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North Wind

Well R-3 Drilling Plan

Installation of Well R-3, TA-74, Los Alamos National Laboratory

Task Order 4
In accordance with
Master Task Order Agreement 72006-000-09

Revision 0, F.C. 1 04/27/10 pgs 5, 20

April 20, 2010

Approved: Heather Smith for Doug Jorgensen 4/20/10

Project Manager Date

34147

REVISION HISTORY

Revision No.	Effective Date	Sections Affected	Description
0	04/20/10	All	Baseline document
F.C.1	04/27/10	pgs 5, 20	Per meeting with Mark Everett, Marvin Gard of LANL, modification to acceptable depth for use of foam above regional aquifer and to number of samples taken during aquifer testing

zones encountered during advancement of this pilot hole will be sampled and then sealed off as they are encountered. The process of over-reaming can then occur with less concern about detection or cross-connection of the perched zones.

A 10-in ID casing will be centered within the surface casing, and sealed with bentonite. The pilot hole will be advanced with a 9 7/8-in bit via open-hole methods using AQF-2, to the first perched zone encountered (expected at ~195 ft bgs). This zone correlates with the screened interval in R-3i and will not be sampled. The zone will be grouted and the pilot hole will then be advanced until the next perched zone is encountered (anticipated at 350 ft bgs). This zone will be sampled and then grouted to preclude cross connection with subsequent perched zones. As multiple perched zones are anticipated, based on review of surrounding wells, the process of advancing to the next perched zone, sampling, then grouting, will be repeated until the top of the regional aquifer saturation is encountered. All samples will be air lifted to the surface. The use of additives will cease at 547 ft bgs, 100 ft above the regional aquifer, and only air and water will be used below this depth.

2.2.1.2 *Drilling Stage 2: Over Reaming with ARCA System*

The pilot hole will be over reamed once the regional aquifer has been reached. Information about formation stability obtained during the drilling of the pilot hole will be used to determine the borehole diameter and drilling method for the over reaming process. The 10-in casing will then be pulled at the surface.

Stable Formational Conditions. If borehole conditions are stable, an 18-in casing will be centered within the 24-in surface casing and sealed with bentonite. A 17-in borehole will be drilled via open-hole methods from ground surface to within 100 ft above the regional aquifer, then a 12-in casing will be advanced through the regional aquifer to the target depth.

Unstable Formational Conditions. If borehole conditions are too unstable to allow for open-hole methods, then:

- A 22-in borehole will be drilled with air and AQF-2 foam as far as possible to the depth at which the formation is unstable. At that time, an 18-in casing will be advanced to the top of that formation.
- Then conventional dual-rotary drilling will be used (without under reaming) to advance the 18-in casing with the ARCA system. The 18-in casing will be advanced to a depth as deep as possible not to exceed ~~547 ft~~ bgs (a depth that correlates to 100 ft above the regional aquifer). 620 (and with use of foam if needed) NE 4-27-10
- If swelling clays are present above the regional aquifer as predicted, a 16-in casing will be set through this interval with the intention of cutting it off and leaving it in place above the aquifer should the swelling clays make recovery impossible.
- From this point, 12-in casing will be advanced through the regional aquifer to target depth or as deep as possible.
- This leaves one final option to telescope down to 10-in casing advance to proceed further below the 12-in terminus, if needed.
- If target depth cannot be reached with the 10-in casing advance method, a contingency option will need to be determined. Proposed options are provided in Section 2.2.2.

(LSO) 4-27-10
(1) ~~land 18-in competent formation, or~~
(2) ~~screw in up to 10 feet into~~
(3) ~~formation, or land in bentonite~~

(1) 22" OH, land 18" in bentonite, or
(2) screw 18" ~2' into clay, or
(3) screw 18" at least 10' into sand/silt/gravel or until friction stops you NE 4-27-10

Table 2.5-1
Sampling and Analysis Plan for R-3

Sample Type	Analysis	Lab	Method	Container	Preservative	Interval
Drill cuttings	Lithologic	N/A	Grab	chip tray #10 & #35 sieve and whole rock 200 ml to 300 ml plastic bags where sufficient	N/A	Every 5 ft
Perched zone water screening sampling	Metals/cations (dissolved & total)	EES-14	grab/airlift	1-liter poly	4°C	Any perched aquifer other than that expected at ~190-240 ft bgs corresponding to R-3i completion.
	Anions (dissolved)	EES-14	grab/airlift	1-liter poly	4°C	
	High explosives	GEL	grab/airlift	3 1-liter amber	4°C	
	VOCs	GEL	grab/airlift	2 40ml VOAs	HCl/4°C	
	Tritium	U of M	grab/airlift	500 ml poly	N/A	
Regional aquifer zone water screening sampling	N/A	N/A	N/A	N/A	N/A	N/A
Well development screening water (confirmation sample everyday)	pH	Field	Grab	N/A	N/A*	At each screen interval
	Specific conductance	Field	Grab	N/A	N/A	
	Temperature	Field	Grab	N/A	N/A	
	Turbidity	Field	Grab	N/A	N/A	
	TOC	EES-14	Grab	2 40ml VOAs	N/A	
Final well development water	TOC	EES-14	Grab	2 40ml VOAs	HCl/4°C	At each screen interval
Final aquifer test	Metals/cations (dissolved & total)	EES-14	Grab	1 liter poly	4°C	At each screen interval 1hr, 12hr, & 23hr.
	Anions (dissolved)	EES-14	Grab	1 liter poly	4°C	
	TOC	EES-14	Grab	2 40ml VOAs	HCl/4°C	

EES-14 = Earth and Environmental Sciences Division's Geochemistry, and Geomaterials Research Laboratory (formerly known as EES-14)
GEL = General Engineering Laboratory
U of M = University of Miami
TOC = total organic carbon
VOA = volatile organic analysis
VOC = volatile organic compound
SVOC = semivolatile organic compound

Mark Everett
4-27-10

Notes: RAD swipes will be collected on all equipment downhole and parked on-site. Equipment will also be screened upon entering and exiting the site.
Rinsate samples will be collected on tanks not certified as clean.

* N/A = Not applicable.

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APPENDICES

ACRONYMS

ags	above ground surface
ARCA	Air rotary casing advance
bgs	below ground surface
DOE	Department of Energy
EES-14	Earth and Environmental Sciences Division, Hydrology, Geochemistry, and Geology Group
EP	Environmental Programs
FOM	Field Operations Manager
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSR	Health and Safety Representative
ID	inside diameter
IDW	investigation-derived waste
LANL	Los Alamos National Laboratory
LANS	Los Alamos National Security, LLC
Layne	Layne Christensen Company
LWI	LANL work instruction
NMED	New Mexico Environment Department
NOI	notice of intent
NTU	nephelometric turbidity unit
NWI	North Wind, Inc.
OD	outside diameter
PIC	person in charge
POC	point of contact
ppm	parts per million
psi	pounds per square inch
PVC	polyvinyl chloride
RCT	Radiation Control Technician
SMO	Sample Management Office
SOP	standard operating procedure
SSEHASP	Site-Specific Environmental Safety and Health Plan
STR	Subcontract Technical Representative
SWPPP	Storm Water Pollution Prevention Plan

TA	technical area
TD	total depth
TOC	total organic carbon
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WCSF	waste characterization strategy form

1.0 INTRODUCTION

Los Alamos National Laboratory (LANL) Management and Operations contracted North Wind, Inc. (NWI) to manage the installation of regional aquifer monitoring well R-3. The well is being installed to provide hydrogeologic and water quality data required by the March 1, 2005, Compliance Order on Consent (Consent Order) agreed to by the New Mexico Environment Department (NMED) and the Department of Energy (DOE) for environmental remediation at LANL. NWI will complete this work for the Los Alamos National Security, LLC (LANS) Environmental Programs (EP) Directorate – American Reinvestment and Revitalization Act Project Office.

The proposed location for well R-3 is in Pueblo Canyon near the eastern boundary of Technical Area 74 (TA-74) (Figure 1.0-1). The primary purpose of well R-3 is to provide a monitoring point within potential contamination flow paths in the regional aquifer near municipal production well O-1. The aquifer monitoring function of abandoned test well TW-1 will be superseded by the installation of well R-3.

This drilling plan provides technical guidance for activities associated with drilling, installation, sampling, and aquifer testing of regional monitoring well R-3. The well is projected to be advanced to a total depth (TD) of approximately 1100 (ft) below ground surface (bgs), in potentially unstable Santa Fe Group sediments through potentially multiple perched water units and varied stratigraphy. Well R-3 is projected to be completed as a dual-screened well within the regional aquifer. The upper 20-ft screen is projected to be placed within the uppermost 80 ft of the regional aquifer, in the most transmissive zone defined during drilling. The lower 20-ft screen will be placed at a depth comparable to where zonal sampling has shown the highest perchlorate concentrations at O-1 in the upper part of the louvers in the O-1 screen (i.e., below 1007 ft depth at R-3). A tentative target depth for the upper screen is between 712-732 ft bgs, and the lower screen is tentatively planned to be set between 1053-1073 ft bgs.

Primary hydrogeologic and geochemical objectives for the installation of R-3 are to provide clarification of depth to the regional aquifer zone of saturation in the vicinity of O-1 and TW-1, as well as for characterization of potential contaminant flow paths and concentrations. Static water level data from TW-1 appear to be anomalously high. During the installation of TW-1, low permeability sealant materials were not emplaced in the annular space. The absence of an annular seal may have established hydrologic connectivity between perched and surface waters, as well as any associated contaminants, and allowed these waters to migrate downward via the annular space. Addition of perched or surface waters may explain the anomalously high static water level readings exhibited by TW-1. An additional objective of R-3 is to evaluate the hydraulic connections between R-3 and near-by Los Alamos County water-supply wells. Water supply well O-1 is not active at this time, but when pumped, water level responses in the two R-3 screens may be used to evaluate hydraulic properties (laterally and vertically) of the regional aquifer.

This drilling plan is in compliance with the scope of work set forth in Task Order 4 of the Master Task Order Agreement Contract between LANS and NWI. The following sections provide an overview of the program management and operations.

1.1 Program Management and Operations

1.1.1 Project Staff

Tables 1.1-1 and 1.1-2 indicate the project roles, staff, and responsibilities for NWI project personnel and LANL project personnel, respectively. The overall project organization of the field personnel is shown on Figure 1.1-1. Additional qualified and experienced staff, both existing and new, may be added after submitting this drill plan. With approval of the LANL Subcontract Technical Representative (STR), staff will be identified and roles will be assigned prior to commencement of field work.

Project management, administration, and quality assurance oversight will be conducted out of NWI's Los Alamos, New Mexico office. The Field Operations Manager (FOM) or designee will provide oversight and will review ongoing operations as they relate to this drilling plan and will assist the drilling team with any technical, operational, or other project related issues.

During each drilling shift, a minimum of one NWI personnel will be present at the drill site. The Field Geologist will have the following responsibilities:

- Maintain detailed field notes describing general drill site activities;
- Compile and submit daily reports and drilling forms (examples included in Appendix A);
- Record down-hole tool types and lengths;
- Conduct lithologic logging;
- Conduct daily safety meetings; and,
- Inspect equipment.

The FOM and/or Field Geologist will also be responsible for compliance with established health and safety documentation and will serve as the alternate Health and Safety Representative (HSR) in the absence of the designated project HSR.

A person in charge (PIC) will be designated at all times during field operations. The PIC is responsible for interaction with LANL personnel and other visitors to the site. Ordinarily, the PIC will be the FOM. In the event that the FOM is not present, the following person(s) will be designated to act as the PIC in this order:

- Lead NWI Field Geologist,
- Associate NWI Geologist / Environmental Scientist.

During an emergency situation, in the absence of on-site NWI personnel, the following person(s) will be designated to act as the PIC in this order:

- Drilling Supervisor (tool pusher);
- Driller.

1.1.2 Health and Safety Training

A Site-Specific Environmental Health and Safety Plan (SSEHASP) has been prepared for this site. Though not anticipated to be a hazardous waste site, NWI will have personnel on site that are trained in the requirements of Occupational Safety and Health Administration Hazardous Waste Operations and Emergency Response (HAZWOPER). In addition, at least two site personnel will be trained in first aid/cardiopulmonary resuscitation.

Additional project and site-specific training is documented in the SSEHASP. Before mobilization into the field all staff will be trained to these requirements.

1.1.3 Security and Traffic Control

Security and Traffic Control plans are provided in Appendices B and C, respectively.

1.1.4 Schedule

Table 1.1-3 shows the tentative well R-3 drilling schedule. Drilling is typically planned for two 12-hour shifts per day, with the day shift typically occurring from 0700-1900 and the night shift from 1900-0700. In cases where difficult drilling conditions are expected or encountered, drilling shifts may be limited to day shift only in order to facilitate timely more efficient communications with all persons involved in potential field change decisions.

1.1.5 Permits

A National Pollutant Discharge Elimination System Storm Water Pollution Prevention Plan (SWPPP) permit has been implemented by LANL. The SWPPP notice of intent (NOI) has been submitted to the United States Environmental Protection Agency (USEPA). Other required permits have been defined as required through the LANL Permits and Requirements Identification process, including the Excavation Permit and the Spark or Flame Producing Operation Permit. Copies of permits, notifications, inspection reports, and site access authorization will be maintained at the drilling site as required. NWI will assume implementation of the LANL-provided Spill Prevention Containment, Control and Countermeasures Plan because NWI intends to maintain bulk fuel storage at the drilling site. A well permit will be obtained from the New Mexico Office of the State Engineer prior to drilling.

1.1.6 New Mexico Environment Department Field Visits

If NMED personnel visit the site, the PIC will attempt to notify the STR or other appropriate LANL personnel (Table 1.1-2), until contact has been made. Thus, LANL personnel shall be promptly informed of NMED personnel visits to the site, and will maintain agency coordination.

