pollution Prevention Plan
TD	Total Depth
TOC	Total organic carbon
TPMC	TerranearPMC
WCSF	Waste Characterization Strategy Form

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1.0 INTRODUCTION

1.1 Background

TerranearPMC has been contracted to install a regional aquifer monitoring well by Los Alamos National Security (LANS) Environmental Directorate (EP) Water Stewardship Project (WSP). The regional aquifer well (designated as R-42) will be located upgradient of well R-28 in Mortandad Canyon within Los Alamos National Laboratory (LANL) Technical Area (TA) 05 in Los Alamos County, New Mexico. All work will be performed under the statement of work (SOW) and in accordance with the Compliance Order on Consent (2005) between the New Mexico Environment Department (NMED) and the United States Department of Energy (DOE)/LANL, and the Work Plan for Geochemical Characterization and Drilling for Fate and Transport of Contaminants Originating in Sandia Canyon (LA-UR-07-7579).

Regional aquifer monitoring well R-42 will be installed in support of the Environmental Programs-Water Stewardship Program. The R-42 well will be installed at a depth of approximately 998 (ft) below ground surface (bgs) in the top of pumiceous sediments beneath the Puye Formation. Well R-42 is being installed to address concerns expressed by the New Mexico Environment Department (NMED) in their October 17, 2007, letter "Notice of Disapproval, Fate and Transport Modeling Report for Chromium Contamination from Sandia Canyon" (NMED 2007, 097586).

The proposed site for well R-42 is located approximately midway between MCOBT-8.5, which has been plugged and abandoned, and well R-28 as shown in Figure 1. The proposed screen for R-42 is in the top of a sedimentary series characterized by abundant vitric-aphyric rhyolitic pumice. This unit has been highly transmissive in many aquifer tests (especially at R-28) and it hosts groundwater with elevated chromium detections at R-28. Proximal upgradient position and location within a common transmissive unit make this location a critical sampling point for understanding contaminant movement toward the well screen at R-28.

This Drilling Plan provides guidance for site preparation, drilling, sampling, borehole geophysics, well installation, well development, aquifer testing, sampling system installation, and site restoration activities. Project staff, health and safety, waste management, security, schedules, and required permits are also discussed in this document.

1.2 Objectives

The R-42 monitoring well is intended to provide hydrogeologic and groundwater quality data to achieve specific data quality objectives consistent with the Groundwater Protection Program for the Laboratory and the Compliance Order on Consent (March 2005) and the NMED approved wrokplan. Specifically, this new well is intended to further define the nature and extent of contamination and address key uncertainties in the conceptual model for contaminant fate and transport from Sandia Canyon.

Secondary objectives are to collect drill-cutting samples, borehole geophysical data, and identify and sample potential perched groundwater zones.

2.0 ORGANIZATIONAL STRUCTURE

This project is being performed for LANS. The end-users of the data collected from this project will be LANL, DOE, NMED, and the general public. The LANL Environmental Programs-Water Stewardship Program (EP-WSP) Drilling Project Lead will assist with obtaining the necessary LANL-required permits and assist with scheduling and logistical issues.

An organizational chart is presented in Table 1.

2.1 Project Management Team

The TerranearPMC Management Team consist of the Program Manager, Project Manager (PM), Drilling superintendent, Environment Safety and Health (ES&H) Representative, and Quality Assurance (QA) Manager. The Management Team will review all task order work plans, ensure compliance with environmental, safety and health plans, and perform project audits of ongoing work.

The Management Team will also provide technical assistance to the Field Team. In addition, they will provide health and safety oversight and quality control guidance for well-construction and procedure compliance.

The ES&H Representative will provide health and safety related technical assistance and senior review of all project specific safety plans. He will also conduct periodic project site safety inspections. The TPMC and LANS Management Team key personnel and their respective roles are detailed in Table 2.

2.2 Field Team

TerranearPMC's field team personnel and their respective roles are shown in Table 2. Additional qualified staff may be added as necessary to ensure all project requirements are met. These staff will be identified and their roles assigned before work begins.

During the drilling operations, there will be two onsite TerranearPMC personnel. One geologist will be onsite full time as the Field Team Leader (FTL) and lead site geologist. The other TerranearPMC team member will assist the geologist as needed. The field geologists will maintain field notes detailing daily site activities, compile and submit daily field reports, document down-hole tools, collect samples, conduct lithologic logging, document wastes generated, and conduct daily safety meetings and equipment inspections. The FTL will be the main point of contact at the site.

Field operations will run seven days per week and shifts will be 12-hour per day throughout the duration of the project. TerranearPMC staff will rotate shifts on a regular basis. TerranearPMC field team members will be interchangeable and their exact scheduling is expected to be flexible.

2.3 Drilling Subcontractor

Boart-Longyear will be the drilling subcontractor supporting the drilling, well installation, and development of R-42. The drilling subcontractor will be responsible for consistent and adequate sample recovery, ensuring that equipment is appropriate for the goals of the drilling project and in proper working order, and that daily drilling logs are maintained.

The Boart Longyear drilling staff will rotate on a 14-day/7-day schedule where the primary crew will work 14 consecutive days and then be relieved by the secondary crew who will work 7 consecutive days. At the end of the 7-day shift, the primary crew will return for another 14-day shift.

2.4 Site Preparation/Restoration Subcontractor

Keers Remediation will be the construction subcontractor supporting the preparation of the drill pad and access road. Keers will install storm water best management practices (BMPs) prior to disturbing soil and in accordance with the Storm Water Pollution Prevention Plan (SWPPP) under the direction of TerranearPMC personnel, perform any needed leveling/grading of areas, provide general labor, and perform heavy equipment operation for the project. In addition, the site preparation/restoration subcontractor will be responsible for moving waste containers and performing final site restoration activities.

