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ESHID-601928

May 2016

FIELD IMPLEMENTATION PLAN FOR ALLUVIAL PIEZOMETERS IN SANDIA CANYON

Los Alamos
NATIONAL LABORATORY
EST. 1943

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Field Implementation Plan for Alluvial Piezometers in Sandia Canyon

May 2016

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CONTENTS

Tables

Figures

ACRONYM LIST

bgs	Below ground surface
DOE	Department of Energy
EPA	Environmental Protection Agency
ES&H	Environment, Safety and Health
FIP	Field Implementation Plan
ft	Feet or foot
FTL	Field Team Leader
FOD	Facility Operations Director
ID	Inside diameter
IDW	Investigation Derived Waste
in	inch
IWD	Integrated Work Document
LANL	Los Alamos National Laboratory
LANS	Los Alamos National Security
OD	Outside diameter
PIC	Person in charge
PM	Project manager
POC	Primary Point of Contact
PVC	Polyvinyl chloride
QA	Quality Assurance
RLM	Responsible Line Manager
SOP	Standard Operating Procedure
SOW	Statement of Work
STR	Subcontract Technical Representative
TA	Technical Area
TD	Total Depth
TPMC	TerranearPMC
VWT	Vibrating Wire Transducer
WCSF	Waste Characterization Strategy Form

1.0 INTRODUCTION

1.1 Background

TerranearPMC (TPMC) has been contracted to install a total of seventeen piezometers by Los Alamos National Security (LANS) Environmental Management (EM) Directorate. The alluvial piezometers, designated as Sandia Canyon Piezometer (SCPZ) 13 through 29, will be located within Los Alamos National Laboratory (LANL) Technical Area (TA) 72 in Los Alamos County, New Mexico (Figure 1). All work will be performed under the statement of work (SOW) and in accordance with a Compliance Order on Consent and the Drilling Work Plan for Alluvial Piezometers in Sandia Canyon (LA-UR-15-29446).

Fifteen piezometers will be installed in a series of transects located along the Sandia Canyon valley floor (Figures 1 and 2). Each transect will consist of three boring locations that span the alluvial-fill portion of valley floor where alluvial saturation would likely be present. The estimated maximum depth for the borings is expected to be approximately 60 ft. Each boring will be instrumented with three vertically discrete monitoring points using vibrating wire transducers (VWT). The VWT units will be directly buried within the borehole using sand pack around each instrument and bentonite emplaced to hydraulically separate each transducer. The lower-most instrument will be placed in the bottom of the borehole just above the bedrock contact, and each instrument above that will be separated by approximately 3 ft. Hand augers or a power auger will be used to install two additional upgradient piezometers to approximately 10 ft.

This Field Implementation Plan (FIP) provides guidance for drilling, VWT system installation, and surface completion. Project staff, health and safety, waste management, security, schedules, and required permits are also discussed in this document.

1.2 Objectives

As stated in the work plan for chromium plume center characterization, dated July 2015 (LANL 2015, 600615), the purpose of the piezometers is to evaluate infiltration over the portion of Sandia Canyon where it is believed that the majority of historical and present-day infiltration occurs. The overall objective of the piezometer configuration will be to evaluate the integrated area of infiltration over the proposed study area. The general approach will be to obtain pressure data at varying depths throughout the saturated portion of the alluvium. Pressure data will be used to refine the current hydrologic model for infiltration of effluent and other surface water sources in Sandia Canyon. The data will also be used to establish a baseline to compare with potential future changes that may occur either because of operational changes in effluent volumes or future remediation strategies that may include discharge of treated groundwater to Sandia Canyon above the infiltration zone monitored by the piezometers. An additional objective is to further constrain the upgradient extent of infiltration in Sandia Canyon.

The end-users of the data collected from this project will be LANL, DOE, NMED, and the general public.

2.0 ORGANIZATIONAL STRUCTURE

This project is being performed for LANS. The LANL Environmental Programs Drilling Subcontract Technical Representative (STR) will assist with obtaining the necessary LANL-required permits and assist with scheduling and logistical issues.