2.0 FIELD ACTIVITIES

2.1 Site Preparation and Drilling Site Maintenance

Basic site preparation will be conducted by LANL personnel prior to drill rig and personnel mobilization. This task will include construction of access roads to provide adequate passage for transporting the drilling and support equipment to the site. Construction of the drilling pads, as well as the construction and lining of cuttings pits, will also be conducted by LANL. This task will also provide work areas for the drilling crew and the scientific/engineering personnel, and will provide adequate space for the drill rig, support equipment, and temporary storage of the investigation-derived waste (IDW).

North Wind and Layne Christensen will stage drilling materials in a manner that will allow the most ergonomic, efficient, and safe work practices for the many stages of drilling operations. This will include appropriate placement of staged equipment, parking of vehicles, securing of cuttings, management of equipment, etc.

NWI will place secondary containment basins beneath the drill rig and support vehicles and equipment prior to commencement of drilling activities at each location. Berms will be constructed to surround the work areas to prevent run-on and run-off of precipitation from the site, in accordance with the SWPPP. If LANL has not installed elk fencing around the pits, NWI will install high-visibility safety fencing around drill cuttings pits to secure those areas. Rope ladders and life rings will be accessible and placed near the pits to be utilized in the event of an emergency.

During drilling activities, NWI will keep the drilling site and work areas safe, neat, and in orderly condition at all times. NWI will maintain temporary fencing and barricades and will be responsible for snow removal in the immediate vicinity of the drill site.

2.1.1 Radiological Screening

LANL will screen and clear the work zone and access roads prior to mobilization and site-preparation activities. Drilling equipment and tooling will be screened prior to mobilization to the R-3 well site from TA-54. A Radiation Control Technician (RCT) from the Radiation Protection 1, TA-18 RCT pool will screen the equipment and tooling prior to demobilization from TA-74 upon completion of work. If determined to be necessary, an RCT will be on site during drilling of the upper part of the borehole.

2.1.2 Field Office and Site Services

A trailer (or equivalent shelter) will be used as a field office. Potable water will be purchased from the County of Los Alamos from fire hydrant #675 at the “old” waste water treatment facility roughly 1.75 mi up canyon and trucked to the site. Water Storage Tank #72-0057 is not available, as the water it contains has been found to have elevated perchlorate and arsenic concentrations (per LANL STR direction). Figure 2.1-1 shows the water source location for Well R-3.

2.1.3 Lay-Down Area

The Pajarito Lay-down Yard (also known as the White Rock Lay-down Yard) is the primary lay-down area for all drilling contractors. It is located on the northwest corner of the intersection of NM State Highway 4 and Pajarito Road. The route to the Pajarito Lay-down Yard from the R-3 drill site is provided in Figure 2.1-2. An additional, smaller lay-down area will be adjacent to the drill pad, to allow for expedient access to tooling and materials.

2.2 Well Drilling

Layne Christensen Company (Layne), under contract to and direct supervision of NWI, will drill the R-3 borehole. Necessary drilling equipment will be situated near the drill site in a safe and secure manner. The orientation and placement of this equipment will depend upon the physical constraints at the drilling site. Figure 2.2-1 shows the site layout and dimensions.

2.2.1 Drilling Method

Drilling will be conducted with methods selected to optimize the potential of completing the well without the use of any drilling additives in or immediately above the expected depth to regional saturation (647 ft). Specifically, the goal of utilizing no drilling additives other than potable municipal water within 100 ft of the projected top of the regional aquifer, if at all possible, will be observed. There is concern that the formational challenges seen by other drilling contractors in locations near this well site (specifically R-3i, R-5 and TW-1) may make it necessary to address contingencies in the proposed drilling technique for this location (see Section 2.2.2).

The R-3 borehole will be advanced using a Schramm Inc. T130XD Rotadrill dual rotary drilling rig with casing rotator. This dual rotary system will allow for drilling as a conventional air rotary or reverse circulation system or a dual tube system, but will also allow for advancement of the casing with the casing rotator while drilling with conventional air/mist/foam or mud methods.

2.2.1.1 Drilling Stage 1: Initial Pilot Hole

A 24-in I.D. surface casing will be installed between ground surface and the top of the Cerros del Rio basalt (projected at ~60 ft bgs) utilizing ARCA drilling techniques.

The top of the regional aquifer is projected at 647 ft bgs. A smaller diameter borehole (9 7/8-in diameter) will be advanced to the top of the regional aquifer, and then over-reamed to a diameter necessary to allow for a 10-in diameter borehole at the target depth of 1100 ft bgs. Perched zones encountered during advancement of this pilot hole will be sampled and then sealed off as they are encountered. The process of over-reaming can then occur with less concern about detection or cross-connection of the perched zones.

A 10-in ID casing will be centered within the surface casing, and sealed with bentonite. The pilot hole will be advanced with a 9 7/8-in bit via open-hole methods using AQF-2, to the first perched zone encountered (expected at ~195 ft bgs). This zone correlates with the screened interval in R-3i and will not be sampled. The zone will be grouted and the pilot hole will then be advanced until the next perched zone is encountered (anticipated at 350 ft bgs). This zone will be sampled and then grouted to preclude cross connection with subsequent perched zones. As multiple perched zones are anticipated, based on review of surrounding wells, the process of advancing to the next perched zone, sampling, then grouting, will be repeated until the top of the regional aquifer saturation is encountered. All samples will be air lifted to the surface. The use of additives will cease at 547 ft bgs, 100 ft above the regional aquifer, and only air and water will be used below this depth.

2.2.1.2 Drilling Stage 2: Over Reaming with ARCA System

The pilot hole will be over reamed once the regional aquifer has been reached. Information about formation stability obtained during the drilling of the pilot hole will be used to determine the borehole diameter and drilling method for the over reaming process. The 10-in casing will then be pulled at the surface.

Stable Formational Conditions. If borehole conditions are stable, an 18-in casing will be centered within the 24-in surface casing and sealed with bentonite. A 17-in borehole will be drilled via open-hole methods from ground surface to within 100 ft above the regional aquifer, then a 12-in casing will be advanced through the regional aquifer to the target depth.

Unstable Formational Conditions. If borehole conditions are too unstable to allow for open-hole methods, then:

- A 22-in borehole will be drilled with air and AQF-2 foam as far as possible to the depth at which the formation is unstable. At that time, an 18-in casing will be advanced to the top of that formation.
- Then conventional dual-rotary drilling will be used (without under reaming) to advance the 18-in casing with the ARCA system. The 18-in casing will be advanced to a depth as deep as possible not to exceed 547 ft bgs (a depth that correlates to 100 ft above the regional aquifer).
- If swelling clays are present above the regional aquifer as predicted, a 16-in casing will be set through this interval with the intention of cutting it off and leaving it in place above the aquifer should the swelling clays make recovery impossible.
- From this point, 12-in casing will be advanced through the regional aquifer to target depth or as deep as possible.
- This leaves one final option to telescope down to 10-in casing advance to proceed further below the 12-in terminus, if needed.
- If target depth cannot be reached with the 10-in casing advance method, a contingency option will need to be determined. Proposed options are provided in Section 2.2.2.

2.2.1.3 Drilling Additives

Fluids and additives that may be used to facilitate drilling are consistent with those previously used in the drilling program at LANL and have been characterized geochemically. The fluids and additives previously authorized by NMED include:

1. Potable water from the municipal water supply, which may be used to aid in the delivery of other drilling additives and to cool the drill bit;

2. QUIK-FOAM™, a blend of alcohol ethoxy sulfates, which may be used as a foaming agent;

3. AQF-2™, an anionic surfactant, which may be used as a foaming agent;

4. Suppressor 3579™, a blend of white mineral oil and paraffin, which may be used as a de-foaming agent, and;

5. Devil Dog DF430™, a silicone emulsion, which may be used as a de-foaming agent.

Complete records will be maintained detailing the type, amount, and volume of drilling fluids used; the borehole depth where the drilling fluids are added; the estimated amount of drilling fluids in storage; and the estimated volume of drilling fluids recovered. No drilling fluids, except potable municipal water, will be used within 100 ft of the regional aquifer. If the regional aquifer cannot be reached without adding other drilling fluids, the situation will be discussed with LANL and NMED personnel. In addition, no other chemicals, except those listed above, will be added to the borehole without approval from LANL and NMED.

Because of the known difficulties encountered in this area of the Laboratory, additional drilling fluids are proposed for use, if needed, in the regional aquifer in Section 2.2.2 which defines the alternate drilling contingency options. As stated above, LANL and NMED approval will be necessary prior to the introduction of any drilling fluids into the regional aquifer.

2.2.1.4 Dust Control

The drill rig may generate dust during dry drilling operations. Dust control will be implemented by applying potable water to the drill rig discharge line. Dust control will also be managed by sprinkling water from the water truck as needed to manage dust on the access roads and drill pad.

2.2.2 Drilling Contingencies

NWI will attempt to drill the borehole to the target depth of 1100 ft bgs with the methods described above. However, a review of available documentation from the drilling of surrounding wells O-1, TW-1, R-3i, and R-5 raises concerns about formational stability through the Santa Fe Group sediments both above and below the regional aquifer and potential challenges running casing strings to target depth.

Anticipated conditions include unstable Santa Fe Group sediments, swelling clays above the regional aquifer, unstable gravels and heaving sands in the regional aquifer.

If the borehole cannot be completed in the regional aquifer using the drilling method described in Section 2.2.1.1, and it becomes necessary to consider a contingency option, a more detailed plan will be developed based on discussions between LANL, NMED and NWI/Layne.

2.2.2.1 Drilling Contingency 1: Terminate Borehole at Higher Interval

The first potential contingency option is to terminate the borehole at the depth reached and reevaluate the final well design.

2.2.2.2 Drilling Contingency 2: Change to Conventional Mud Rotary Drilling Technique

The second option is to change the drilling method to conventional mud rotary utilizing either the 9 7/8-in (or 9 1/2-in) tricone bit inside the 10-in ID casing, once the 10-in ID casing can no longer be advanced. This change would include the mobilization of mud equipment to the site and the set up and drilling for that alternate borehole advancement technique. The mud proposed to be used includes:

- Soda Ash, sodium carbonate used to reduce calcium in make-up water to <100 ppm Ca^{2+} and adjust pH >9.0;
- QUIK-GEL™, used to facilitate primary filtration control and borehole stabilization through filter cake development;
- QUIK-TROL LV™, used to reduce filtration rate and invasion, improve filter cake composition, and for added borehole stability;
- EZ-MUD GOLD™, used to provide stabilization of encountered clay or shale formations, also to provide additional filtration control with minimal viscosity increase;
- AQUA CLEAR PFD™, used to facilitate removal of additives during well development;
- Potable water from the municipal water supply, which may be used to aid in the delivery of other drilling additives and to cool the drill bit.

Mud properties will be managed and monitored. Monitoring will include the wall cake, sand content, viscosity, pH, and weight of the mud being used.

2.2.2.3 Drilling Contingency 3: Change to Flooded Reverse Drilling Technique

The third option is a flooded-reverse method using a combination of available municipal water, formation water, and the minimum amount of additives necessary to stabilize the borehole. The option of using solely municipal water is not feasible due to the necessity of hauling water to the drill site. Formation water will have to be re-circulated during this technique.

In addition to those additives listed above in Drilling Contingency 2, the following also require consideration for introduction into the regional aquifer.

- PENETROL™, used to counteract stickiness of clays;
- N SEAL™, used to counteract losses of circulation.

2.3 Core Sampling

Core sample collection is not planned for R-3.

2.4 Groundwater Detection

Methods for groundwater detection include driller's observations, water-level measurements, borehole video, and borehole geophysics. If groundwater is detected at any point, the depth to water will be checked using a water-level meter through the drill string. The LANL STR will be notified within 4 hours of groundwater detection, if detection occurs during the day shift; and no later than 10:00 am the following morning, if detection occurs during the night shift. The presence of water will be verified as necessary by LANL personnel.

Depth-to-water measurements will be conducted in accordance with the following NWI SOPs:

- NWI ENVP-007, Water Level Measurements, and
- NWI ENVP-014, Sampling Equipment Decontamination.

2.5 Sample Collection Procedures

Groundwater and cuttings sample collection and handling activities are described in the following subsections.

2.5.1 Groundwater Sample Collection

Sample collection and handling activities will be conducted in accordance with the following LANL and NWI requirements and SOPs.

- Filtering and Chemical Preservation of Water Samples, ENV-WQH-SOP-066;
- Field Water Quality Analyses, ENV-DO-203;
- Groundwater Sampling, SOP-5232;
- Field Decontamination of Equipment, EP-ERSS-SOP-5061;
- NWI ENVP-002, Sample Handling, Packaging and Shipping;
- NWI ENVP-004, Collection of Quality Control Samples;
- NWI ENVP-006, Groundwater Sampling;
- NWI ENVP-014, Sampling Equipment Decontamination;
- NWI ENVP-021, Chain of Custody Documentation; and
- NWI LWI-010, Filtering and Chemical Preservation of Water Samples.

The Sampling and Analysis Plan in Table 2.5-1 details the analyte suite, container types and volumes; and, preservative, if applicable, for all the groundwater samples that will be collected in the open borehole as well as in the completed well.

2.5.1.1 Perched Groundwater Sampling

Perched water is expected to be encountered in the Cerros del Rio lavas at approximately 195 to 240 ft bgs, and likely to be encountered in Puye Formation sediments at approximately 350 ft bgs and 400 ft bgs. It is possible to hit additional perched zones between 400 ft bgs and the top of the regional aquifer. Except for the zone corresponding to R-3i (195-240 ft bgs), samples will be collected at each zone encountered and analyzed per Table 2.5-1.