3.0 FIELD ACTIVITIES

Field activities will include site preparation, well drilling, sample collection, down-hole geophysical characterization, well installation, well development, aquifer testing, surface completion, and site restoration. The Work Plan for Geochemical Characterization and Drilling for Fate and Transport of Contaminants Originating in Sandia Canyon (LA-UR-07-7579) will be used to guide field operations and ensure all objectives are met. A tentative schedule for project field activities is presented in Table 3.

3.1 Site preparation

The drill site will be prepared for drilling operations prior to mobilization of the drill rig and equipment. A completed and approved excavation permit will be on site prior to soil disturbance. Site preparations and drilling operations will be conducted in accordance with the provisions of the SWPPP. The following are the pre-mobilization activities to be performed:

- Conduct radiological survey of access road and drill site. LANL will provide radiological control technician (RCT) personnel to assist TerranearPMC with this project;
- Install mobile field offices and electrical services (generator);
- Construct an approximately 200 ft by 150 ft compacted gravel drill pad;
- Construct one cuttings/drill-fluid pit with an approximate capacity of 100,000 gallons;
- Construct and maintain the access road to drill site.

An anticipated site set-up map is presented on Figure 2.

3.1.1 Radiological Screening

The drill site and all equipment involved with the drill pad construction and drilling operations will be screened before arriving on site and before leaving the site by the Radiological Protection (RP-1) group. Analytical and geologic samples will also be screened before leaving the site.

3.1.2 Field Office and Site Services

A TPMC-provided trailer will function as a field office. A TPMC-provided portable generator will provide electricity for the site. Potable water for drilling will be trucked to the site by the drilling subcontractor from a Los Alamos county fire hydrant located outside of municipal well house PM-5. The field office will also be used as the muster area for tailgate safety meetings and in case of an emergency. Important information such as an emergency contact list and a route to the hospital map will be posted at the field trailer (Figure 3). Applicable permits, procedures, QA and

ES&H documents, and other guidance and reference documents, and general support equipment and supplies will also be stored in the field trailer.

3.1.3 Road Construction and Improvements

The access road will be constructed with compacted gravel and earth disturbance will be kept to a minimum. Required permits will be obtained prior to construction of the access road as part of the excavation permit process. The sequence of clearing, grubbing, resurfacing, and possible dust suppression will be conducted as described in the SWPPP.

3.1.4 Cuttings Pit

One lined cuttings pit will be excavated into the drill pad adjacent to the borehole to contain drill cuttings and fluid returns. The cuttings pit will be designed to provide enough storage capacity for the borehole drilling and installation of the monitoring well. The borehole will be drilled approximately 150 ft within the regional aquifer. It is anticipated approximately 100,000 gallons of storage capacity for cuttings and drilling water will be sufficient.

A perimeter berm will be installed around the entire pit approximately 2-ft above the drill pad's surface. The pit will be lined with 8-mil reinforced polyethylene sheeting and will be fenced with high-visibility fencing. The polyethylene sheeting will be secured to the berm. Plywood backstops will be constructed to extend above the pit's perimeter berm to stop and contain high velocity drilling discharge. Exact orientation and placement of the backstops will be decided during drill pad construction. An anticipated 40,000 gallons of well development water will be pumped into onsite storage tanks rather than into the pit.

3.2 Well Drilling

Drilling equipment and supplies for the completion of the project will be situated around the work site in an organized and secure manner specified on the SWPPP map. Surplus and/or inactive equipment and supplies may be staged at the LANL drilling project laydown yard located at the northwest corner of Pajarito Road and New Mexico State Road 4. Access to the laydown yard is through a locked gate. The FTL will control the gate key.

3.2.1 Mobilization

Mobilization will consist of transporting and setting up equipment at the location. Mobilization will include the following:

- Mobilize drill rig, trailers, support vehicles, drilling tools and materials, and well construction materials to the drill site.
- Stage alternative drilling tools and construction materials at the laydown yard.
- Set up drill rig, trailers, support vehicles and tools at the location.
- Review scope of work and project-specific health and safety issues with crew.
- Complete all required training for all personnel.
- Obtain Facility Operations Director (FOD) Work Authorization, including rig inspection and Integrated Work Document (IWD) review.

3.2.2 Drilling Methods

The borehole for R-42 will be drilled using a Foremost DR-24 HD drill rig. Specifications for this machine may be found at Foremost's website (http://www.foremostmobile.com/index.php). The presence of intermediate-depth groundwater (potentially present within the Cerros del Rio basalt) will impact drilling method choices for the R-42 borehole.

The primary drilling methods will be conventional dual-rotary and casing advance. Several different sizes of casing will be available. The casing diameters will be sufficient to allow smaller casing to telescope through larger casing with the smallest diameter casing allowing an acceptable annular filter pack thickness. All casings will be standard wall, A53 grade B welded casing and the anticipated sizes are 16-in, 12-in and 10-in.

Figure 4 illustrates the predicted stratigraphy and proposed well design for R-42. The discussion of drilling methods that follows refers to several of the stratigraphic contacts shown in this figure.

A retractable 16-in casing will be advanced with fluid-assisted air-rotary methods through the Bandelier Tuff, the Guaje Pumice Bed, and upper Puye Formation sediments to the top of the Cerros del Rio basalt (at an estimated depth of 429 ft bgs). A 15-in open borehole will then be advanced with fluid-assisted direct circulation air-rotary methods and down-hole hammer through the Cerros del Rio basalt (an estimated depth of 708 ft bgs). Perched groundwater is not anticipated based on observations at MCOBT-8.5, but if perched groundwater is present, the borehole will be cased with 12-in casing and sealed with bentonite to isolate the perched water. If perched groundwater is not present, the 12-in casing will be lowered into the open borehole and advanced to refusal.

If needed, a 10-in casing will be advanced to a target depth of 150 ft into the regional aquifer (an estimated depth of 1080 ft bgs) without the use of drilling fluid additives other than municipal water as needed.