An organizational chart is presented in Table 1.

2.1 TPMC Project Management Team

The TPMC Management Team consists of the Program Manager, Project Manager (PM), Lead Field Geologist, Environment, Safety and Health (ES&H) Representative, and Quality Assurance (QA) Manager. The Management Team will review all task order work plans, ensure compliance with QA, ES&H plans, and perform project audits of ongoing work.

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

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

2.2 Field Team

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

During the drilling operations, there will be one onsite TPMC geologist. The geologist will be onsite full time to act as the Field Team Leader (FTL)/Person in Charge (PIC) and lead site geologist. Other TPMC team members will assist the FTL as needed. The lead field geologist will maintain field notes detailing daily site activities, compile and submit daily field reports, document down-hole tools and type/quantity of materials used during drilling and well construction, maintain and document pipe tallies, collect samples, conduct lithologic logging, document wastes generated, and conduct daily safety meetings and equipment inspections. The FTL/PIC will be the main point of contact at the site

Field operations will run 12-hours a day, seven days per week. Shift timing is yet to be determined. TPMC field team members will be interchangeable and their exact scheduling is expected to be flexible.

2.3 Drilling Subcontractor

Cascade Drilling will be the subcontractor supporting the drilling and piezometer installation. The drilling subcontractor will be responsible for site safety, ensuring that equipment is appropriate for the goals of the drilling project and in proper working order, and that daily drilling logs are maintained.

3.0 FIELD ACTIVITIES

Field activities, including borehole drilling, lithologic logging, VWT system installation, and surface completion will follow an approved Integrated Work Document (IWD). The Drilling Work Plan for Alluvial Piezometers in Sandia Canyon (LA-UR-15-29446) will be used to guide field operations and ensure all objectives are met.

A listing of relevant standard operating procedures (SOPs) for the field project is presented in Table 3.

3.1 Borehole Drilling

Drilling equipment and supplies for the completion of the project will be staged around the work site in an organized and secure manner. Surplus and/or inactive equipment and supplies may be stored at the R-43 well pad.

3.1.1 Mobilization

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

- Mobilize drill rig, trailers (if necessary), support vehicles, drilling tools and materials, and piezometer construction materials to the drill site.
- Stage alternative drilling tools and construction materials at the laydown yard.
- Entrance/exit radiological screening of all equipment and tooling by RP-1.
- Set up drill rig, trailers, support vehicles and tools at the location.
- Review scope of work and project-specific health and safety issues with crew.
- Complete all required training for all personnel.
- Obtain Facility Operations Director (FOD) Work Authorization, including rig inspection and IWD review.

The site will be accessed from south of E. Jemez Rd. The water source for the project has been identified as a fire hydrant near the Eco Station on E. Jemez Rd.

3.1.2 Drilling Methods

Fifteen of the seventeen boreholes will be drilled with a CME 75 Limited Access Rig (LAR) crawler-mounted auger rig and a selection of downhole tooling and support equipment. Hollow stem augers, 4.25-in. inside diameter (ID) / 8-in. outside diameter (OD), and drive samplers run on rods will be used for the drilling and coring.

Two piezometer boreholes, located further up canyon, will be hand augered with nominal 3-inch stainless steel hand augers and stainless steel extension rods or power augered with nominal 4-in. OD augers.

TPMC SOP-20069, R1, *Soil, Tuff, and Sediment Sampling,* will be used as a guide for drilling, coring, and hand augering.

3.1.3 Lithologic Logging

Drive samples during drilling will be collected for examination to determine lithologic characteristics. During hand/power augering, lithology will be based on characteristic changes in the quality of augering as well as on the recovered auger materials. Lithologic characteristics and relative moisture will be recorded on a lithologic log as per TPMC SOP-7006, *Field Logging, Handling, and Documentation of Borehole Materials*.