2.5.1.2 Regional Groundwater Sampling

Regional aquifer groundwater samples will not be collected for general and contaminant chemistry during drilling or well development. Only daily TOC will be required during well development and at the end of the aquifer test, however, field screening data will be collected during aquifer testing and well development and will include parameters of pH, turbidity, specific conductivity, temperature, ORP and DO. TOC will be a separate sample collected and analyzed by LANLs EES lab as a separate parameter collected at the end of each shift during development and at the end of the aquifer test.

Assuming that R-3 is completed as a 2-screen well, groundwater characterization samples will be collected by LANL at the end of the aquifer pumping tests. Samples will be collected through the stainless steel discharge pipe used for the pumping tests. These samples will be analyzed for a suite of constituents, including radionuclides, target analyte list metals, general inorganic chemicals, total organic carbon (TOC), VOCs, SVOCs, and stable isotopes of hydrogen, nitrogen, oxygen, and chromium. Groundwater screening samples will be analyzed for dissolved cations/metals, anions, and tritium. Analyses will be performed by EES-14 except where noted in Table 2.5-1.

Subsequent groundwater samples will be collected per the *2009 Interim Facility-Wide Groundwater Monitoring Plan* (LANL 2009, EP2009-0143).

2.5.1.3 Groundwater Sample Handling Procedures

Groundwater samples will be preserved in iced coolers, and delivered to the Sample Management Office (SMO) for processing. After processing, NWI personnel or available LANL personnel will transport the groundwater samples to EES-14 for analysis. EES-14 will provide rapid turn-around analyses for the screening analytes (see Table 2.5-1). The results of the analyses will be used to evaluate whether perched water zones should be isolated with casing before the regional aquifer is penetrated.

2.5.1.4 NMED Split Sampling

NMED personnel may perform a field visit to collect a split of the groundwater samples during drilling. The procedure for an NMED visit is as follows.

- The STR will notify NMED personnel when the drilling team detects, or is expected to encounter water-bearing zones.
- Once on-site, NMED personnel will sign the visitor's log.
- Due to restrictions outlined in the SSEHASP, it is a requirement that NMED personnel collect a split of the groundwater sample outside of the exclusion zone.
- In the case of limited groundwater volume, the appropriate LANL analyte suite outlined in Table 2.5-1 will be given priority.

2.5.2 Cuttings Sampling

Samples of cuttings generated during drilling of R-3 will be collected from the drilling rig discharge line or cyclone. When cuttings returns are available, cuttings will be collected over the entire interval of the borehole, separated and homogenized in 5-ft intervals. The cuttings will be examined to determine lithologic characteristics and to prepare the borehole lithologic log. Sample collection of the borehole cuttings is outlined in Table 2.5-1. The sampling will be conducted in accordance with the following NWI SOPs:

- NWI LWI-001, Geologic Logging of Cuttings and Core;
- NWI ENVP-014, Sampling Equipment Decontamination; and,
- NWI LWI-011, Transportation and Admittance of Borehole Materials to the Field Support Facility.

Portions of the cuttings will be sieved using >#10 and >#35 mesh sieves and placed in chip trays along with a sample of unsieved (whole rock) cuttings. Finer sieved sizes or bulk cuttings will be collected when >#10 mesh materials are absent. The remaining cuttings will be placed in Ziploc® bags (approximately 200 to 300 ml), labeled, and archived in core boxes. Cuttings will be screened by an RCT before being removed from the drilling site.

Zones where no cuttings are returned (e.g., zones of lost circulation) will be indicated by labeling the appropriate depths in the sample trays with "no returns." If foam or drilling mud is used during drilling, cuttings return lag time will be recorded. Up-borehole velocities will be calculated based on borehole diameter and fluid volumes used. Physical measurements of lag time may also be made by clean circulating the borehole, drilling a 6-in. interval, and measuring the up-borehole travel time.

2.6 Down-Hole Geophysics

As conditions allow, LANL's borehole video camera, natural gamma, and induction tools will be used to view and evaluate the open borehole prior to installing well casing in the borehole after drilling is completed. The natural gamma tool has the capability to be run in a cased borehole, and may be used to determine cased borehole characteristics, if conditions require.

If open borehole conditions exist at TD, the following geophysical logs may be conducted by LANL's subcontractor, Schlumberger, Inc., including:

- Accelerator Porosity Sonde (Neutron Porosity),
- Array Induction,
- Combined Magnetic Resonance,
- Natural and Spectral Gamma, and
- Formation Micro-Imager logs.

If borehole conditions are not stable, the following geophysical logs may be conducted by LANL's contractor, Schlumberger, Inc., in the cased-hole including:

- Accelerator Porosity Sonde (Neutron Porosity),
- Triple Lithodensity,
- Elemental Capture,
- Natural Gamma, and
- Spectral Gamma logs.

These geophysical logs will be used to characterize the hydraulic properties of saturated rocks in the regional aquifer, to select the well screen depth, number of screens, screen lengths, and other aspects of well construction. The suite and timing of geophysical logging will depend on borehole conditions. Alternatively, they may be used to define geologic and hydrogeologic properties of the borehole, and to determine zones of perched water.

An NWI field staff member will be present during logging operations to oversee logging runs and calibration checks. NWI will notify the STR at the start and end of geophysical logging operations, and will provide to the STR three hard copies and one electronic copy of unprocessed geophysical logs. Oversight of geophysical logging will be performed in accordance with NWI-LWI-004, Contract Geophysical Logging.

2.7 Well Installation and Completion

Based on the potentiometric surface in LANL's 3-D regional geo-hydrologic model, the top of regional saturation at R-3 is approximately 647 ft bgs. Well R-3 is tentatively designed with two 20-ft-long screens, with the upper screen installed between 712-732 ft bgs in an anticipated transmissive gravel interval and the lower screen installed between 1053-1073 ft bgs, within the regional zone of saturation, as shown on Figure 2.7-1. Actual screen lengths and intervals will be determined based on data acquired during drilling, video logging, and geophysical logging.

The intention is to place the upper screen near the top of the zone of saturation to target a highly-productive zone, and place the lower screen at a depth correspondent to where previous data have shown detection of perchlorates in well O-1. Final screen placement and well design will be based on discussions between NWI, LANL, DOE, and NMED personnel.

2.7.1 Well Construction

The well casing and screen will be provided by LANL. The casing and screen will be factory-cleaned before shipment and delivery to LANL. Additional decontamination of the stainless steel components will be performed on-site prior to well construction using high pressure heated water, if necessary. Water used during decontamination will be managed in accordance with the waste characterization strategy form (WCSF) in Table 2.8-1.

The well will be constructed of 5.0-in ID/5.563-in outer diameter (OD) type A304 passivated stainless steel casing fabricated to American Society for Testing and Materials Standard A312, "Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes." If the casing provided has beveled and welded joints, a slag apron or "witch's hat" will be placed around the casing being welded to prevent slag and welding debris from entering the borehole or well casing. Stainless steel casing will be placed below the screen to provide a 20-ft sump (to be determined by LANL). Stainless steel centralizers will be placed immediately above and below the screen(s). The well casing string will be suspended in the borehole during backfill and will not be allowed to rest on the bottom of the borehole at any time.

Two screens will be installed in R-3 unless otherwise directed by the STR. The screens will be two 10-ft lengths of 5.563-in OD compatible, 0.020-in rod-based wire-wrapped well screen, giving each well screen an effective screen length of 20 ft.

If drive casing is used to advance the borehole to TD, the casing shoe will be cut off prior to well installation. The casing shoe will be entombed in bentonite, with at least 5 vertical ft of bentonite between the top of the cut off section of casing and shoe and the bottom of the primary filter pack.

Steel tremie pipe (2-in ID) will be used during well construction to place annular fill materials down-hole. The bottom of the borehole will be tagged prior to well installation and sand will be placed in the bottom of the borehole to the base of the sump. Bentonite chips will be placed around the sump, to within 5 ft of the bottom of the screen. Potable water will be used to transport backfill materials down-hole.

The primary filter pack will consist of 10/20 grade sand and will be placed on top of the bentonite seal to 5 ft above the top of the screen. The actual primary filter pack interval will be based on site-specific conditions. After placement, the screened interval will be swabbed to promote settling and compaction of the primary filter pack. A 2-ft-thick transition zone (collar) of 20/40 grade sand will be placed above the primary filter pack.

Bentonite chips will be placed on top of the fine sand collar to approximately 60 ft bgs. The initial 3-5 foot pour of bentonite chips will be allowed to hydrate for no less than 4 hours before the emplacement of additional bentonite. Additionally, the top of the bentonite seal will be allowed to hydrate for no less than 4 hours prior to emplacement of the cement surface seal. Type I/II Portland cement, with a mixture ratio of 5.2 gallons potable water per bag, or other LANL-approved mix, will be used to fill the borehole annulus from the top of the bentonite seal to approximately 3 ft bgs. The depth to annular backfill materials will be tagged after each pour to determine that the materials are settling properly. Down-hole video and natural gamma logs may be performed by LANL personnel to confirm well construction (see section 2.6).

2.7.2 Well Development

The primary objective of well development is to remove suspended sediment from the water until turbidity is <5 nephelometric turbidity units (NTU) and TOC is < 2 ppm for three consecutive samples. The well will be developed to ensure that an equivalent volume of drilling fluids have been recovered and that water quality parameters are within the specified limits and stable.

The well may be developed by both mechanical and chemical methods. Mechanical methods, the primary method of well development, include swabbing, bailing, air-lifting, jetting and pumping. Chemical methods will only be employed in cases where mechanical methods have proven ineffective in removing residual drilling fluids. Development by chemical means may include detergents (i.e., sodium acid pyrophosphate or AQUA-CLEAR PFD™) to remove natural and added clays; and/or, chlorine to kill any bacteria introduced during well completion. Chemical methods will only be used if approved, in writing, by the STR.

A suitable winch line rig, pulling unit, or work over rig will be used for well development. Development of the well will begin by bailing and swabbing the screened interval and sump to remove drilling fluids, as well as formational fine-grained sediments that have been introduced into the well during drilling and installation. Bailing will be conducted using a suitable stainless steel bailer. Bailing will continue until water clarity visibly improves. The screened interval(s) will be swabbed using a surge block to enhance filter pack development. The surge block will consist of an appropriately-sized rubber disk attached to a winch line or pipe. The swabbing tool will be lowered into the well and drawn repeatedly above and below the screened interval(s) for approximately 1 hour. Water turbidity will not be measured during the bailing and swabbing process. Water produced during swabbing and bailing operations will be discharged to the cuttings pit.

Upon completion of swabbing and bailing development methods, development of the well will continue by pumping the well at an appropriate rate, dependent on well and aquifer characteristics. A 4-in.-diameter Grundfos™ submersible pump (or equivalent) with an appropriately sized pump motor will be used for the final stage of well development. The pump intake will be set at multiple depths across the screened interval(s) and in the sump to remove as much suspended sediment as possible from the well, filter pack, and formation immediately surrounding the borehole. Water produced during pumping will be captured and stored in suitable tanks. Development water will be containerized and managed as described in section 2.8, Investigation-Derived Waste. Well development through pumping will continue until the specified water quality parameters are met (turbidity <5 NTU for three consecutive readings, all other parameters stable). If the turbidity standard is not attainable, an alternate standard of stabilization of pH, temperature, and specific conductivity readings combined with TOC levels less than 2.0 ppm must be achieved before the termination of development activities.

The water quality parameters that will be monitored during the pumping stage of well development include:

- pH,
- Specific conductance,
- Temperature,
- ORP
- Turbidity, and,
- total organic carbon (TOC).

During pumping, water samples will be collected daily in 40-ml septum vials and 250-ml high-density polyethylene bottles and transferred to EES-14 for TOC and anion analyses. Samples will be submitted unfiltered and without acid preservatives. During the pumping phase of well development all parameters will be measured in a flow through cell.

2.7.3 Aquifer Testing

If the decision is made to test aquifer properties within installed screened interval(s), NWI shall collect and record aquifer test data consistent with requirements in the NWI-developed and LANL-approved procedures technically equivalent to Pumping Tests, EP-ERSS-SOP-5039. These tests will be conducted by LANL subcontractor David Schafer and Associates. A NWI field staff member will be present during aquifer testing to oversee and record field activity, and to assist David Schafer and Associates.

LANL will provide the stainless steel pipe to install the pump for the aquifer test. Prior to conducting the aquifer test of the screened zone, NWI will collect both water level and local barometric data over a period of 2 days. Barometric data from LANL meteorology towers will be used as the source of barometric measurements. An additional day will be allowed to optimize pumping rates, collect additional early test data, and to fill the discharge pipe. A suitable pump and discharge pipe will be installed in the well and the discharge pipe will have check valves installed. Inflatable packers will be used to isolate the screened zones and to reduce casing storage effects. Non-vented transducers will be used during aquifer testing. The pumping phase of the aquifer test will run for 24 hours, followed by 24 hours of collection of water level recovery data. Characterization samples, if required, will be collected by NWI staff at the end of each day. Water quality parameters will be measured in a flow-through cell, and TOC levels will be verified at the end of the aquifer test.

2.7.4 Sampling System Installation

Upon completion of well development and aquifer testing activities, a dedicated sampling system including pump, discharge pipe, additional plumbing, wiring, control panel, etc. will be installed in the well. The dedicated sampling system will meet the specifications mandated in MTOA Section 4.8, and a design schematic of the sampling system will be submitted to LANL for approval prior to ordering the system. The dedicated sampling system technical specifications and installation procedures are described below.

The pump system is planned as a dual screen completion with a submersible pump. A stainless steel check valve will be installed to protect against backflow. Any materials that will contact groundwater samples will be constructed of stainless steel or Teflon, although brass check valves may be used in the discharge pipe above the static water level. A 1-in ID, passivated stainless steel pipe will be used as the discharge pipe and a weep valve will be installed approximately 20 ft bgs to prevent freezing of water within the discharge pipe. Two 1-in ID strings of polyvinyl chloride (PVC) pipe will be installed above the top of the pump, but below the anticipated minimum water level. One pipe will be used for the installation of a dedicated transducer, an In Situ LevelTroll™, and the other will be used for checking the water level manually with a water level tape. The bottom 1.5 ft of the PVC pipe will be slotted and a closed end-cap will be installed. In addition, a weather-resistant pump control box will be installed adjacent to the wellhead.