All casing strings installed in the R-42 borehole will use welded drive shoes on the bottom of the string to protect the leading edge of the casing and to assist in cutting the borehole. The drive shoes will be cut off the casing strings using a pneumatic casing cutter on drill rods before casing extraction. Short sections of casing attached to the drive shoes will remain in the borehole and will be isolated in bentonite during well construction. The exception to this standard would be if the 12-in casing were used to case off intermediate-depth water. If 12-in casing were used for this purpose, a thinner (and weaker) flush welded shoe would be used to eliminate having to cut off the shoe and breach the seal while still allowing retraction of the 12-in casing string.

3.2.3 Proposed Alternative Drilling Methods

Drilling conditions may require converting to alternative methods. Consultation with the LANL STR will precede any deviations from the above referenced drilling methods. Conventional dual-rotary and casing advance will be the primary drilling methods employed at the R-42 borehole.

3.2.4 Drilling Additives

Drilling foam will be used as needed and will be terminated approximately 100 ft above the top of the regional aquifer. A brief description of potential drilling additives are as follows.

- AQF-2® (foaming agent): Added at a rate of 0.5 to 2.0% by volume. AQF-2 is an anionic surfactant that is added to fresh water for air/foam, air/gel-foam, or mist drilling

applications. AQF-2 is the newest foaming agent in the Baroid line and is the preferred foaming agent for environmental drilling applications.

- Quik Foam® (foaming agent): Added at a rate of 0.5 to 1.0% by volume. Quik Foam provides the surfactant necessary for foam formation.

3.2.5 Decontamination

Decontamination of the drill rig and tools will be performed by hot water/steam pressure washing before arriving onsite prior to the start of drilling activities and before leaving the site. Decontamination water will be containerized in 55-gallon drums, properly labeled and stored onsite. Decontamination of sample tools will be performed with a wire brush followed by spraying with Fantastik® and wiping clean with paper towels. Bailers will be washed with LiquiNox® detergent and potable water and rinsed with deionized water prior to sample collection.

3.2.6 Demobilization

Demobilization activities will include:

- Final decontamination and screening for radioactivity by RP-1 of the drill rig, tools, and support equipment.
- Loading and removal of the drilling tools, including alternative tools, from the site.
- Removal of the drill rig and support vehicles from the site.
- Staging and securing of investigation derived wastes (IDW) for future disposition.
- Removal of municipal waste (e.g. materials packaging).
- Final site cleanup.

The WSP Subcontract Technical Representative (STR) will inspect the site prior to final demobilization of the drill crew. Final demobilization of the drill crew will not be permitted until the condition of the site is acceptable to the STR.

3.3 Groundwater Detection

The presence of groundwater will be checked at target depths specified in the Drilling Work Plan (LANL, June 2007). The target depths will be the lower portion of the Cerros del Rio basalt (flow base is at approximately 708 ft bgs) and the top of the regional aquifer (approximately 930 ft bgs).

The primary indicator for perched water will be the driller's observations. If the driller notes any indication of groundwater, drilling will stop, the drilling tools will be removed from the borehole as required, and the presence of water will be verified using a water level meter. Alternatively, if the drill tools employed allow, the presence of water may be verified through the tooling without removal from the borehole. If water exists in the borehole the tools will either be pulled from the borehole or remain out of the hole to allow the field team to check for accumulation of water in the borehole and collect a sample for analysis.

3.4 Sample Collection Procedures

3.4.1 Groundwater Screening and Groundwater Characterization Sample Collection

Sample collection and handling procedures will be conducted in accordance with TPMC procedures equivalent to ENV-DO-306, SOP-01.03, and SOP-01.04 (LANL 2001b, LANL 2000, LANL 2002). See Table 4 for analytical suites, container size, and preservation.

Groundwater screening samples will be collected if significant perched groundwater is encountered and at the top of the regional aquifer and from the well screen interval at the end of well development. Screening samples will be analyzed for dissolved cations/metals and anions by the LANL Earth and Environmental Sciences Division (Group EES-6) chemistry laboratory.

Groundwater characterization samples will be collected from the completed well between 10 and 60 days after well development in accordance with the Consent Order. Collection of characterization samples is not part of the scope of work covered by this drilling plan.

3.4.2 Cuttings Samples

Cuttings will be collected from the discharge line at 5-ft intervals. The cuttings will be examined to determine lithologic characteristics and will be used to prepare lithologic logs. Portions of the cuttings will be wet sieved (using #10 and #35 mesh) and placed in chip trays along with unsieved cuttings. Finer sieve sizes or bulk cuttings will be collected when #10 mesh materials are absent. An additional aliquot of the #10 fraction of cuttings (approximately 200 to 300 milliliters) will be prepared for all intervals where sufficient returns are available; this additional aliquot will be placed in a separate Ziploc® bag and submitted to the LANL geology team leader at the conclusion of drilling activities. The sieved fractions in chip trays will be submitted to LANL. Lost circulation zones with no cuttings returns will be indicated by empty chip trays and cuttings-loss markers (core boxes) labeled ‘no returns’. The remaining bulk cuttings will be sealed in Ziploc® bags, labeled, and archived in core boxes. The core boxes will be delivered to the LANL sample management facility at the conclusion of drilling activities. A summary of cuttings sampling is presented in Table 5.

3.5 Down-Hole Geophysics

3.5.1 Schlumberger Geophysical Logging

Geophysical logging may be performed by Schlumberger in the R-42 borehole. The drilling subcontractor shall assist in hanging a sheave from the rig mast or tophead for wireline access to the borehole. If requested, Schlumberger will log the entire borehole after TD is reached. The following cased-hole geophysical suite may be run in the R-42 borehole:

- Natural and Spectral Gamma Logs
- Elemental Capture Sonde
- Accelerator Porosity Sonde (APS)
- Triple Litho Density

In the event that the borehole is open, the following open-hole geophysical suite will be performed:

- Natural and Spectral Gamma Logs
- Elemental Capture Sonde
- Accelerator Porosity Sonde (APS)
- Formation Microimager (FMI); can only be operated below the water table
- Array Induction
- Combinable Magnetic Resonance (CMR)

The logs will be used to characterize the hydraulic properties of saturated rocks within the regional aquifer and to help select the well screen depth. The geophysical logging operation will consist of one mobilization after reaching the total depth for R-42. Personnel from RP-1 will perform radiological screening and documentation of Schlumberger's down-hole radioactive source tool(s) upon arrival and prior to departure. If logging is conducted in an open hole, no radioactive sources will be used and RP-1 will not be contacted. A TPMC field crewmember will be present during logging operations to oversee logging runs and calibration checks.