3.1.4 Groundwater Detection

Based on existing alluvial wells and piezometers in the area, the saturated thickness of alluvial groundwater is highly variable. Water-level variability is driven by hydraulic response to the daily variations in effluent discharge, periodic storm flows, and seasonality. The alluvial water level is anticipated to occur near the alluvium/bedrock interface, however, water may be encountered above the alluvium bedrock interface. In each borehole, water levels will be measured if present. Water levels will be measured in accordance with TPMC SOP-7008, R0, *Manual Groundwater Level Measurements*.

3.1.5 Decontamination

Subsequent to mobilizing the auger rig to the site, the rig and all down-hole tools will be inspected for cleanliness. Following completion of drilling activities, augers and sampling tools will be decontaminated with a wire brush followed by spraying with Fantastik® and wiping clean with paper towels. Investigation derived waste (IDW) accumulated during decontamination activities will be staged on site and characterized as determined by the Waste Characterization Strategy Form (WCSF).

Decontamination will be conducted in accordance with TPMC SOP-7007, R0, *Field Decontamination of Equipment*. IDW accumulated during decontamination activities will be staged on site and managed according to the WCSF.

3.2 Piezometer Installation and Construction

The alluvium/bedrock interface will establish the total depth (TD) of the piezometer boreholes. An estimated approximate depth for the drilled boreholes is 60 ft below ground surface (bgs), and approximately 10 ft bgs for the hand/power augered boreholes. The goal will be to identify the top of bedrock in each borehole, then backfill the borehole with bentonite to the base of alluvium to create a seal to ensure no preferential seepage occurs because of construction.

The fifteen piezometer boreholes drilled with the auger rig will consist of three VWT sets in each borehole. Each VWT will be installed in a 2-ft interval of 10/20 silica sand separated by a 1-ft interval of bentonite chips. The first (lowermost) VWT and sand interval will be placed at the alluvium/bedrock contact. The VWTs and backfill materials will be installed through the augers as the augers are retracted to prevent slough from entering the borehole and ensuring accurate placement of the VWTs and backfill materials.

The two hand/power auger piezometer boreholes will consist of two VWT sets in each borehole. Each VWT will be installed in a 2-ft interval of 10/20 silica sand separated by a 1-ft interval of bentonite chips. The first (lowermost) VWT and sand interval will be placed at the alluvium/bedrock contact. It may require several attempts to complete the auger holes to the specified depth depending on the presence of large cobbles or boulders within the alluvium. If the auger holes remain open, the VWTs and backfill materials will be installed. In the event that caving occurs, polyvinyl chloride (PVC) pipe will be used to stabilize the auger hole during VWT and backfill material installation.

A separate/unique data cable will be connected to each VWT and will reach beyond the surface of the borehole. The VWTs will be clearly labeled and will be lowered into the borehole using the manufactured communication cable. Moderate tension will be maintained on the communication cable throughout installation. Proper functioning of the VWTs will be confirmed after lowering and prior to initial backfilling. Material volumes will be calculated prior to emplacement and measured to verify depths as necessary throughout backfilling. Measurements will be made with either a

sounding line run through a tremie pipe or with PVC tubing. Bentonite seals will be carefully hydrated to prevent infiltration into the filter pack sand. Upon placement of the upper VWT and installation of the uppermost sand pack, the boreholes will be backfilled with hydrated bentonite chips to 0.5 ft bgs. TPMC SOP-7012, R0, *Well Construction*, will be used as a guide for piezometer installation and construction.

The predicted geology and conceptual design for installation of 3 transducers in a borehole is shown in Figure 3.

3.3 Surface Completion

The wellhead surface completion will include a 4-ft long 10-in. ID steel outer protective casing to protect the data cables and data logger. The protective casing will extend to approximately 1-ft bgs. Approximately 3 ft of pea gravel will be placed inside the protective casing. A weep hole will be installed at the base of the steel casing to prevent water build-up inside the protective casing. The top of the protective casing will be fitted with a LANL supplied tamper-proof well cover plate and will be set in a 3-ft by 3-ft by 0.5-ft-thick concrete pad. A brass survey monument, imprinted with well identification information, will be placed in the northwest corner of the pad. Wellhead surface completions will be constructed in accordance with SOP-7012, R0, *Well Construction*.