2.7.5 Surface Completion

Surface completion shall be performed consistent with NWI-developed and LANL-approved procedures technically equivalent to SOP-5032 no later than 30 days after the completion of well development.

The monitoring well surface completion for R-3 will include a 16-in I.D. (16.75-in OD) steel casing to protect the stainless steel monitoring well and associated sampling equipment/cabling. The protective casing will be installed to a minimum depth of 3 ft bgs, and the top of the protective casing will be set at 3 ft above ground surface (ags). A 0.5-in diameter weep hole will be drilled in the base of the protective casing to prevent accumulation of water inside. The top of the protective casing will be fitted with a tamper-proof well cover plate and will be set in a 10-ft × 10-ft × 6-in-thick reinforced concrete pad (2,500 psi, minimum). The surface pad will be outsloped so that meteorologic waters will drain away from the protective casing. Four bright yellow removable safety bollards will be set near the edges the pad around the wellhead. The bollards will serve as traffic barriers but will allow access during well sampling or maintenance. A brass survey marker will be placed in the northwest corner of the pad, approximately 1 ft from the edges of the pad, and stamped with the well name, completion date, and ground surface elevation. Figure 2.7-2 shows the projected well head and surface completion details.

A New Mexico licensed Professional Land Surveyor will survey the horizontal location and elevation of the permanent brass marker, the top of the well casing, the top of the protective outer casing, and the ground surface of the completed well. Data provided by the surveyor will be in North American Datum of 1983 State Plane Coordinate, and elevation in relation to mean sea level (National Geodetic Vertical Datum of 1929). The accuracy of the survey data will be 0.1 ft for horizontal position and to the nearest 0.01 ft for vertical elevations. Survey data will be on file with NWI and provided in the well fact sheet and the well completion report.

2.8 Investigation-Derived Waste

Ordering of sample paperwork from the SMO will be coordinated with the LANL waste generator. Investigation-derived waste (IDW) will be managed in accordance with SOP EP-SOP-5328, “Characterization and Management of Environmental Program Waste” (http://www.lanl.gov/environment/all/qa/adep.shtml). This SOP incorporates the requirements of applicable USEPA and NMED regulations, DOE orders, and Laboratory requirements. The primary waste streams include drill cuttings, drilling water, development water, purge water, decontamination water, and contact waste.

Drill cuttings will be managed in accordance with the WCSF and the NMED-approved “NOI Decision Tree for Land Application of IDW Solids from Construction of Wells and Boreholes” (NMED 2007). Drilling, purge, and development waters will be managed in accordance with the NMED-approved “NOI Decision Tree for Drilling, Development, Rehabilitation, and Sampling Purge Water” (NMED 2006). Initially, drill cuttings and drilling water will be stored in lined pits. The contents of the pits will be characterized with direct sampling following completion of drilling activities, and waste determinations will be made from validated data in accordance with the WCSF included in Table 2.8-1. If validated analytical data show these wastes cannot be land-applied, they will be removed from the cuttings pit, containerized, and placed in accumulation areas appropriate to the type of waste. Cuttings, drilling water, development water, and purge water that cannot be land-applied and are designated as hazardous waste will be sent to an authorized treatment, storage, or disposal facility within 90 days of containerization.

Development water, purge water, and decontamination water will be containerized separately at their point of generation, placed in an accumulation area appropriate to the type of waste, and directly sampled. Contact waste will be containerized at the point of generation, placed in an appropriate accumulation area, and characterized using acceptable knowledge of the media with which it came in contact and then properly disposed in accordance with the WCSF (see Table 2.8-1).

2.9 Site Restoration

Upon completion well construction activities and final demobilization, the contractor will perform the site restoration activities including grading, seeding, and/or replacement of vegetation per the contractor's Engineering Design Standards on seeding and site stabilization and the site-specific approved SWPPP.

3.0 REFERENCES

29 CFR 1910.120, 2002, Title 29, "Labor," Part 1910, "Occupational Safety and Health Administration," Subpart H, "Hazardous Materials," Section 1910.120, "Hazardous Waste Operations and Emergency Response," *Code of Federal Regulations*, Office of the Federal Register.

LANL, 2007, *2007 Interim Facility-Wide Groundwater Monitoring Plan*, LA-UR-07-3271, EP2007-0277, Los Alamos National Laboratory, May 2007.

LANL, 2009. "Exhibit D, Scope of Work and Technical Specifications, Drilling and Installation of Well R-51, R-52, and R-29 at LANL," Task Order 3 # 72006-003-09 in accordance with the Master Task Order Agreement, Los Alamos National Laboratory, Los Alamos, New Mexico (release date 9/10/09).

LANL, 2009, Security Plan

NMED, 2006, "NOI Decision Tree for Drilling, Development, Rehabilitation, and Sampling Purge Water," New Mexico Environment Department, November 2006.

NMED, 2007, "NOI Decision Tree for Land Application of IDW Solids from Construction of Wells and Boreholes," New Mexico Environment Department, November 2007.

North Wind, 2009, "Environmental Programs-Wide Environmental Health and Safety Plan for Projects at Los Alamos National Laboratory, Revision 3," North Wind, Inc., January 2009.

North Wind, Inc., 2009. "Environmental Programs-Wide Standard Operating Procedures for Los Alamos National Laboratory, Revision 0," January, 2009.

North Wind, 2009, "Environmental Programs-Wide Quality Assurance Plan for Projects at Los Alamos National Laboratory, Revision 0," North Wind, Inc., January 2009.

North Wind, 2009, "Site-Specific Environmental Health and Safety Plan Drilling and Installation of Wells R-29, R-51, and R-52," NWI-10005-003, In support of Task Order 3 In accordance with Master Task Order Agreement # 72006-000-09, North Wind, Inc., November 2009.

NWI ENVP-002, Sample Handling, Packaging and Shipping, Rev. 1, North Wind, Inc.

NWI ENVP-004, Collection of Quality Control Samples, Rev. 1, North Wind, Inc.

NWI ENVP-005, Design, Installation, and Development of Monitoring Wells, Rev. 2, North Wind, Inc.

NWI ENVP-006, Groundwater Sampling, Rev. 3, North Wind, Inc.

NWI ENVP-007, Water Level Measurements, Rev. 2, North Wind, Inc.

NWI ENVP-014, Sampling Equipment Decontamination, Rev. 1, North Wind, Inc.

NWI ENVP-021, Chain of Custody Documentation, Rev. 4, North Wind, Inc.

NWI LWI-001, Geologic Logging of Cuttings and Core, Rev. 0, North Wind, Inc.

NWI LWI-004, Contract Geophysical Logging, Rev. 0, North Wind, Inc.

NWI LWI-010, Filtering and Chemical Preservation of Water Samples, Rev. 0, North Wind, Inc.

NWI LWI-011, Transportation and Admittance of Borehole Materials to the Field Support Facility, Rev. 0, North Wind, Inc.

SOP EP-SOP-5238, “Characterization and Management of Environmental Program Waste” (http://www.lanl.gov/environment/all/qa/adep.shtml).

Table 1.1-1
NWI Project Staff and Roles

Clear and unambiguous lines of authority and responsibility for safety matters are established and maintained at all organizational levels.

Role	Name	Description
Project Manager (PM)	Doug Jorgensen, PMP	Responsible for ensuring all project activities are performed safely and within applicable requirements.
Field Operations Manager (FOM)	Heather Smith, PG Brennon Orr Eric Whitmore	Primary communicator between the NWI integrated team and LANL STR. Responsible for the protection of employees, the public, and the environment. In addition, the FM shall be responsible for following: 1) oversee the day-to-day drilling and drilling-related operations; 2) manage the project field drilling operations, execute the work plan and schedule, enforce safety procedures and site controls, and document drilling field activities; and, 3) ensure that all personnel under their supervision clearly understand their authority, responsibility, and are accountable with Conduct of Operations requirements.
Lead Geologist (LG)	Dan Osbourne Greg Kinsman Tom Klepfer Diane Oshlo Mike Whitson Andrew Feltman Stephen Thomas	Provides oversight for drilling activities, monitoring well installation, and general site management/oversight services including monitoring field conditions. In addition, the LG will be responsible for geologic logging and sample collection, waste management, daily field progress reporting, and interacting with the LANL STR.
Environmental Health & Safety Representative (HSR)	Jason Barkell Or approved alternate	The HSR, as part of the field team, shall be dedicated on-site. Personnel and shall work closely with CONTRACTOR management personnel to implement and administer SUBCONTRACTOR'S approved SSEHASP.
Health and Safety Director (HSD)	Bruce Miller	Corporate HSD responsible for NWI HSPs and SSHASP approvals.
Environmental Professional	Melanie Lamb	Implements and administers SUBCONTRACTOR'S required environmental deliverables and CONTRACTOR'S environmental requirements.
Geologist/Sample Technician	Bill Larzelere Kyle Morgan Desiree Staires Randall Boyle Liz Mockbee Donny Jaramillo	Perform general field activities including sampling, logging, documentation, drilling oversight, and waste management per the LG and the WMC.
Waste Management Coordinator (WMC)	Kim Oman	Responsible for segregation, characterization, packaging and management of waste generated by the project; Provides real-time support to the field team; Prepares packages for shipment, as necessary.

Table 1.1-1 (Continued)

Role	Name	Description
Waste Management (WM) Technician	Angela Trujillo	Assists the LG and field team with supervision and implementation of waste management requirements and shall be directed in their work by the WMC.
Quality Assurance (QA) Specialist	Kitty Gandee Melanie Lamb	Assists the LG and field team with supervision and implementation of quality assurance requirements.

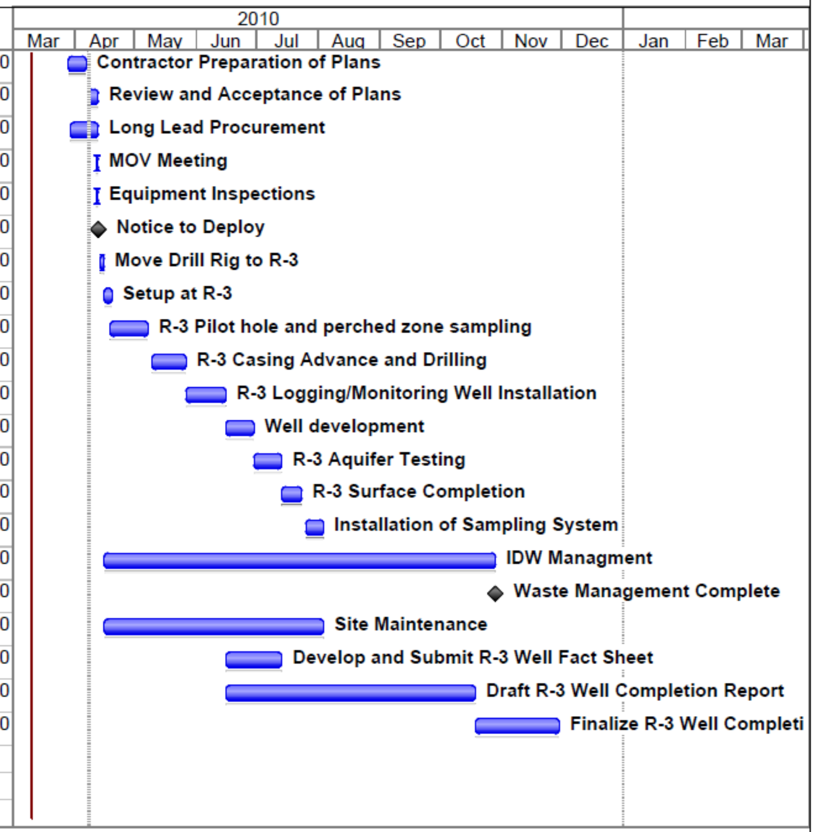
Table 1.1-2
LANL Project Staff and Roles

Role	Name	Description
Procurement Specialist	Terry Forrester	The Procurement Specialist is the authority that directs commercial or technical changes to any subcontract.
STR	Robin Reynolds (lead) Marvin Gard Dave Anderson Jim Thomson	The STR is the LANS employee with technical and performance oversight of the subcontractor's scope of work including, but not limited to, engineering, procurement, safety, quality, schedule, and coordinated execution of the work that is carried out by the subcontractor. The STR has no authority to direct commercial or technical changes to any subcontract.
Technical Lead	Mark Everett	Technical expert on-site
Environmental Health and Safety point of contact (POC)	Dave Dixson Oliver Wilton	LANS environmental safety oversight
Shift Operations Managers	Steve Pearson Greg Helland	Logistics oversight
Waste Generator	Bennie Martinez	The waste generator is the LANS employee whose act or process produces hazardous waste or whose act first causes a hazardous waste to become subject to regulation.
Waste Management (WM) Coordinator	Dave Mikkelson	The LANS WM Coordinator shall provide support as follows: 1) responsible for the segregation, characterization, packaging and management of all waste forms generated by the project; 2) provide real-time support to the field team; and, 3) prepare packages for shipment, as necessary.