Schlumberger will process the geophysical logs and provide a preliminary interpretation within 24 hours of completion. Five copies of the raw field geophysical logs and a compact disc (CD) containing the field logs (in .las format) will be provided to LANL immediately after completion of logging. Final logs, electronic files, and montages will be provided in the well completion report.

3.5.2 LANL Geophysical Logging

Geophysical logging may also be performed using LANL's geophysical tools in the R-42 borehole. The drilling subcontractor shall assist in making the borehole accessible and making room on the drill pad for the geophysical trailer. The following geophysical tools may be run in the R-42 borehole when conditions permit, such as after advancing an open-hole before drill casing is installed:

- Downhole camera
- Array Induction
- Natural Gamma
- Caliper

The logs will be used to investigate perched water intervals, verify geologic contacts, verify backfill placement and to investigate casing condition if needed.

3.5 Well Installation and Completion

One well screen (approximate length of 20 to 40 ft) will be placed in the most productive interval identified within the upper 100 ft of the regional aquifer. Data from screening samples and the lithologic, geophysical, and video logs will be used to determine the exact placement of the screened interval of the well. The well will be designed in accordance with TPMC's procedure equivalent to LANL ER SOP-05.01. LANL will provide an approved well design to TPMC prior to the start of well installation. Final well design will be based on data review and discussions between TPMC, LANL EP-WSP, and NMED.

3.5.1 Well Construction

The well will be constructed of 5.0-in. inside diameter (ID)/ 5.56-in outside diameter (OD), type A304, stainless steel casing fabricated to ASTM A312 standards provided by LANS. The screened interval of the well will consist of nominal 12-ft length(s) of 5.3-in OD, 0.020-in slot, rod-based wire wrapped well screen. Each well screen segment has an effective screen length of 10 ft. The actual total well screen length and well construction details will be based upon site-specific conditions and will be approved by the LANL STR in writing before the start of well construction. NMED will approve the design prior to well construction.

Stainless-steel casing will be installed below the bottom-most well screen to provide up to a 20 ft sump with a threaded end cap. External couplings, also of type A304 stainless steel fabricated to ASTM A312 standards, will be used to connect individual casing and screen joints. All well screen and casing will be thoroughly washed/decontaminated before use and wrapped in plastic if staged after washing. Centralizers will be placed immediately above and below the well screen. A secure cap will be welded or threaded onto the top of the well casing to prevent backfill materials from entering the well during construction.

A tremie pipe will be used during well construction to gravity feed the annular fill materials below the regional aquifer water table. The bottom of the borehole will be tagged at the beginning of well installation and a 50/50 mix of bentonite chips and sand will be placed from the bottom of the borehole to within 5 ft of the bottom of the screened interval. The well shall be supported from the top at all times during construction.

The primary filter pack of the screened interval will consist of sand and will be placed approximately 5 ft above and below the screened interval. The primary filter pack material and interval will be based on site-specific data. After placement, the screened interval will be swabbed to promote settling and compaction of the primary filter pack. A two to five foot thick collar of finer-grained (20/40) sand will be placed above the primary filter pack.

A bentonite seal consisting of 100 percent bentonite chips will be placed above the fine sand collar. Potable water will be used to transport the materials down-hole.

Backfill material will consist of a high-solids bentonite grout and/or bentonite chips to fill the borehole annulus to within 75 ft of the ground surface. Grout will be placed in the borehole annulus through a side-discharging tremie pipe from the bottom up.

Cement with 2 to 5% bentonite, or other approved mix, will be used to fill the remainder of the borehole annulus. The depth to annular material will be measured periodically to determine that the materials are settling properly.

3.5.2 Well Development

Development of R-42 will begin immediately after the well has been constructed. The primary objective of well development is to develop the filter pack and remove suspended sediment from the well until water turbidity is less than 5 nephelometric turbidity units (NTUs) for three consecutive samples. Additional water quality parameters to be measured during development include pH, temperature, specific conductance, dissolved oxygen, and total organic carbon (TOC). If the turbidity standard is not attainable, an alternate standard of stabilization of pH, temperature, conductivity, and a TOC level of less than 2.0 parts per million (ppm) must be achieved before termination of development procedures. Water will be collected daily in 40-ml

septum vials and 250-ml poly bottles and transferred to LANL Earth and Environmental Sciences Division (EES-6) laboratory for analysis. Samples will be submitted unfiltered and without preservatives.

Development of the well will begin by bailing and swabbing the screened interval and sump to remove any backfill materials, and formation material that have been introduced into the well during drilling and well construction and clean the filter pack. Bailing will continue until water clarity visibly improves.

The screened interval will be swabbed using a surge block to enhance filter pack development. The surge block will consist of a 4.75-in. OD, 1-in. thick nylon (or similar) disc attached to a weighted static rod operated on a wireline. The swabbing tool will be lowered into the well and drawn repeatedly across the screened intervals for approximately 1 hour. Water turbidity will not be measured during the bailing and swabbing process.

A 4-in. diameter submersible pump with an appropriately sized pump motor will be used for the final stage of the well development. The submersible pump used during development will be a larger unit, capable of moving larger volumes (20+ gallons per minute), than the pump to be installed for the dedicated sampling system. The pump intake will be set at multiple depths within the screened interval and in the sump to remove as much suspended sediment and introduced fluids as possible until the desired results (parameters) are achieved.