3.4 Demobilization

Demobilization activities will include:

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

The LANL STR will inspect the site prior to final demobilization of the drill crew. Final demobilization of the drill crew will not be permitted until the condition of the site is acceptable to the STR.

3.5 Investigation Derived Waste

IDW will be managed in accordance with an approved WCSF. This procedure incorporates the requirements of all applicable EPA and NMED regulations, DOE orders and Laboratory requirements. The primary waste streams include drill cuttings, contact waste and, potentially, decontamination water. Drill cuttings will be managed in accordance with the NMED-approved *Notice of Intent Decision Tree for Land Application of IDW Solids from Construction of Wells and Boreholes* (November 2007). Drill cuttings will be containerized and characterized with direct sampling. If they cannot be land-applied, the cuttings will be sent to an authorized treatment, storage, or disposal facility. Contact waste will be containerized and characterized based on the

waste determination of the drill cuttings. If decontamination water is generated, it will be containerized and characterized by direct sampling of the containerized waste.

A WCSF has been prepared by LANS in accordance with EP-DIR-SOP-10021, *Characterization and Management of Project Waste,* and will provide more detailed information on waste descriptions, quantities, handling, and disposition. All wastes generated during the Sandia Canyon piezometer installation project will be managed according to the WCSF.

Table 1
Piezometer Installation Project Organizational Chart

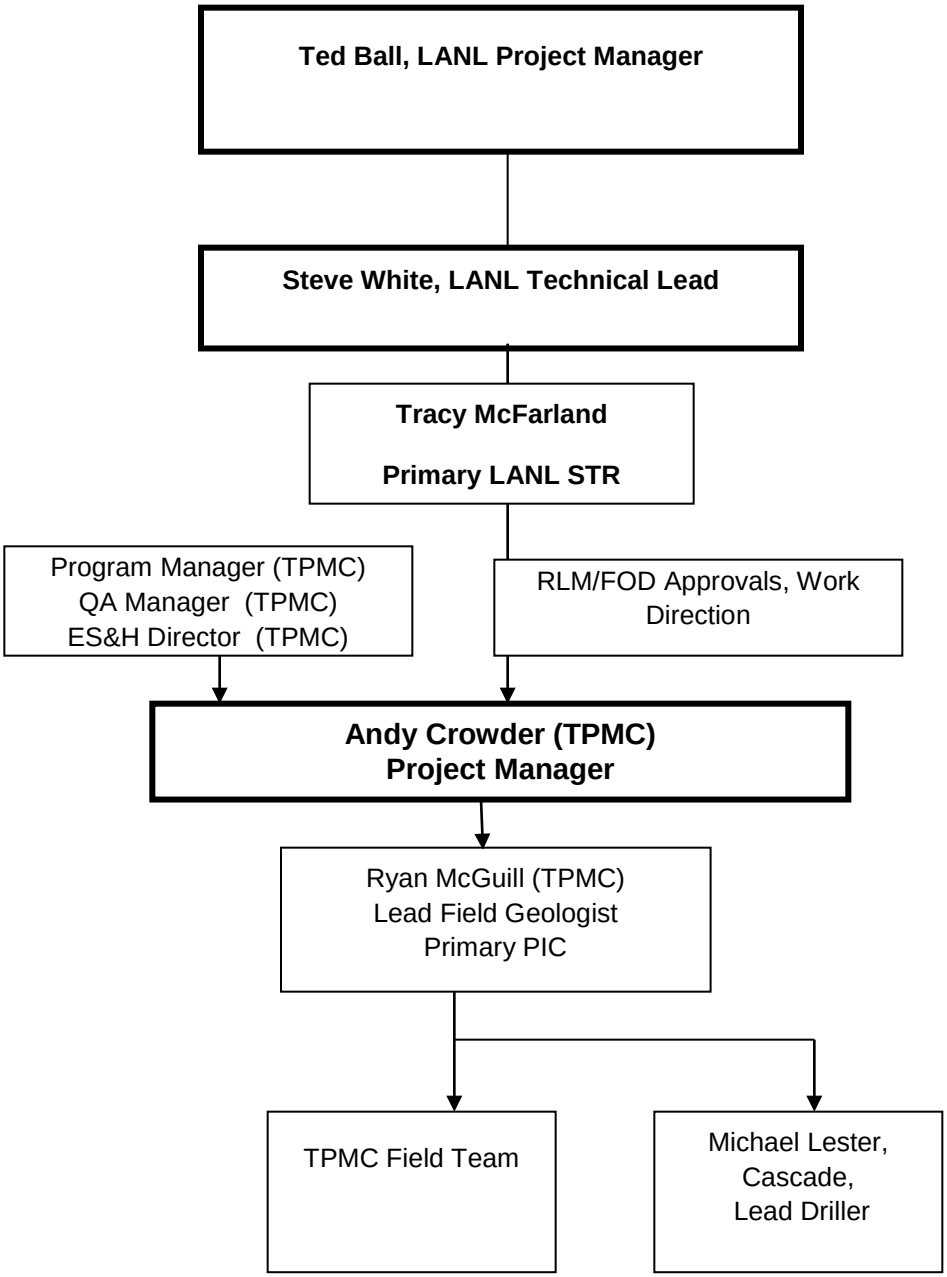

Table 2
Key Team Personnel Roles and Responsibilities

Name	Role	Responsibilities
Andy Crowder	Project Manager, Alternate Person in Charge (PIC)	Project management, budget, resource commitments, and LANS interaction
Ryan McGuill	Principal Field Team Leader (FTL), Primary PIC	Project and field management, LANS interaction, geology, and subcontractor coordination