Table 1.1-3
Drilling Schedule

Los Alamos National Laboratory - Drilling Services
Task Order 4 - Regional Monitoring Well R-3

ID	Task Name	Duration	Start	Finish
1	Contractor Preparation of Plans	7 days	Mon 3/29/10	Tue 4/6/10
2	Review and Acceptance of Plans	3 days	Thu 4/8/10	Mon 4/12/10
3	Long Lead Procurement	10 days	Tue 3/30/10	Mon 4/12/10
4	MOV Meeting	1 day	Mon 4/12/10	Mon 4/12/10
5	Equipment Inspections	1 day	Mon 4/12/10	Mon 4/12/10
6	Notice to Deploy	0 days	Tue 4/13/10	Tue 4/13/10
7	Move Drill Rig to R-3	2 days	Wed 4/14/10	Thu 4/15/10
8	Setup at R-3	2 days	Fri 4/16/10	Mon 4/19/10
9	R-3 Pilot hole and perched zone samplin	15 days	Mon 4/19/10	Fri 5/7/10
10	R-3 Casing Advance and Drilling	13 days	Mon 5/10/10	Wed 5/26/10
11	R-3 Logging/Monitoring Well Installation	14 days	Thu 5/27/10	Tue 6/15/10
12	Well development	10 days	Wed 6/16/10	Tue 6/29/10
13	R-3 Aquifer Testing	10 days	Wed 6/30/10	Tue 7/13/10
14	R-3 Surface Completion	8 days	Wed 7/14/10	Fri 7/23/10
15	Installation of Sampling System	7 days	Mon 7/26/10	Tue 8/3/10
16	IDW Managment	141 days	Fri 4/16/10	Thu 10/28/10
17	Waste Management Complete	0 days	Thu 10/28/10	Thu 10/28/10
18	Site Maintenance	78 days	Fri 4/16/10	Tue 8/3/10
19	Develop and Submit R-3 Well Fact Shee	20 days	Wed 6/16/10	Tue 7/13/10
20	Draft R-3 Well Completion Report	90 days	Wed 6/16/10	Mon 10/18/10
21	Finalize R-3 Well Completion Report	30 days	Tue 10/19/10	Mon 11/29/10



North Wind, Inc. Drilling Schedule
Start Date 3-29-10
Finish Date 11-29-10

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

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Table 2.5-1
Sampling and Analysis Plan for R-3

Sample Type	Analysis	Lab	Method	Container	Preservative	Interval
Drill cuttings	Lithologic	N/A	Grab	chip tray #10 & #35 sieve and whole rock 200 ml to 300 ml plastic bags where sufficient	N/A	Every 5 ft
Perched zone water screening sampling	Metals/cations (dissolved & total)	EES-14	grab/airlift	1-liter poly	4°C	Any perched aquifer other than that expected at ~190-240 ft bgs corresponding to R-3i completion.
	Anions (dissolved)	EES-14	grab/airlift	1-liter poly	4°C	
	High explosives	GEL	grab/airlift	3 1-liter amber	4°C	
	VOCs	GEL	grab/airlift	2 40ml VOAs	HCl/4°C	
	Tritium	U of M	grab/airlift	500 ml poly	N/A	
Regional aquifer zone water screening sampling	N/A	N/A	N/A	N/A	N/A	N/A
Well development screening water (confirmation sample everyday)	pH	Field	Grab	N/A	N/A*	At each screen interval
	Specific conductance	Field	Grab	N/A	N/A	
	Temperature	Field	Grab	N/A	N/A	
	Turbidity	Field	Grab	N/A	N/A	
	TOC	EES-14	Grab	2 40ml VOAs	N/A	
Final well development water	TOC	EES-14	Grab	2 40ml VOAs	HCl/4°C	At each screen interval
Final aquifer test	Metals/cations (dissolved & total)	EES-14	Grab	1 liter poly	4°C	At each screen interval
	Anions (dissolved)	EES-14	Grab	1 liter poly	4°C	
	TOC	EES-14	Grab	2 40ml VOAs	HCl/4°C	

EES-14 = Earth and Environmental Sciences Division's Geochemistry, and Geomaterials Research Laboratory (formerly known as EES-14)
GEL = General Engineering Laboratory
U of M = University of Miami
TOC = total organic carbon
VOA = volatile organic analysis
VOC = volatile organic compound
SVOC = semivolatile organic compound

Notes: RAD swipes will be collected on all equipment downhole and parked on-site. Equipment will also be screened upon entering and exiting the site.
Rinsate samples will be collected on tanks not certified as clean.

* N/A = Not applicable.

Table 2.8-1
Waste Characterization for Well R-3

Waste Description	Waste # 1 Contact Waste	Waste #2 Drill cuttings	Waste #3 Drilling Fluids	Waste #4 Development Water	Waste #5- Decontamination Fluids
Volume	30 cy	80 cy	50,000 gallons	50,000 gallons	500 gallons
Packaging	Drums or roll-off bins	Lined pit or approved containers	Lined pit or approved containers	Approved Containers	Approved Containers
Regulatory Classification					
Radioactive (rad)	X	X	X	X	X
Solid	X	—	—	—	—
Hazardous	X	X	X	X	X
Mixed (hazardous and rad)	X	X	X	X	X
Toxic Substances Control Act	—	—	—	—	—
New Mexico Special Waste	—	—	—	—	—
Industrial	X	X	X	X	—
Sanitary Wastewater	—	—	—	—	X
Characterization Method					
Acceptable knowledge (AK): Existing Data/Documentation	X	—	—	—	X
AK: Site Characterization	—	—	—	—	—
Direct Sampling of Containerized Waste	—	X	X		X
Analytical Testing					
Volatile Organic Compounds (EPA 8260-B)	—	X	X	X	X
Semi volatile Organic Compounds (EPA 8270-C)	—	X	X	X	X
Organic Pesticides (EPA 8081-A)	—	X	X	X	X
Organic Herbicides (EPA 8151-A)	—	X	X	X	X
PCBs (EPA 8082)	—	—	X	X	—
Total Metals (EPA 6010-B/7471-A)	—	X	X1	X1	X
Total Cyanide (EPA 9012-A)	—	X	X2	X2	X
General (NO3+NO2, F, Cl, SO4, pH, microtox/COD/TSS/TDS/TTO, Oil and Grease)	-	X (nitrates if land applied)	X	X	X3
Perchlorates	—	X	X	X	X
High Explosives Constituents (EPA 8330/8321-A)	—	—	X	X	—
Asbestos	—	—	—	—	—
BTEX (EPA-8021b)	—	—	—	—	
Tot. pet. hydrocarbon (TPH)-GRO (EPA 8015-M) TPH-DRO (EPA-8015-M)	—	X (if visible stain)	—	—	—
Toxicity characteristic leaching procedure (TCLP) Metals (EPA 1311/6010-B)	—	X	—	—	—
TCLP Organics (EPA 1311/8260-B & 1311/8270-C)	—	—	—	—	—
TCLP Pest. & Herb. (EPA 1311/8081-A/ 1311/8151-A)	—	—	—	—	—
Radium 226 & 228 (EPA 9320)	—	X	X	X	—
Gross Alpha (alpha counting) (EPA 900)	—	X	X	X	X
Gross Beta (beta counting) (EPA 900)	—	X	X	X	X
Tritium (liquid scintillation) (EPA 906.0)	—	X4	X4	X4	X4
Gamma spectroscopy (EPA 901.1)	—	—	X	X	X
Isotopic plutonium (chem. separation/alpha spec.) (HASL-300)	—	X	X	X	X
Isotopic uranium (chem. separation/alpha spec.) (HASL-300)	—	X	X	X	X
Total uranium (6020 inductively coupled plasma mass spectroscopy [ICPMS])	—	—	—	—	—
Strontium-90 (EPA 905)	—	X	X	X	—
Americium-241 (Separation/alpha spec.) (HASL-300)	—	X	X	X	—

Table 2.8-1 (Continued)

Waste Description	Waste #6 Municipal Solid Waste	Waste #7 PCS	Waste #8 Concrete Chips and Concrete Slurry	Waste #9 Contaminated Storm Water	
				Waste #9a Secondary Containment Storm water, managed as Used Oil (recycled)	Waste #9b Secondary Containment Storm water, managed as Other
Volume	2 cy	<1 cy	30 cy	variable	variable
Packaging	Approved Containers	Approved containers	Approved Containers	Approved Containers	Approved Containers
Regulatory classification					
Radioactive	—	X	X	—	—
Solid	X	—	X	X (for recycle)	—
Hazardous	—	—	X	—	X
Mixed (hazardous and radioactive)	—	—	—	—	—
Toxic Substances Control Act (TSCA)	—	—	—	—	—
New Mexico Special Waste	—	X	—	—	—
Industrial	—	X	X	—	X
Characterization Method	—				
Acceptable knowledge (AK): Existing Data/Documentation	—	X	X	—	X
AK: Site Characterization	X	X (rad only)	X	—	—
Direct Sampling of Containerized Waste	—	X	X (as needed)	X	X
Analytical Testing					
Volatile Organic Compounds (EPA 8260-B)	—	X	—	X	X
Semivolatile Organic Compounds (EPA 8270-C)	—	X	—	X	X
Organic Pesticides (EPA 8081-A)	—	—	—	—	X
Organic Herbicides (EPA 8151-A)	—	—	—	—	X
PCBs (EPA 8082)	—	X	—	X	—
Total Metals (EPA 6010-B/7471-A)	—	—	X (if required by ENV-RCRA)	X	X
Total Cyanide (EPA 9012-A)	—	X	—	—	X
General (NO3+NO2, F, Cl, SO4, pH, microtox/COD/TSS/TDS/TTO, Oil and Grease)	—	—	—	—	X3
Perchlorates	—	—	—	—	X
High Explosives Constituents (EPA 8330/8321-A)	—	—	—	—	—
Asbestos	—	—	—	—	—
BTEX (EPA-8021b)	—	—	—	—	—
Total petroleum hydrocarbon (TPH)-GRO (EPA 8015-M) TPH-DRO (EPA 8015-M)	—	X	—	X	—
TCLP Metals (EPA 1311/6010-B)	—	X	—	—	—
TCLP Organics (EPA 1311/8260-B & 1311/8270-C)	—	X	—	—	—
TCLP Pest. & Herb. (EPA 1311/8081-A/ 1311/8151-A)	—	X	—	—	—
Radium 226 & 228 (EPA 9320)	—	—	—	—	—
Gross Alpha (alpha counting) (EPA 900)	—	X	—	—	—
Gross Beta (beta counting) (EPA 900)	—	X	—	—	—
Tritium (liquid scintillation) (EPA 906.0)	—	X4	—	—	—
Gamma spectroscopy (EPA 901.1)	—	X	—	—	—
Isotopic plutonium (chem. Separation/alpha spec.) (HASL-300)	—	X	—	—	—
Isotopic uranium (chem. Separation/alpha spec.) (HASL-300)	—	X	—	—	—
Total uranium (6020 inductively coupled plasma mass spectroscopy [ICPMS])	—	—	—	—	—
Strontium-90 (EPA 905)	—	X	—	—	—
Americium-241 (chem. Separation/alpha spec.) (HASL-300)	—	X	—	—	—

1-FILTERED METALS REQUIRED FOR LAND APPLICATION (EXCEPT HG)
2-FILTERED CYANIDE FOR LAND APPLICATION
3-ANALYZE FOR MICROTOX//COD/TSS/TDS/Oil and Grease and pH for SWWS Plant; include TOC , Total Nitrogen, and Total Nitrates for RLWTF.
NOTE: If LANL does not have an available Microtox Analysis facility to handle the Microtox analysis, this analysis may not be required and may be accepted by the SWWS sanitary wastewater plant on a case-by-case basis.
4-TRITIUM ANALYSIS: Request TRITIUM ANALYSIS, H3 not LLH3, with a 30 DAY TURNAROUND.

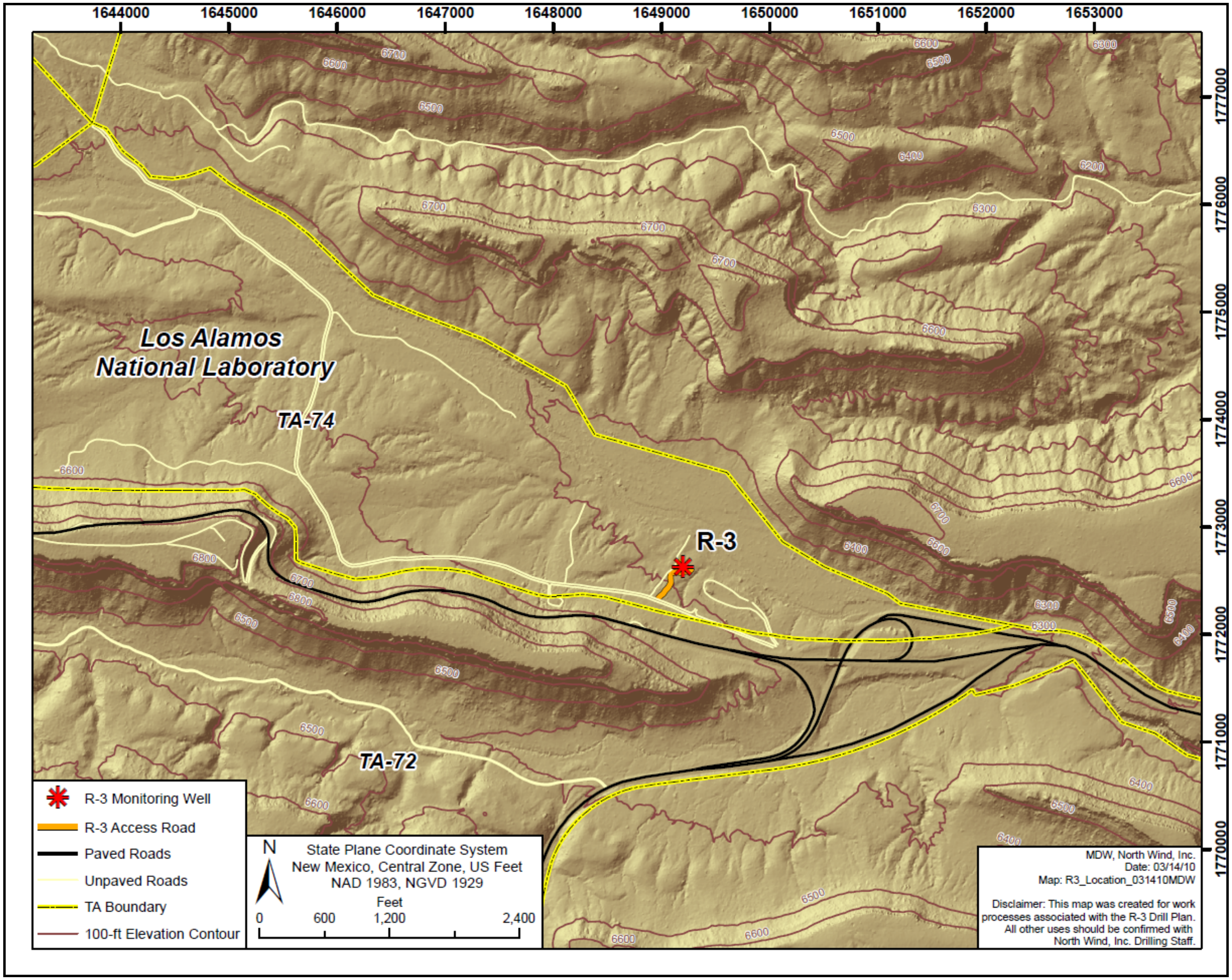

Figure 1.0-1 - Location of Well R-3 at TA-74.