3.5.3 Sampling System Installation

A dedicated sampling system consisting of a 4-in, 5-gallon per minute (gpm), Grundfos® submersible pump (environmentally retrofitted with Teflon®) with a 4-in, 3 horsepower (HP), 3-phase, 460-volt, Viton fitted Franklin® submersible motor will be installed in the well. The pumping system will provide approximately 5-gpm of water flow at ground surface.

All materials that contact the groundwater will be constructed of either stainless steel, Teflon, or PVC. All components of the pump column will be new. The pump column will be constructed of 1 in. threaded/coupled stainless steel pipe with check valves installed in the pipe string every 200 ft. A weep hole will be installed at the bottom of the uppermost pipe joint to protect the pump column from freezing. To measure water levels in the well, a 1-in. inside diameter (ID) schedule 80 polyvinyl chloride (PVC) pipe access tube will be installed to sufficient depth to set a dedicated transducer below the measured static water level. The PVC transducer tube will be equipped with a 6-in section of 0.010 in. slot screen with a threaded end cap at the bottom of the tube. A weather-resistant pump control box will be installed next to the wellhead.

3.5.4 Surface Completion

The wellhead completion will include a steel outer protective casing to protect the stainless steel monitoring well. The wellhead completion will be a ‘stick-up’ with an overall height, including riser cap, of 3-ft, 6-in. A weep-hole will be installed to prevent water build-up inside the protective casing. The top of the protective casing will be fitted with a LANL supplied tamper-proof well cover plate and will be set in a 10-ft by 10-ft by 6-in.-thick reinforced concrete pad. A brass survey monument, imprinted with well identification information, will be placed in the northwest corner of the pad. A total of four bollards, painted yellow for visibility, will be set at the outside corners of the pad to protect the well from traffic. One of the four bollards will be designed for easy removal to allow access to the well.

Southwest Mountain Surveys, a New Mexico licensed Professional Land Surveyor, will survey the well location and elevation. Survey points will include: ground surface elevation, the top of the well casing, and the top of the protective casing. The accuracy of the survey data will be in accordance with NMED Regulations and LANL procedure. Survey data will be supplied to the LANL Drilling Project Lead and will also be provided in the completion report.

3.6 Investigation Derived Waste

Cuttings and fluids produced during drilling, well development, and hydro testing will be sampled and analyzed in accordance with the Waste Characterization Strategy Form (WCSF) created for this project. Cuttings and water samples will be collected and submitted under chain of custody documentation to the SMO. Samples will be collected in a representative manner and the possibility of contaminant stratification will be accounted for in the sample collection procedure.

Cuttings approved for onsite management will be left in the cuttings pit and buried after the cuttings pit liner has been removed, or used as fill in site restoration or road maintenance.

In the event that the IDW cannot be disposed of on site, LANL will be contacted for transportation and disposal requirements.

Contact waste will be characterized and disposed of in accordance with requirements stated in the WCSF.

Cement cuttings and/or concrete slurry will be segregated from the cuttings pit and stored in 55 gallon drums pending disposal as specified in the WCSF.

3.7 Site Restoration

Site restoration will conform to requirements of the SWPPP. The road improvement and drilling pad will be left in place to facilitate future well sampling and maintenance. The drill pad will be reduced by approximately 50 percent during site restoration. The cuttings pit will be backfilled and ground surface will be recontoured. An attempt will be made to compact the backfill in the cuttings pit by wheel rolling with restoration equipment. To ensure future safety, no parking or driving should be permitted over the former pit location. Metal posts will be installed to identify the perimeter of the pit after restoration. Erosion control will be accomplished and the site will be revegetated in accordance with the SWPPP.