Robert Brounstein	ES&H Professional	IWD and Health and Safety compliance
Al Whiteaker	Quality Assurance Manager	Quality assurance management oversight
Thomas Sower	Field Geologist, FTL/ Alternate PIC	Field management, geology, and subcontractor coordination
Evangelos Gletsos	Waste Team Leader, Waste Management Technician	Supervise field waste personnel
Michael Lester	Cascade Drilling, Lead Driller	Project and technical management oversight of drilling operations
Ted Ball	Project Manager	Responsible to the Program Director for the successful execution of the project.
Phillip Ulibarri	Facility Ops Director (FOD)	Facility Operations and Security Management/Coordination; When delegated authorizes and approves project work
Steve White	Drilling Project Technical Lead	Project leadership for overall drilling projects planning, coordination, oversight, execution and closeout for this project
Ashley Pryor	Subcontracts Specialist	Responsible for solicitation, negotiation, award, and administration of subcontracts and has overall commercial responsibility for respective subcontracts; designated authority to direct subcontractor
Tracy McFarland	Primary Point-of-Contact (POC), Subcontract Technical Representative (STR)	Responsible to the Project Manager for monitoring and documenting the subcontractor's day-to-day performance, providing day-to-day oversight, assuring work is performed in a safe manner. STR is the single Point-of-Contact for interaction between LANS and Subcontractor.

Table 3
TPMC/LANL Project Specific Standard Operating Procedures (SOPs)

SOP	Title
GL-LA-15-01, R0	Documentation of Field Activities
LANL EP-DIR-SOP-10021, R1	Characterization and Management of Environmental Programs Waste
SOP-7006, R0	Field Logging, Handling, and Documentation of Borehole Materials
SOP-7007, R0	Field Decontamination of Equipment
SOP-7008, R0	Manual Groundwater Level Measurements
SOP-7012, R0	Well Construction
SOP-20069, R0	Soil, Tuff, and Sediment Sampling