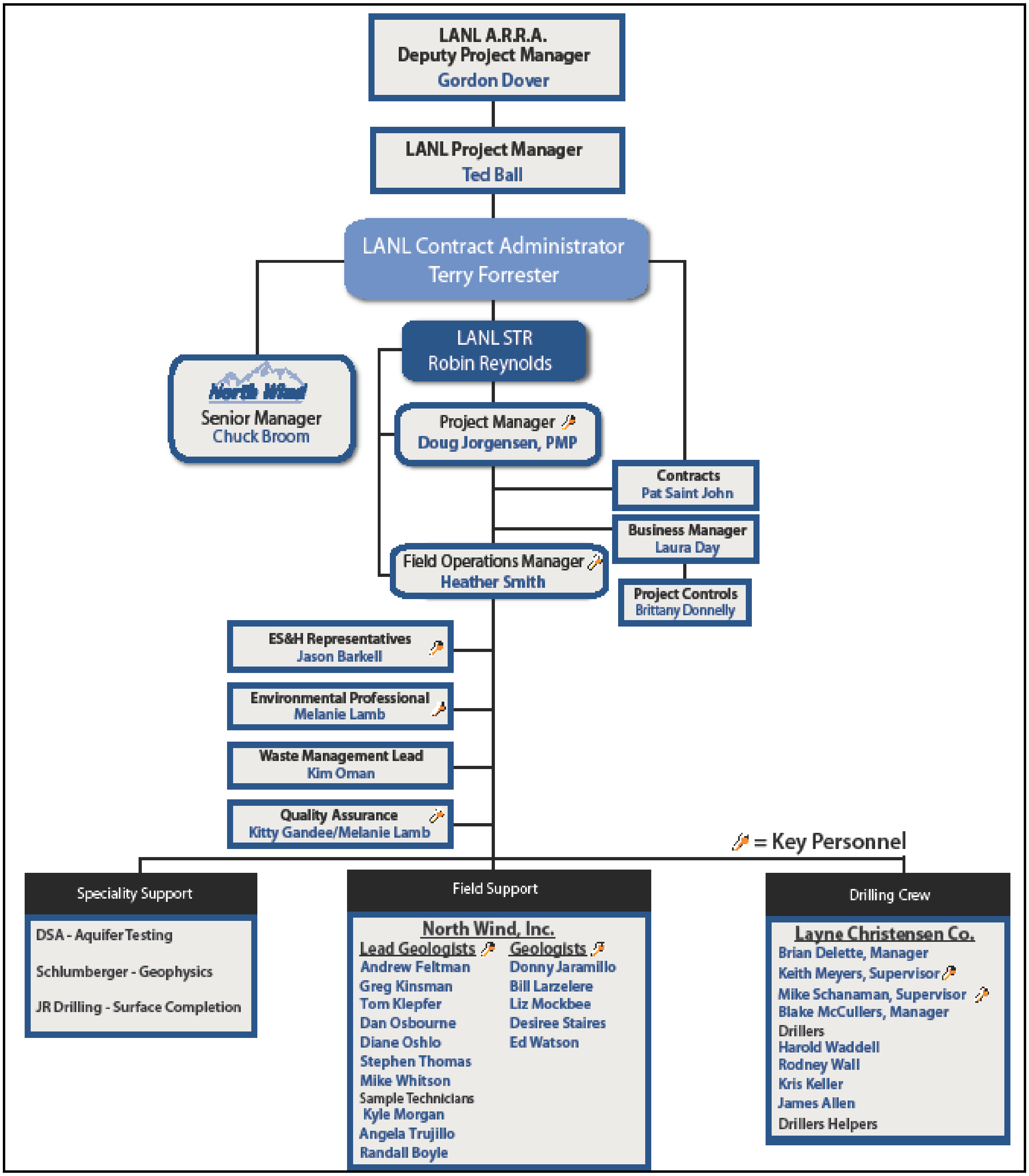

Figure 1.1-1 Project field organization chart.

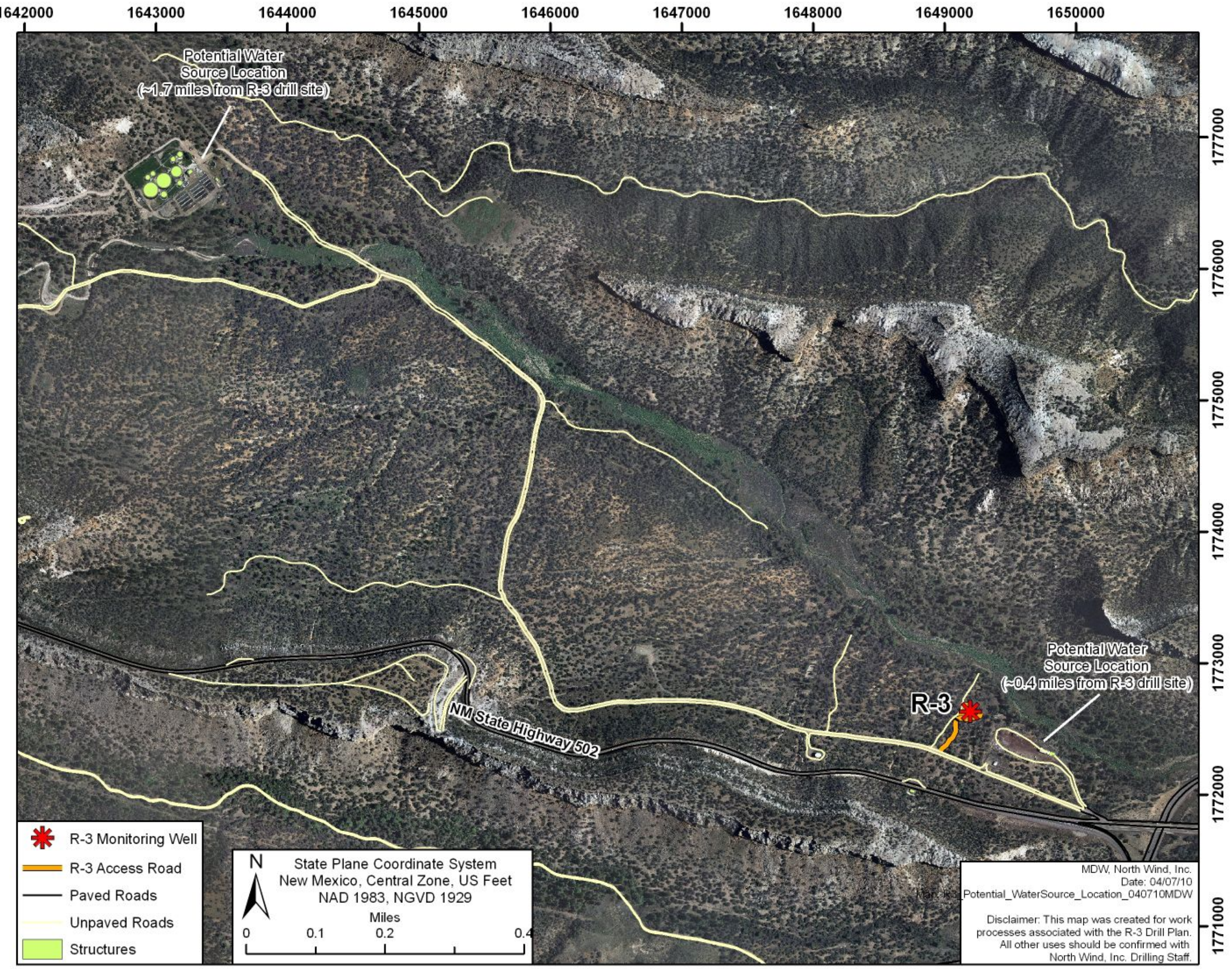

Figure 2.1-1 Water source location for the R-3 drill site.

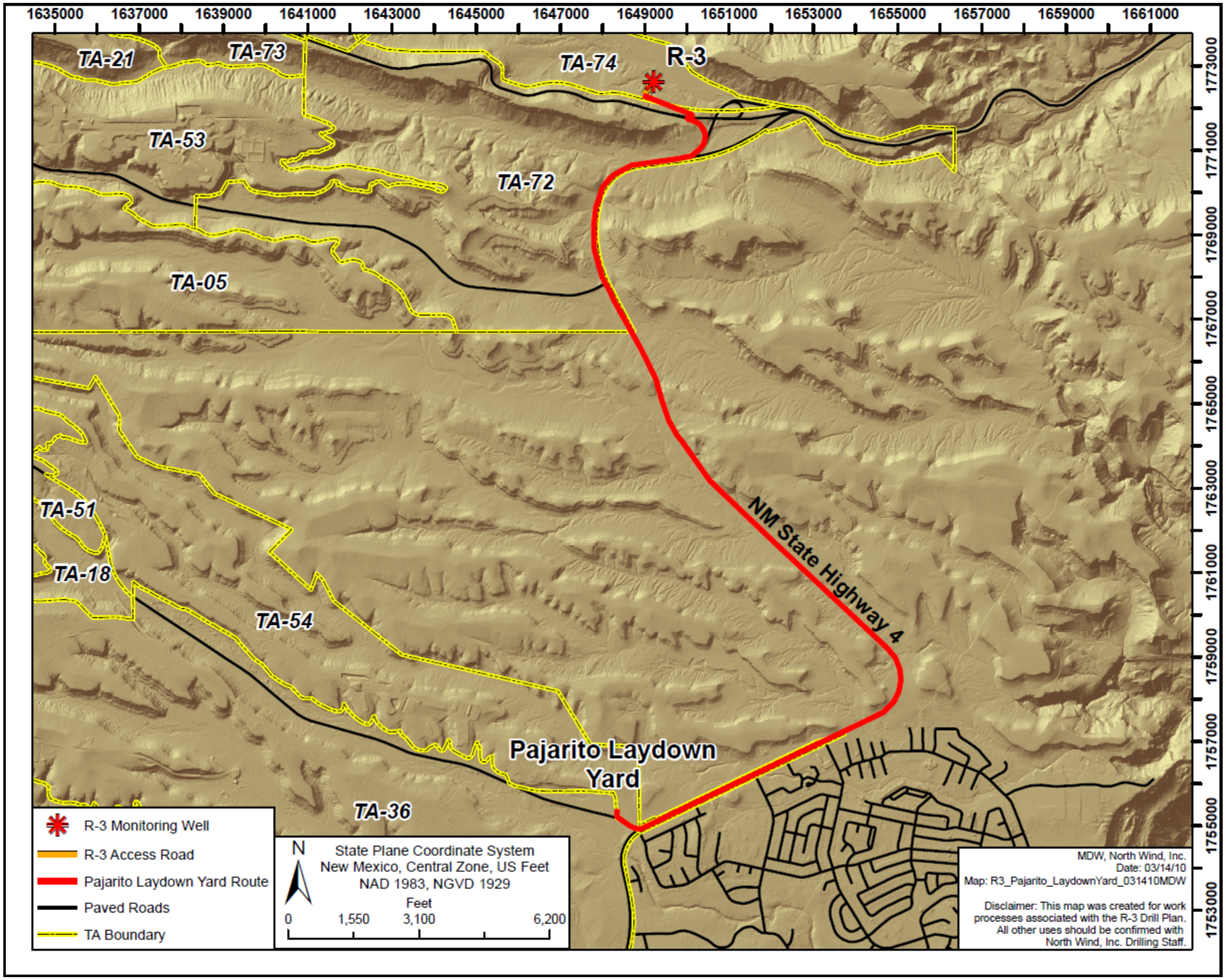

Figure 2.1-2 Route to the Pajarito lay-down yard from Well R-3.

Figure 2.2-1 Well R-3 site layout and dimensions.