Table 1
R-36 Project Organizational Chart

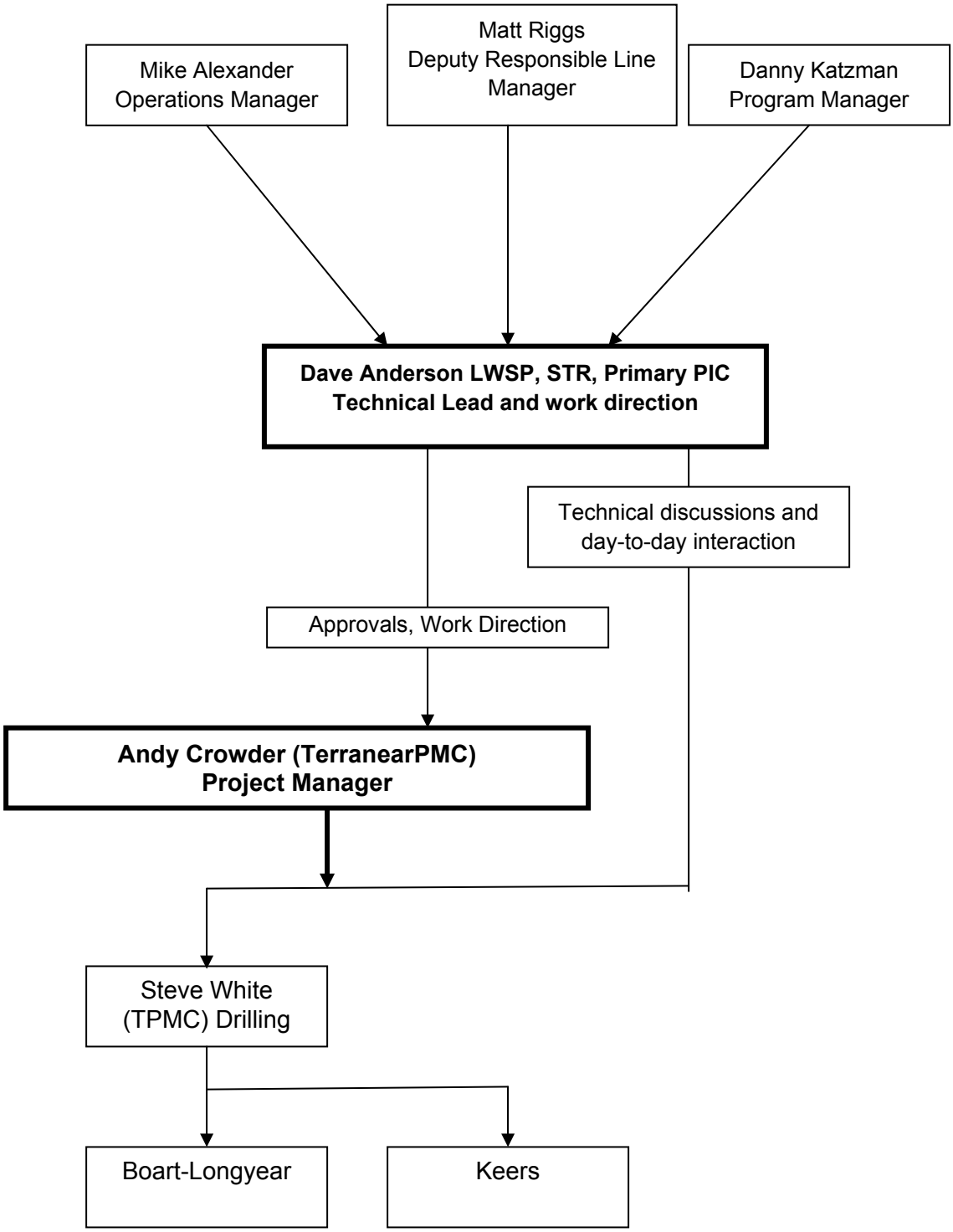


Table 2
TerranearPMC Key Team Personnel Roles and Responsibilities

Name	Role	Responsibilities
Peter Gram	Program Manager	Program Management
Andy Crowder	Project Manager, Alternate Person in Charge (PIC)	Project management, budget, resource commitments, and LANS interaction
Paul Sawyer	Health & Safety ES&H Representative	IWD and Health and Safety compliance
Al Whiteaker	Quality Assurance Manager	Quality assurance management oversight
Jeff Lee	Waste Management Coordinator/SSO	Management of waste and implementation of WCSF; Field site safety officer; implementation of IWD
Steve White	Drilling Superintendent, Field Team Leader (FTL), Alternate PIC	Project and field management, LANS interaction, geology, and subcontractor coordination
Rick Lawerence	Field Geologist, Alternate FTL/ Alternate PIC	Field management, geology, and subcontractor coordination
Andy Miller	Field Geologist, Alternate FTL/ Alternate PIC	Field management, geology, and subcontractor coordination
Rich Leishman	Field Geologist, Alternate FTL/ Alternate PIC	Field management, geology, and subcontractor coordination
Pattie Baucom	Field Geologist, Alternate FTL/ Alternate PIC	Field management, geology, and subcontractor coordination
Ryan McGuill	Field Team Member	Assist on-site geologist

Table 2 (Continued)
LANS Key Team Personnel Roles and Responsibilities

Name	Role	Responsibilities
Mike Alexander	LWSP Facility Ops Director (FOD)	Facility Operations Management/Coordination
Matt Riggs	LANL Water Stewardship Program (LWSP) Deputy Responsible Line Manager (RLM)	Responsible to the RLM, Program Director for the overall planning, coordination, approval execution and closeout for this project.
Dave Anderson	LWSP, Primary Person-in-Charge (PIC), Subcontract Technical Representative (STR)	Assigned the authority and responsibility to perform the overall planning, coordination, execution and closeout for this project. Is the single Point-of-Contact for LANS and Subcontractor interaction.

Table 3
Tentative Drilling Schedule

Activity	Start Date	Date of Completion
Drill Site Preparation	6/18/2008	6/25/2008
Driller Mobilization	6/23/2008	6/25/2008
R-42 Drilling	6/27/2008	TBD
R-42 Geophysics	TBD	TBD
R-42 Well Construction	TBD	TBD
R-42 Development	TBD	TBD
R-42 Pump Installations	TBD	TBD
IDW Analyses	TBD	TBD
Site Restoration	TBD	TBD

Notes: TBD = to be determined

Table 4
Analytical Suites, Sample Containers, Preservation, Sample Volume, and Preferred Laboratories for Groundwater collection from Well R-42

Analytical Suite	Sample Container	Filtered (0.45 micron filter)	Sample Volume (L)	Preferred Laboratory
Groundwater Screening Samples				
Metals/cations (dissolved)	poly	No	1.0	EES-6*
Anions (dissolved (including perchlorate)	poly	No	1.0	EES-6

Notes:

*EES-6: LANL Earth and Environmental Sciences-Hydrology, Geochemistry and Geology Group.

Table 5
Sample Collection Activities for Drill Cuttings

Sample Description	Test	Sample Size	Container	Sample Frequency
Cuttings	Bulk cuttings systematically collected for archival purposes and for supplemental sample needs	500-700 ml	Plastic Ziploc™ bags	One sample every 5-ft.
Cuttings	Sieved cuttings for lithologic description and binocular microscope examination	Enough to partly fill trays	Plastic chip trays	One sample every cutting run (nominally every 5-ft.) Normally, an unseived sample, >10 mesh sample, and a >35 mesh sample every cuttings run.
Cuttings	Sieved cuttings for petrography	200-300 ml sieved or bulk, if necessary	Plastic Ziploc™ bags	One > 10-mesh sample every cuttings run (nominally every 5-ft.); finer sizes or bulk split will be substituted where > 10-mesh size cannot be obtained

Note: Priority of sample core collection when recovery is less than 100% should be anions, moisture content, and stable isotopes, radionuclides and tritium, and radiological screening.