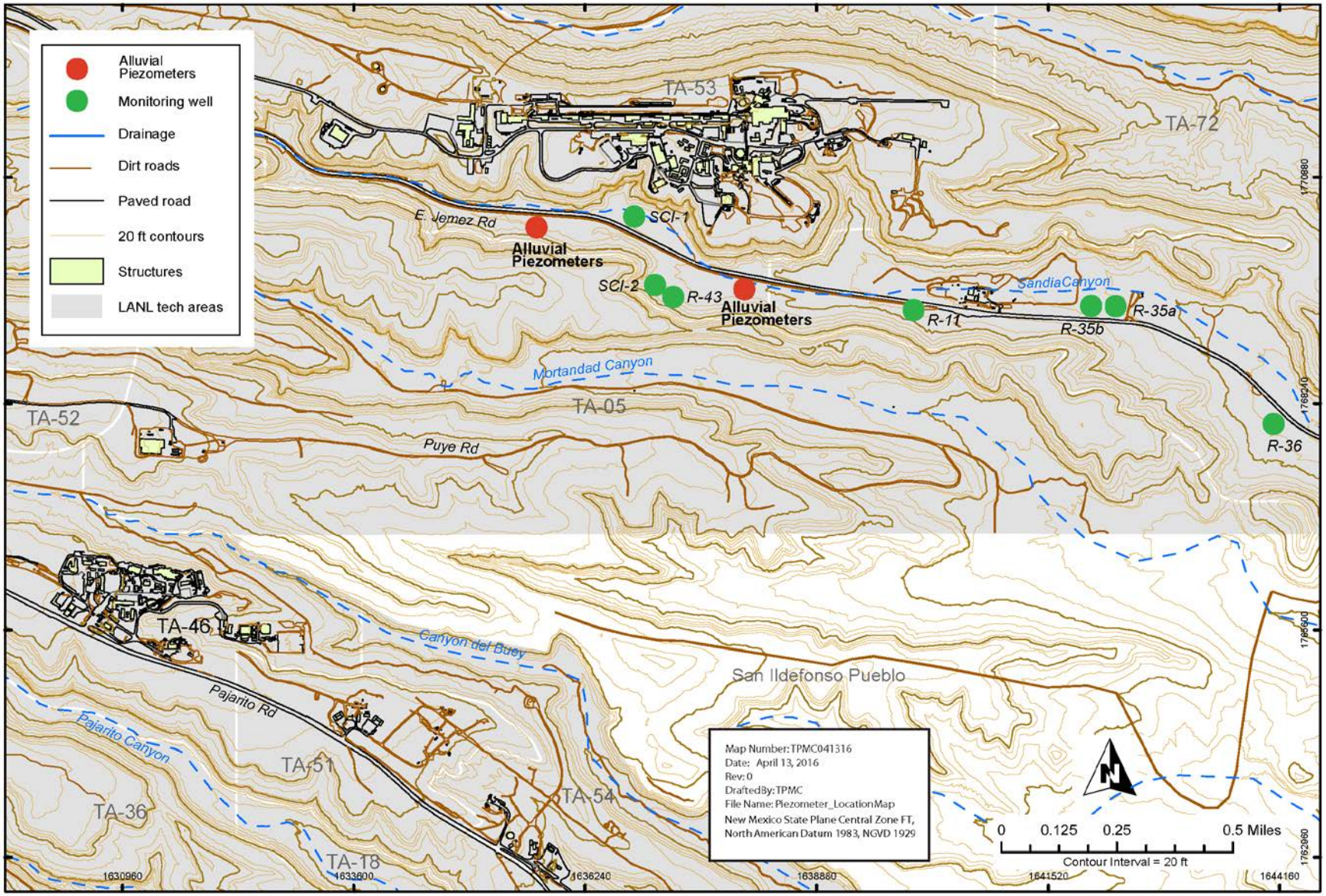

Figure 1 Proposed location for Sandia Canyon Alluvial Piezometers