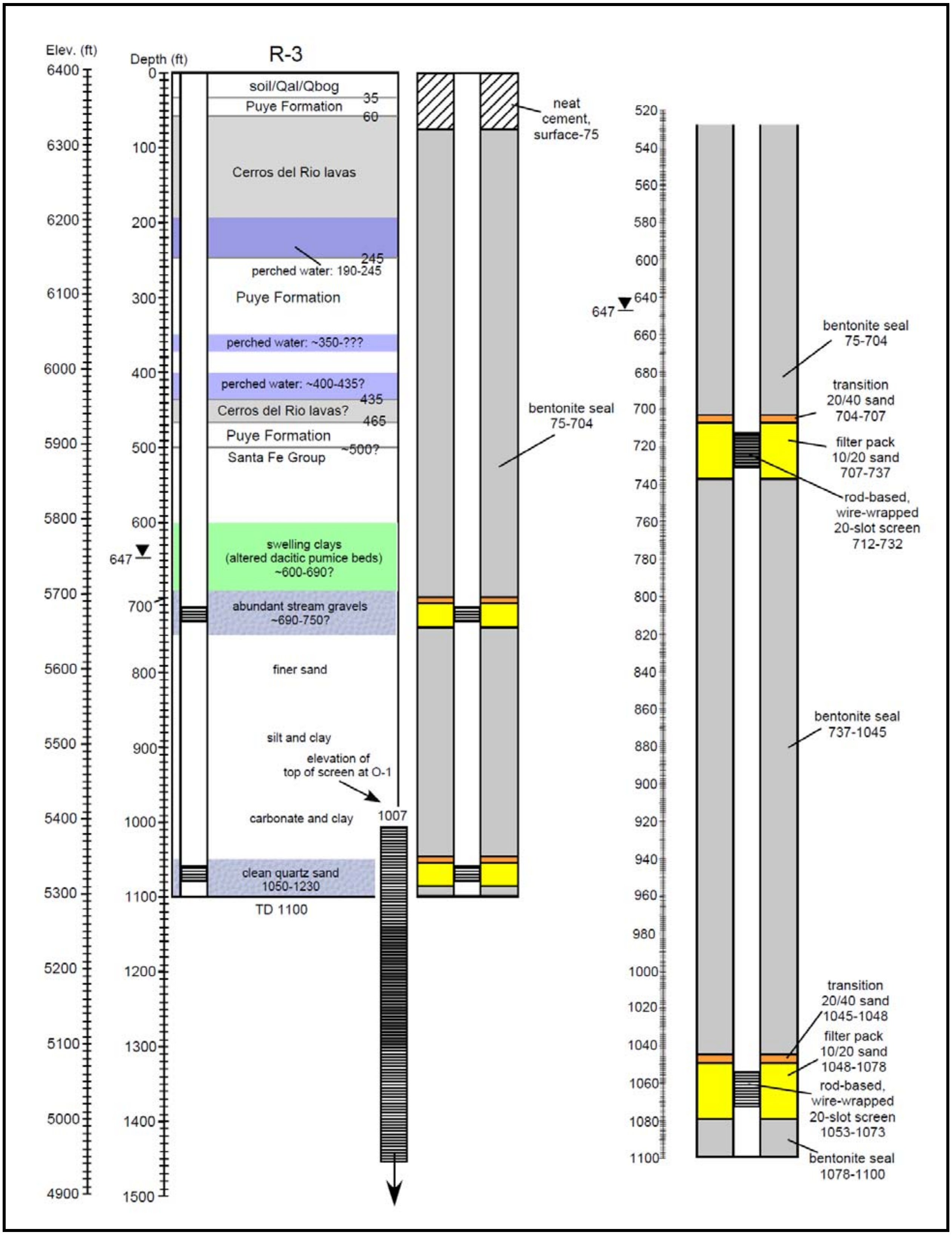

Figure 2.7-1 Proposed well design schematic for well R-3.

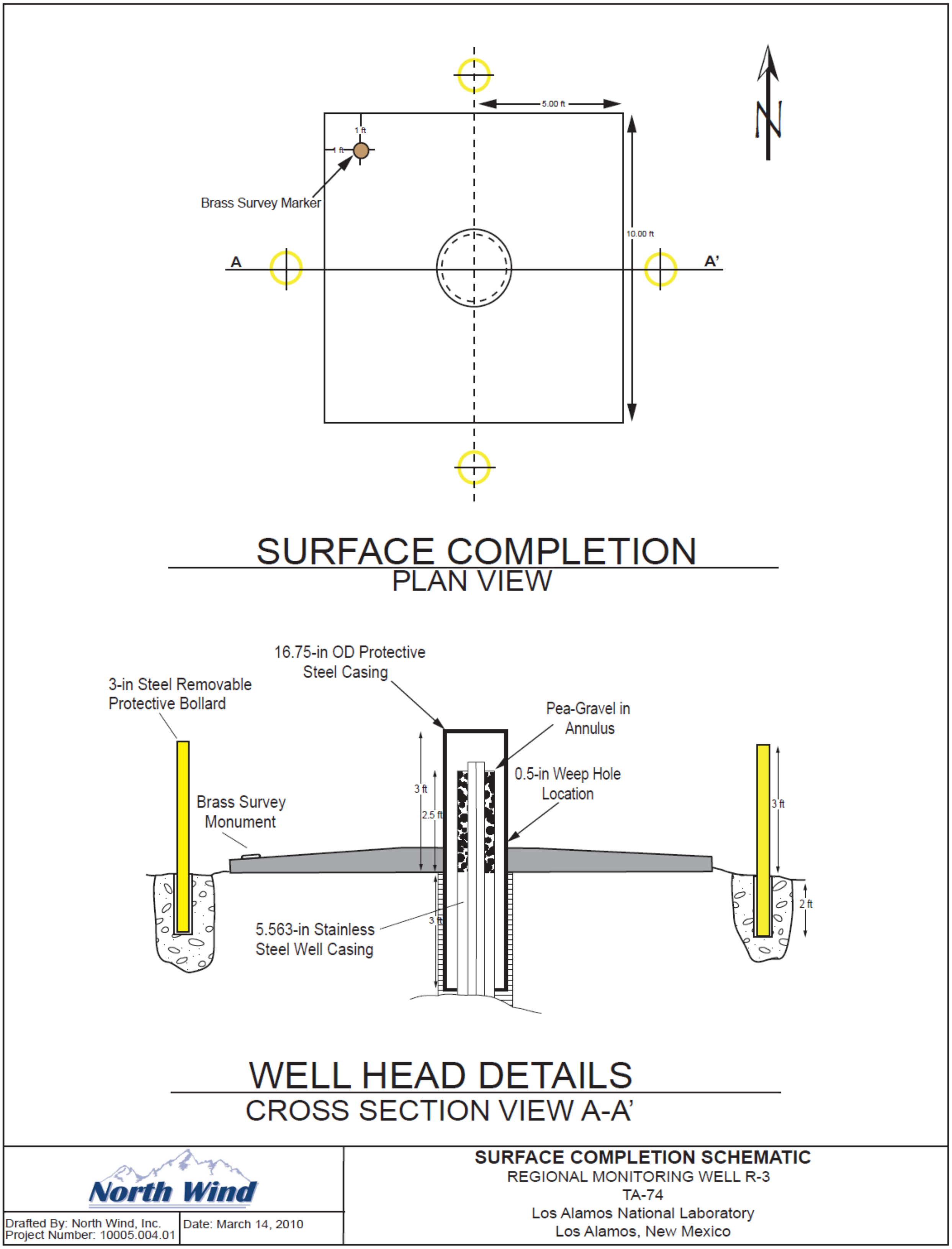

Figure 2.7-2 Surface completion schematic.

APPENDIX A

Drilling Forms for MTOA #72006-000-09

Task Order 4

North Wind

ANNUAL/BOREHOLE FILL

Provide all depth measurements with respect to ground surface

Site Name: ____________________ Project No.: ____________________

Location: ____________________ Document Originator: ____________________

Lead Company: ____________________ Document Reviewer: ____________________

Supporting Company: ____________________ Review Complete: ____________________

Start Date/Time: ____________________ End Date/Time: ____________________

ANNULAR BOREHOLE FILL

Each column represents a different backfill lit. A backfill lit is defined by a change in backfill material or borehole diameter.

	LIFT 1	LIFT 2	LIFT 3	LIFT 4	LIFT 5	LIFT 6
Tagged bottom Depth (ft)						
Tagged Top Depth (ft)						
Annular Material						
Annular material Function						
Hole Diameter						
Begin Date						
End Date						
Calc Volume (ft^3)						
Actual Volume (ft^3)						

ANNULAR BOREHOLE FILL (continued)

Each column represents a different backfill lit. A backfill lit is defined by a change in backfill material or borehole diameter.
Please refer to ALB-WI-1.5 for annular material and annular material function options.

	LIFT 7	LIFT 8	LIFT 9	LIFT 10	LIFT 11	LIFT 12
Tagged bottom Depth (ft)						
Tagged Top Depth (ft)						
Annular Material						
Annular Material Function						
Hole Diameter						
Begin Date						
End Date						
Calc Volume (ft^3)						
Actual Volume (ft^3)						

Comments:

BACKFILL TALLY SHEET (Cover Page)

Provide all depth measurements with respect to ground surface

Site Name: ____________ Project No.: ____________
Location: ____________ Document Originator: ____________
Lead Company: ____________ Document Reviewer: ____________
Supporting Company: ____________ Review Complete: ____________

Lift No.: ________ Lift Function: ________ Type of Backfill: ________
Start Date: ________ End Date: ________ Backfill delivered via: ☐ Tremie ☐ Freefall

TARGET LIFT VALUES

Borehole Diameter ________ in. Well/Piezometer OD: ________ in. Annular Area Calc: ________ ft^3/ft
Target Lift Interval ________ to ________ ft bgs. Target Volume Calc: ________ ft^3/ft
Calc material to be added (bags, etc.): ____________

ACTUAL LIFT VALUES

Actual Lift Interval ________ to ________ ft bgs. Actual Material Added (bags, etc.) ________

Calculated Volume (Based on actual lift interval): ________ ft^3 *(input this date point on Annular Borehole)*

Actual Volume of Final Interval: ________ ft^3 *(input this date point on Annular Borehole)*

Use Reference Sheet for Calculations

Pour #	Targeted Interval (ft bgs)	Volume Calculation (cu ft)/Material Calculation (bags, pail, super sacks, etc.)	Actual Material Added (United defined by FTL)	Water Used (gals.)	Tremie Depth (ft bgs)	Actual Tag (ft bgs)

BACKFILLTALLY SHEET (Continued)

Provide all depth measurements with respect to ground surface

Site/Screen Name: ____________________ Project No.: ____________________

Location: ____________________ Review Complete: ____________________

Lift No.: ____________ Type of Backfill: ____________ Date: ____________

Pour#	Targeted Interval (ft bgs)	Volume Calculation (cu ft)/Material Calculation (bags, pails, super sacks, etc.)	Actual Material Added (Units Defined by FTL)	Water Used (glas.)	Tremie Depth (ft bgs)	Actual Tag (ft bgs)

North Wind

BOREHOLE STATUS FORM

To be filled out by drilling engineer or site geologist

Site Name: ____________ Project No.: ____________

Location: ____________ Document Originator: ____________

Lead Company: ____________ Document Reviewer: ____________

Supporting Company: ____________ Review Complete: ____________

Logging Date: ____________

Well Status: ☐ Open Hole ☐ Completed ☐ Other: ________

Number of Concentric Casing(s): ____________ Current Borehole Depth: ________ ft. bgs

Borehole Summary Table						
Casing Top Depth (ft)						
Casing Bottom Depth (ft)						
Casing Inside Diameter (in.)						
Casing Wall Thickness (in.)						
Casing Type/Material						
Bit Size (in.)						
From (ft)						
To (ft)						
Cement Plugs						
From (ft)						
To (ft)						

Type of Fluid in Hole: ☐ Groundwater ☐ QUIK-FOAM ☐ EZ-MUD ☐ No Fluid

Fluid Level: ________ ft. bgs

Fluid Level Determined: ☐ Estimated ☐ Measured Measured With: ____________

Other Materials in Hole:

	From		To		ft.
	From		To		ft.
	From		To		ft.

Reason for Running Log:

Comment:

Page ______ of ______

North Wind

CONSTRUCTION TALLY SHEET (Cover Sheet)

Provide all depth measurements with respect to ground surface

Site Name: ____________ Project No.: ____________

Location: ____________ Document Originator: ____________

Lead Company: ____________ Document Reviewer: ____________

Supporting Company: ____________ Review Complete: ____________

Begin Date: ____________ Item to be Installed ☐ Well ☐ Piezometer ☐ Pump

End Date: ____________ Anchor of Screen(s) Top/Bottom: ________ ________ ft.