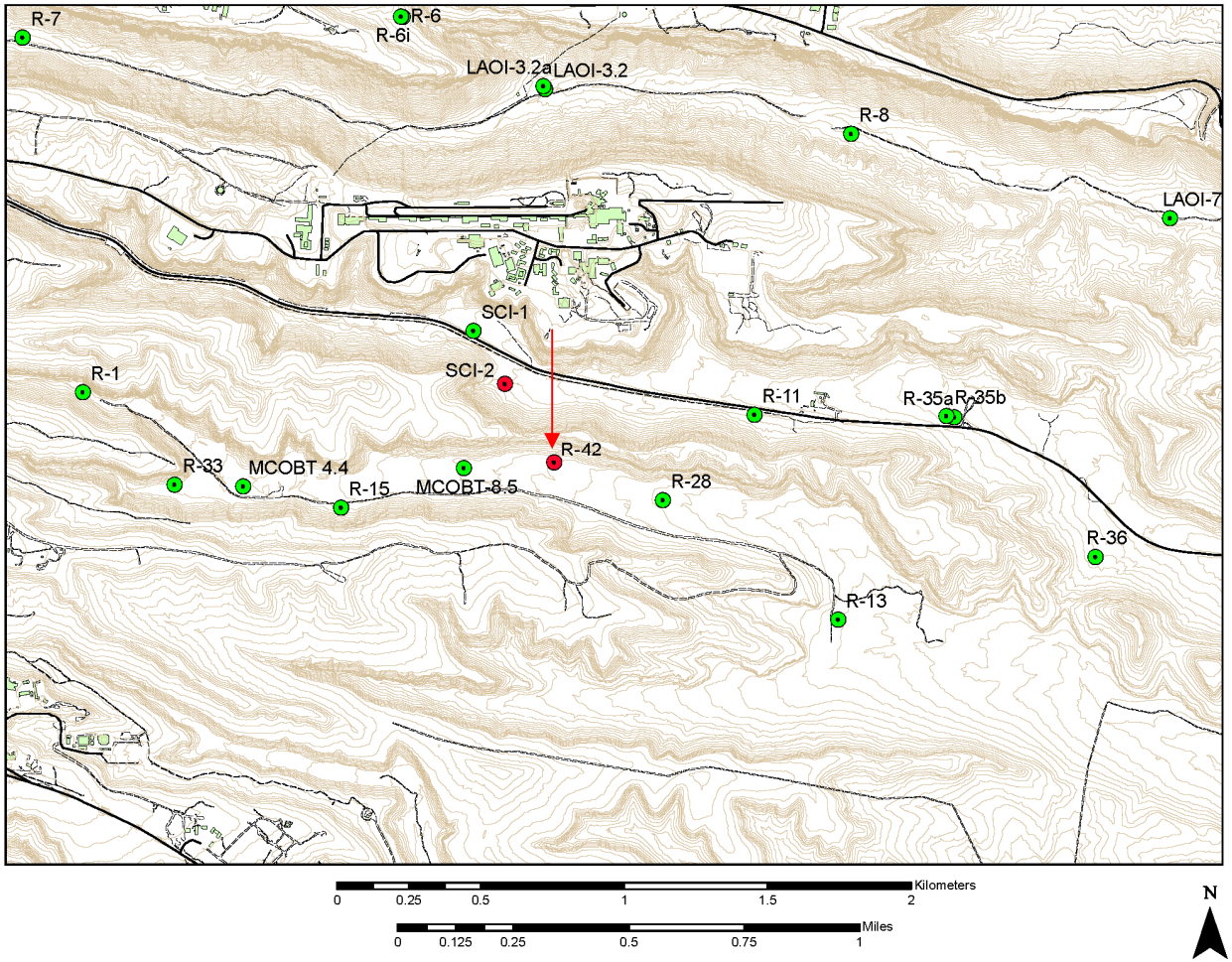


Figure 1 Proposed location of Regional Monitoring Well R-42

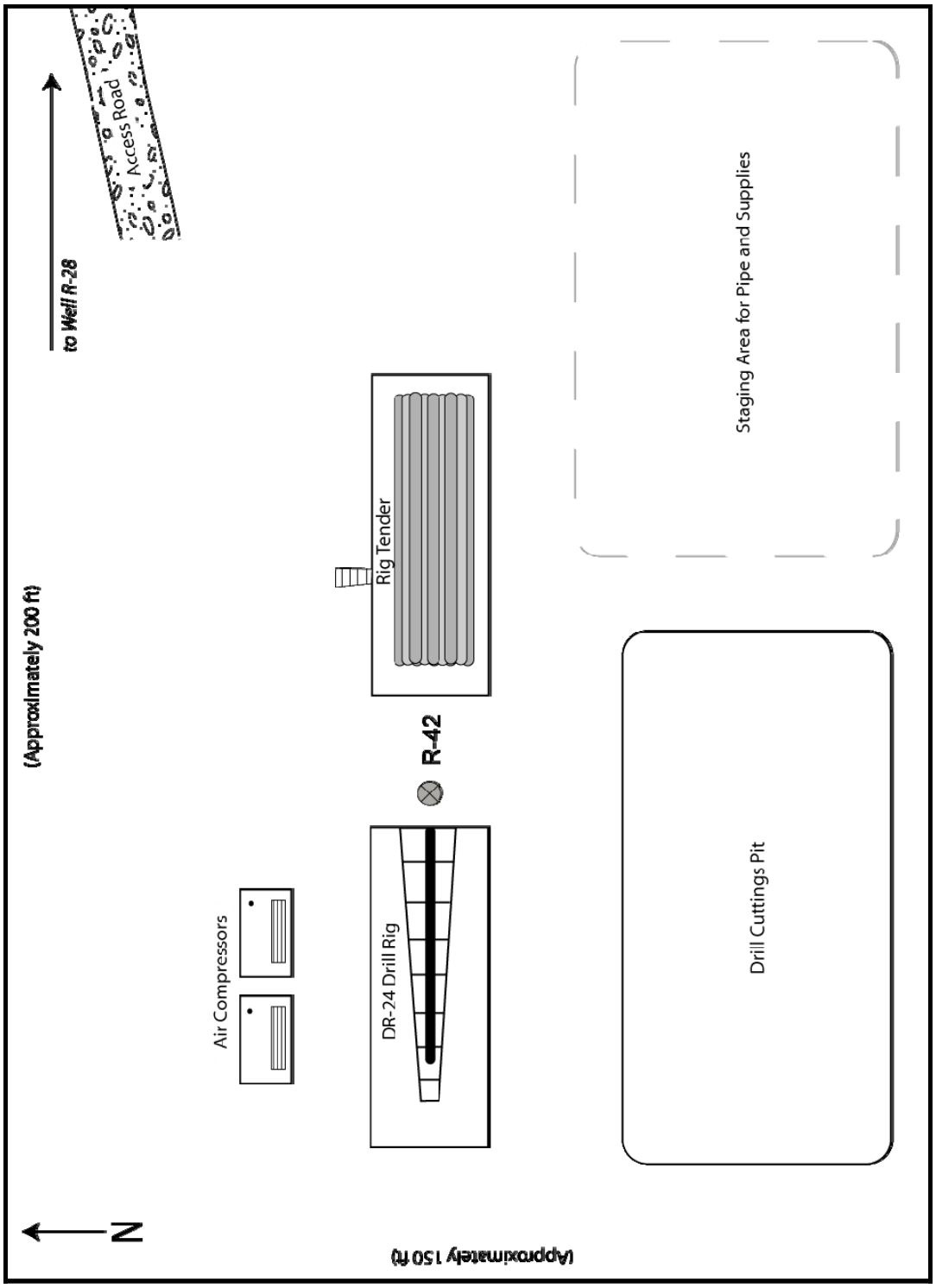
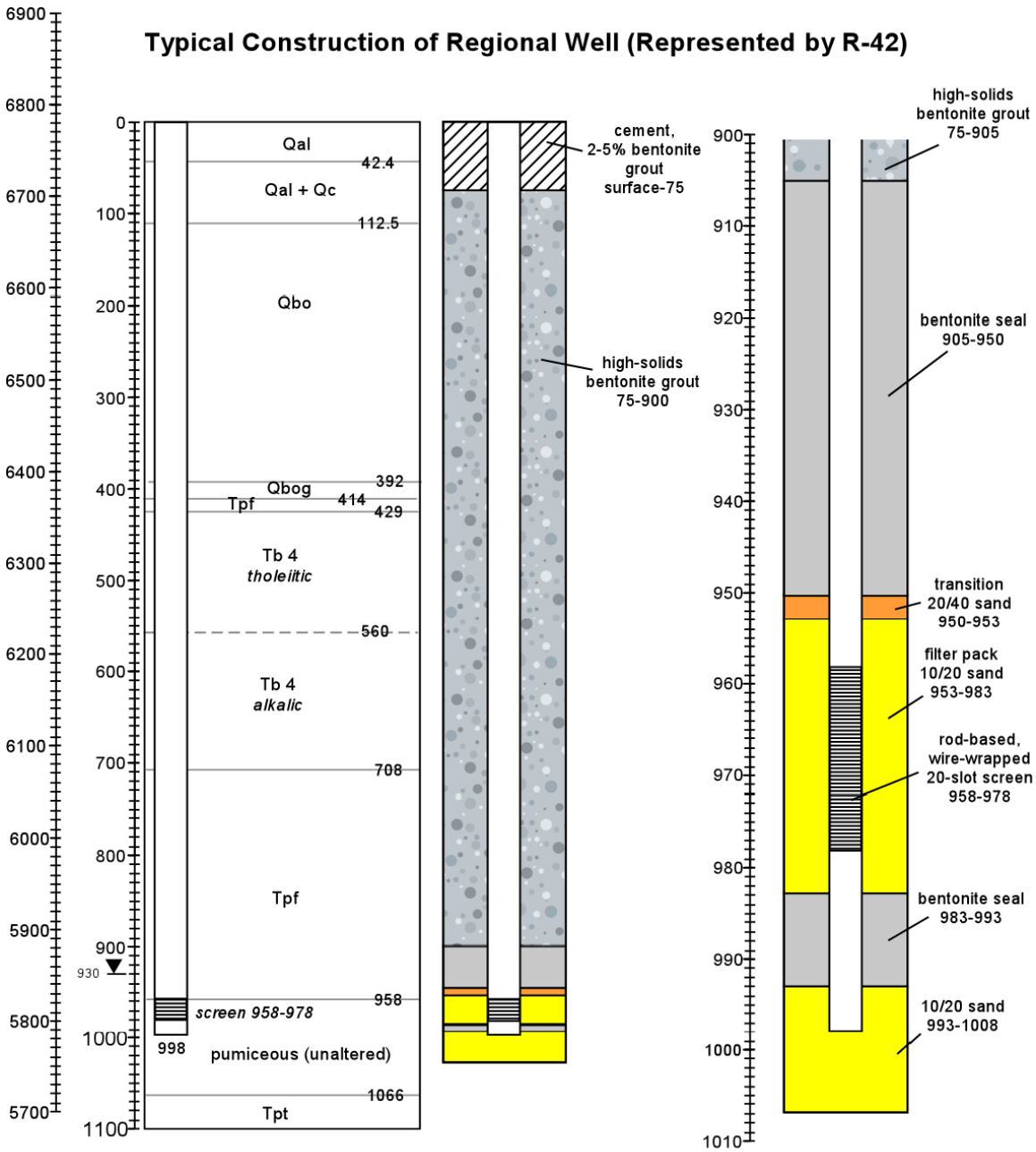


Figure 2 Proposed site set-up map for Regional Monitoring Well R-42

Figure 3 Route to hospital from R-42



Notes: Qal = alluvium; Qc = colluvium; Qbo = Otowi Member of the Bandelier Tuff; Qbog = Guaje Pumice of the Otowi Member of the Bandelier Tuff; Tpf = Puye Formation, Tb4 = Cerros del Rio lavas; Tpt = Totavi-like stream gravels.

Figure 4 Predicted stratigraphy and proposed well design for Regional Monitoring Well R-42