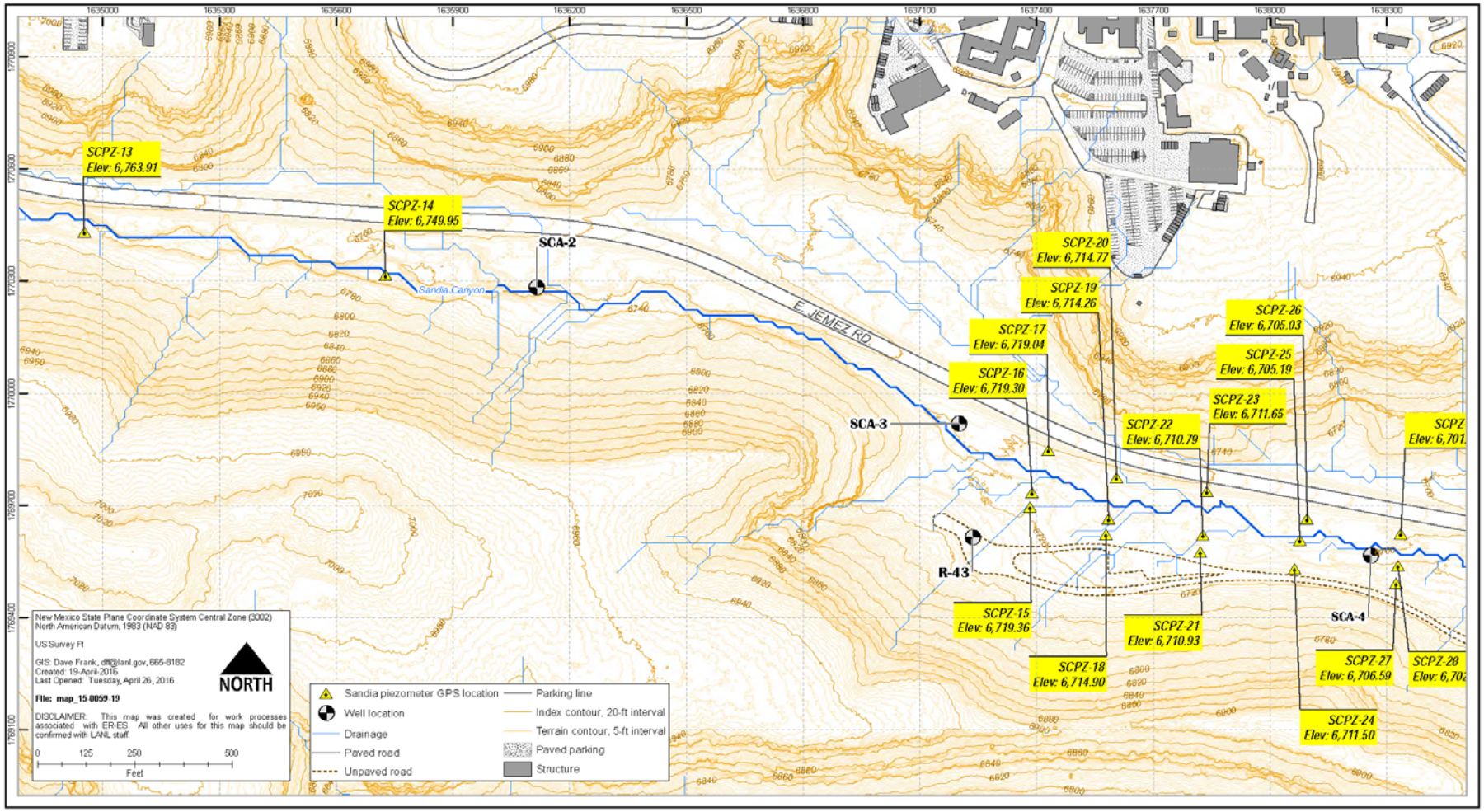

Figure 2 Proposed location for Alluvial Piezometer Transects and Upgradient Alluvial Piezometers