ITEM TO BE CONSTRUCTED

						Estimated Depth at Top of Component	Cent
Sump	End Cap/ Bullnose	Mid Body (ft)	Coupler (ft)	Joint Length (MB+C)	Total Length	Total Depth	

STACK	Joint No.	Mid Body (ft)	Coupler (ft)	Joint Length (MB+C)			Cent

Stack Verified By:

STACK	Joint No.	Mid Body (ft)	Coupler (ft)	Joint Length (MB+C)			Cent

Stack Verified By:

STACK	Joint No.	Mid Body (ft)	Coupler (ft)	Joint Length (MB+C)			Cent

Stack Verified By: ____________

Page Totals		

North Wind

CONSTRUCTION TALLY SHEET (Continued)

Provide all depth measurements with respect to ground surface

Site Name: ____________________ Project No.: ____________________

Location: ____________________ Review Complete: ____________________

Date: ____________________

Totals from previous page		

STACK	Joint No.	Mid Body (ft)	Coupler (ft)	Joint Length (MB+C)			Cent

Stack Verified By:

STACK	Joint No.	Mid Body (ft)	Coupler (ft)	Joint Length (MB+C)			Cent

Stack Verified By:

STACK	Joint No.	Mid Body (ft)	Coupler (ft)	Joint Length (MB+C)			Cent

Stack Verified By: ____________________

Page Totals		

North Wind

DAILY DRILL RIG INSPECTION CHECKLIST

Technical Area: **SSHASP No.** **Date ____ / ____ / ____**

√ - Denotes Good Condition **D – Denotes Deficiency**

		COMMENTS
CAB		
____	Fire Extinguisher (5ABC minimum)	__________
____	F/E Inspected and Charged	__________
____	Lights	__________
____	Mirrors	__________
____	Gauges all functional	__________
____	Seat & belts in working order	__________
____	Cab kept neat & clean	__________
____	Window glass free of cracks	__________
ENGINE		
____	Engine operation	__________
____	Lubrication done regularly	__________
____	No fluids leaking from rig	__________
DRIVE TRAIN		
____	Tires in good condition – No loose lug nits	__________
____	Brakes in working order	__________
____	Back-up alarm functional	__________
CONTROLS		
____	All Emergency switches working	__________
____	Pressure gauges functioning	__________
____	Safety relief working	__________
____	Weight indicator working	__________
____	All hoses in good condition	__________
____	All drill controls working	__________
DRILLING EQUIPMENT		
____	Hoses in good condition	__________
____	Tools in working order	__________
____	Jacks in working order	__________
____	Solid footing for rig and jacks	__________
____	All equipment guards in place	__________
____	Guards on sheaves to prevent line displacement	__________
____	Ropes in good condition (no cuts, worn sports, burns, etc.)	__________
____	Cables in good condition	__________
____	Hooks, slings, shackles free of cracks, corrosion, deformation, and signs of overloading or excessive wear	__________
____	Hooks all have safety latches (except auger lifting hook)	__________
____	Augers/rods in good condition	__________
____	Auger/rod pins and bolts in good condition	__________
____	Crown block and sheaves secured to mast	__________
____	Crown block and sheaves free of cracks, corrosion, deformation, missing components, and signs of overloading or excessive wear	__________
____	Sheave bearings properly lubricated	__________
____	Locking device on mast pivot points	__________
____	Bolts and nuts tight	__________
____	Cat head smooth & free of grooves	__________
____	Anti-fouling devices installed on all manual cat heads	__________
____	Guy lines in place	__________

Inspection Performed By: ____________________ Date: __________

North Wind

DAILY FIELD REPORT

Project No.: ____________ Date: ____________

Project/Well: ____________ Weather: ____________

Lead Company: ____________ Supporting Company: ____________

Location: ____________

Document Originator: ____________ Document Reviewer: ____________

Time On-Site: ____________ Time Off-Site: ____________

Personnel On-Site		Equipment On-Site	
Name	Company	Name	Description

Description of Daily Activities and Events

Total Water Volume Used:		Total Water Volume Injected Down Borehole:
Total Fuel Delivered:	Gallons Diesel:	Gallons Gasoline:
Comments:		

North Wind

DAILY FIELD REPORT

Project No.: ____________ Date: ____________

Project/Well: ____________ ____________

Lead Company: ____________ Supporting Company: ____________

Location: ____________

Document Originator: ____________ Document Reviewer: ____________

Deviations from Planned Activities (Include reason for deviation)

LANL Support Needed for Next Shift

North Wind

FORKLIFT INSPECTION RECORD

MACHINE #:	MODEL:
MAKE:	DATE:
HOUR METER READING:	ENGINE OIL ADDED (QTS.):
INSPECTOR/OPERATOR:	

NO.	ITEM TO BE CHECKED	OK	REPAIR REQUIRED?	DATE OF REPAIR	REPAIRED BY
1.	Check oil and coolant levels for leaks				
2.	Check belts and radiator hoses for condition				
3.	Check hydraulic hose and fitting condition				
4.	Check exhaust system for leaks				
5.	Check tire condition and pressure				
6.	Check battery connections and mounting				
7.	Check electrical system				
8.	Check condition of forks-presence of cracks				
9.	Check steering system operation				
10.	Check for loose/missing bolts, guards, etc.				
11.	Check fire extinguisher				
12.	Clean windshield				
13.	Check for proper operation of all instruments and gauges				
14.	Check for operation of back-up alarm				
15.	Check boom angle and length indicator				
16.	Service and parking brake for proper operation				
17.	Ensure proper lubrication				
18.	Check for load capacity chart				
19.	Ensure warning and operation decals are readable				
20.	Ensure control panel markings are readable				
21.	Check that operator manual is with machine				
22.	Ensure that forks stay level with machine				
23.	Check attachments				
24.	Check condition and operation of all controls				
25.	Check condition of seat belts and cab				
26.	Check boom sections for cracks and damage				
27.	Check all boom pins and pin retainers				
28.	Check hydraulic cylinders for leaks and damage				
29.	Check boom mounting				
30.	Check boom wear pads, guides, and rollers				
31.	Check condition and operation of outriggers				
	List needed supplies on back of sheet	Make any comments on back of sheet			

North Wind

LOG HEADER FORM

Fill out one form for each logging run

Site Name: ____________ Project No.: ____________

Location: ____________ Document Originator: ____________

Lead Company: ____________ Document Reviewer: ____________

Supporting Company: ____________ Review Complete: ____________

LOGGING EVENT INFORMATION

Logging Date: ______ Operator: ____________ Run Number: ______

☐ KA or COLOG Equipment ☐ LANL Logging Trailer ☐ SLB Logging Vehicle No.: ______

Logging Unit/Serial Number: ____________

Electronic File Name: ____________ Format: ____________

Start Time: ____________ End Time: ____________

Measuring Point Description: ☐ GL (Ground Level) *Default to Ground Level when suitable*

☐ Other ____________

Measuring Point to GL: ______ ft

Top Log Depth: ______ ft Bottom Log Depth: ______ ft

Log Run Through: ☐ Casing ☐ Annular Space ☐ Tremie ☐ Open Hole

GEOPHYSICAL LOG INFORMATION

Log Type:

☐ Triple Litho Density ☐ Compensated Neutron ☐ Caliper-Gamma Ray

☐ Platform Express ☐ Array Induction ☐ Spontaneous Potential

☐ Natural-Gamma Ray ☐ Magnetic Resonance ☐ Elemental Capture

☐ Fullbore Micro ☐ Other (See Logger Remarks)

Calibration Matrix (neutron only) ☐ *Dolomite* ☐ *Limestone* ☐ *Sandstone* ☐ *Not Applicable*

Null Value (if applicable)

Uniform Log Speed? ☐ Yes ☐ No Logging Depth Increment: ______ ft/min

Calibration Note/FTL Logger Remarks/Quality of Log:

VIDEO LOG INFORMATION

☐ *No Water Observed* ☐ *Water Observed*

Water Observed Entering At: ______ ft bgs ______ ft bgs ______ ft bgs

Quality of Log: ☐ Good ☐ Fair ☐ Poor

Quality Comment (Required for Fair or Poor):

FTL/Logger Remarks (Note any fluid encountered):

North Wind

MATERIAL TALLY SHEET

Page____ of ____

Site/Well Name: ______________________ Project No.: ______________________

Location: ______________________ Document Originator: ______________________

Lead Company: ______________________ Document Reviewer: ______________________

Supporting Company: ______________________ Review Complete: ______________________

Date	Time	Tool/Material Description	Length (ft)	String Length (ft)

North Wind

MATERIAL TALLY SHEET

Page____ of ____

Site/Well Name: ______________________ Project No.: ______________________

Location: ______________________ Document Originator: ______________________

Lead Company: ______________________ Document Reviewer: ______________________

Supporting Company: ______________________ Review Complete: ______________________

Date	Time	Tool/Material Description	Length (ft)	String Length (ft)

North Wind

PUMP INSTALLATION

Provide all depth measurements with respect to ground surface

Site Name: ____________________ Project No.: ____________________

Location: ____________________ Document Originator: ____________________

Lead Company: ____________________ Document Reviewer: ____________________

Supporting Company: ____________________ Review Complete: ____________________

INSTALLATION

Installation Company: ____________________

Installation Start Date: ____________________ Installation Time: ____________________

Installation End Date: ____________________ Installation End Time: ____________________

Intake Depth (ft bgs): ____________________

PUMP

Manufacturer: ____________________

Model: ____________________

Type: ____________________ Serial No.: ____________________

Stages: ____________________ Riser Diameter (in): ____________________

Pump Capacity (gal/min): ____________________ Pump Outer Diameter (in): ____________________

PUMP MOTOR

Manufacturer: ____________________

Model: ____________________ Serial No.: ____________________

Horsepower: ____________________ ____________________

TRANSDUCER

Transducer Tube Depth (ft): ____________________ Slot Interval (ft): ____________________

Internal Diameter (in): ____________________

VALVES

Valve Type:						
Valve Depth (ft bgs):						

Valve Type:						
Valve Depth (ft bgs):						

Comments:

North Wind

PUMP TEST TALLY SHEET (Cover Sheet)

Site/Screen Name: ____________ Project No.: ____________

Location: ____________ Document Originator: ____________

Lead Company: ____________ Document Reviewer: ____________

Supporting Company: ____________ Review Complete: ____________

Test Type: ____________

Date Test Started: ____________ Time Test Started: ____________

Date Test Ended: ____________ Time Test Ended: ____________

Pre-Test Static Water Level (ft): ____________

FLOW METER

Meter Type: ____________ Meter Serial No.: ____________

Initial Meter Reading (gal.):

Final Meter Reading (gal.): ____________ Total Gallons Pumped: ____________

PUMP

Pump Type: ____________

Pump Capacity (hp): ____________ Depth of Pump Intake (ft): ____________

PUMPING TEST

Date	Time	Elapsed Time (min) Incremental Cumulative	Flow Meter Reading (gpm)	Pumping Rate (gpm)

North Wind

Project Number:

Film Type: ______________________ Roll No. ______________

ASA Number: ______________________

Photo No.	Date	Time	Photographer	Weather Conditions	Location	Description of Photograph
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						

____

Photographer Name

North Wind

SURFACE COMPLETION

Provide all depth measurements with respect to ground surface

Site Name: ____________________

Location: ____________________

Lead Company: ____________________

Supporting Company: ____________________

Project No.: ____________________

Document Originator: ____________________

Document Reviewer: ____________________

Review Complete: ____________________

SURFACE PAD COMPLETION

Start Date: ____________________

End Date: ____________________

Pad Thickness: ____________________

Pad Width (ft): ____________________

Pad Length (ft): ____________________

Concrete psi: ____________________

Brass Marker Location: ____________________

Well Completion Depth (ft): ____________________

Placement Date: ____________________

MONUMENT COMPLETION

Outside Diameter (ft): ____________________

Inside Diameter (ft): ____________________

Monument Install Date: ____________________

Lock Install Date: ____________________

Well Name Stamped on Brass Market Date: ____________________

BOLLARD COMPLETION

Number Installed: ____________________

Installation Date: ____________________

Color Painted: ____________________

Painted Date: ____________________

North Wind

TAILGATE SAFETY BRIEFING

Job Site: ______________________ Date ______________

Field Supervisor: ______________________________________

Project Title: Project No:

Briefing Summary:

Work Scope and Schedule:

Hazards and Controls:

Personal Protective Equipment:

Safety & Health Documents:

Required Training:

Lessons Learned or Other Concerns:

Name (print)	Z Number	Signature	Date

WATER LEVEL MEASUREMENT TALLY SHEET (Cover Page)

Provide all depth measurements with respect to ground surface

Site/Screen Name: ____________________ Project No.: ____________________

Location: ____________________ Document Originator: ____________________

Lead Company: ____________________ Document Reviewer: ____________________

Supporting Company: ____________________ Review Complete: ____________________

Date	Time	Borehole or Well TD (ft bgs)	Drill Casing TD (ft bgs)	Measuring Point (ft ags)	DTW at Measuring Point (ft ags)	DTW (ft bgs)	Pre-DTW Activity (also record drilling fluids and volumes used)	Time Since Activity (hr)	Comments

North Wind

WELL/PIEZOMETER CONSTRUCTION

Provide all depth measurements with respect to ground surface

Site Name:	______	Project No.:	______
Location:	______	Document Originator:	______
Lead Company:	______	Document Reviewer:	______
Supporting Company:	______	Review Complete:	______

ITEM TO BE CONSTRUCTED ☐ Well ☐ Piezometer

PRODUCTION CASING

Each Column represents difference casing. Production casing is defined by a change in casing type, inner diameter, outer diameter, casing material and joint type. Please refer to ALB-WI-1.4 for casing type, casing material, and joint type options.

Begin Install Date						
End Install Date						
Casing Type						
Casing Length (ft)						
Bottom Depth (ft)						
Inner Diameter (in)						
Outer Diameter (in)						
Casing Material						
Joint Type						

CENTRALIZER

Each column represents centralizer information.

Provide all depths (ft)						
Material (S or SS)						

SCREENED INTERVAL

Each column represents a different screened interval. Please refer to ALB-WI-1.4 for screen type, screen material, and joint type options.

Screen Designation:						
Install Date						
Screen Type						
Screen Material						
Open Type Depth (ft)						
Open Bottom Depth (ft)						
Inner Diameter (in)						
Outer Diameter (in)						
Slot Size (in)						
% Open Area Per ft						
Joint Type						

APPENDIX B

Security Plan for TA-74, R-3 Well Installation

Security Plan for TA-74, R-3 Well Installation

Well R-3 is located within TA-74 off the main road to the Los Alamos County sewage treatment plant. The gate to the treatment plant is locked outside of normal business hours. Security control will be maintained as follows:

- The R-3 drill site will be accessed using the ESH-247 key at the Los Alamos County sewage treatment plant gate off State Route 501.
- The gate will be locked after normal business hours except during site access. Locks will be daisy-chained together.
- Names and Z Numbers of all personnel on site will be maintained during site operations.
- Site personnel and visitors will be required to sign the on-site tailgate safety briefing log maintained by NWI.

APPENDIX C

Traffic Control Plan

Traffic Control Plan

The drilling site is on an undeveloped road that is used to access LANL water sampling locations. The drill site will be located on one side of the road while the laydown area will be on the other side of the road. As such, traffic control will be maintained as follows:

- At the R-3 drill site, signs will be posted to indicate that the speed limit is 15 mph during drilling operations and when pedestrians are present (see Figure 1.0-1).
- The road will be temporarily blocked during heavy equipment mobilization to ensure all vehicular and pedestrian traffic is accounted for.