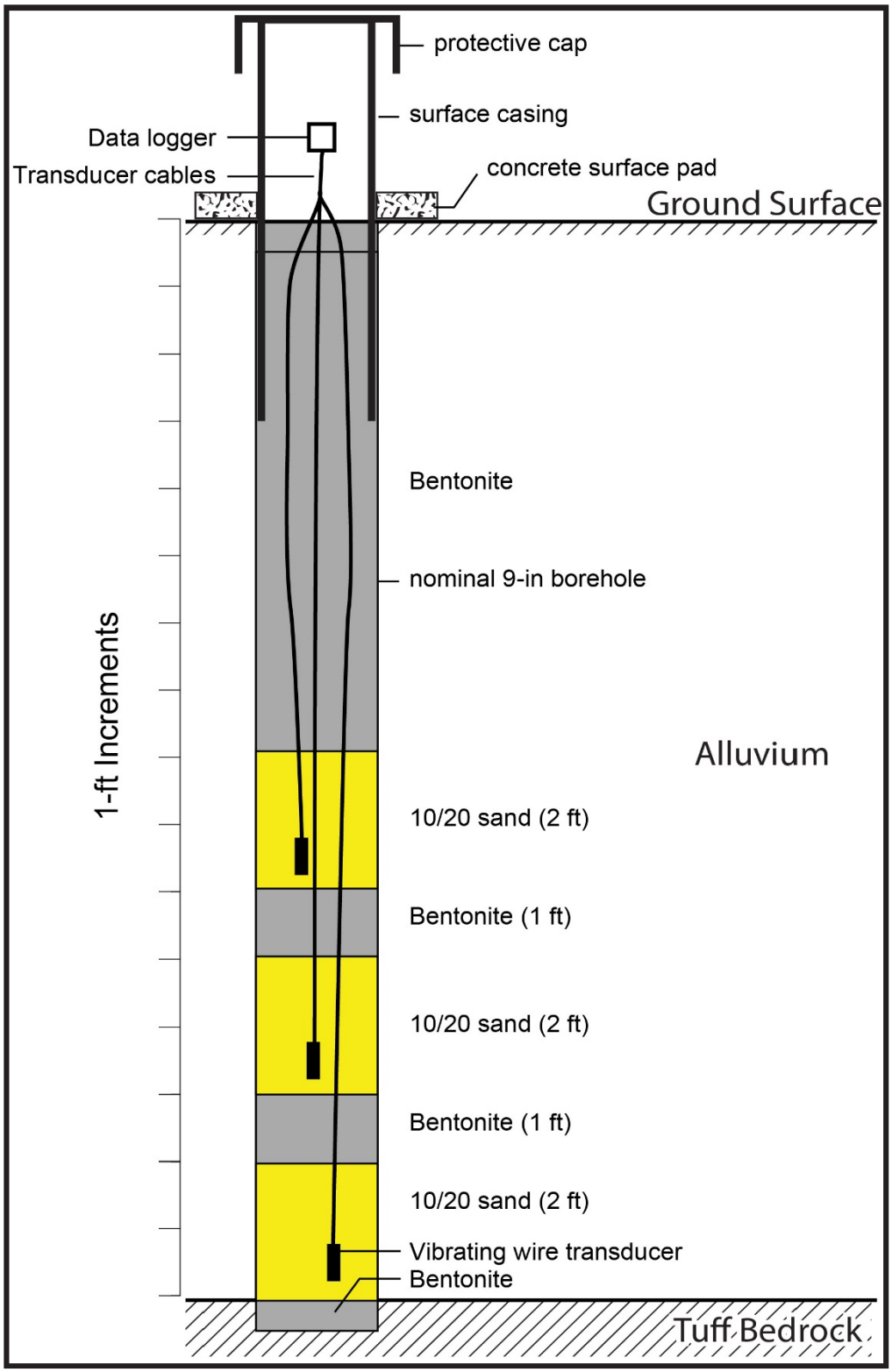

Figure 3 **Predicted geology and conceptual well design for piezometers**