ESHID-600129
June 2014

FIELD IMPLEMENTATION PLAN

WELL CrEX-1

Field Implementation Plan

CrEx-1

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1. INTRODUCTION

1.1 Site Location and Description

The CrEx-1 site is located at TA-05 and LANL, just off the road into Mortandad Canyon (Figure 1.1-1). For this project a large (200ft by 200ft) drill pad and laydown area will be cleared, leveled and base-coursed.

1.2 Access and Traffic Control

All drilling, well installation, well geophysics, well development, hydrologic testing, and pump installation activities will occur on the drill pad. All personnel working at the site shall wear a LANL badge and the required personal protective equipment (PPE). Support activities will occur at the Pajarito Laydown Yard (PLY), located immediately north of the junction of Pajarito Road and State Road 4, just west of White Rock, NM. Activities at the PLY are restricted to the hours of 7am to 10pm, seven days a week.

The drill pad will be adjacent to the pad containing the water treatment system and tank system

All field activities will be coordinated through the LANS Subcontract Technical Representative (STR). By 3pm on the day prior to onsite work, the STR will notify the Shift Operations Manager (SOM) and the TA-64 Operations Center (505/665-2824 or by LANS radio) of the plan for the next day. Work not on the plan-of-the-day cannot be conducted until the STR has been notified and approval given by the SOM.

Prior to arriving at LANL all of the subcontractor's major equipment should be cleaned and free of road grime and oil. Leaking equipment will not be allowed on LANL property other than the Pajarito Laydown Yard. Prior to mobilizing from the Pajarito Laydown Yard to the well site, the drill rig and all support equipment will be surveyed by LANS Radiological Control Technicians (RCTs) to document that no radioactive materials are introduced onto LANL property. Prior to demobilizing from the Pajarito Laydown Yard, all subcontractor equipment will be re-surveyed by LANS RCTs to document that no radioactive materials are leaving LANL property.

All field activities will be conducted using the 2 person, 2 methods of communication rule at LANL and shall follow the current EP communication policy.

During business hours the TA-64 Operations Center or the SOM shall be contacted:

- before unlocking the Mortandad Canyon gate to enter or exit the gated area
- every two hours during the shift;
- if any personnel leave the site during the shift;
- when all personnel depart the site at the end of the shift; and
- any time vehicle traffic intends to travel up or down the Mortandad Canyon road.

For weekend and after-hours work, the site Person-in-Charge (PIC) shall contact the STR, SOM, or designee.

1.3 Security Requirements

All personnel working on the site will receive a LANL badge through the LANL Badge Office. Personnel will be trained on the computer-based initial and annual security refresher and other required security training. All personnel will enter the Pajarito Corridor through the Vehicle Access Port (VAP) and be required to show their LANL identification badge to the guard on duty there, 24 hours per day, 7 days a week.

After-hours access for vehicles over one ton capacity or towing a trailer will require special arrangements, possibly including the security dog crew. The security dog crew will require advance notice of large vehicles, deliveries or trailers during after-hours or weekends.

Photography on site will only be performed by LANS personnel. Company cellular phones and Corrective Actions Program (CAP) provided radios will be the primary methods of communication. Personal cellular phones are allowed but the camera function shall not be used.

1.4 Roles and Responsibilities

Table 1.4-1 presents the roles and responsibilities and contact information for the project.

Role	Responsibility	Name	Affiliation	Contact Information
Lead Project Manager	Overall project direction and management Funding from sponsors Interaction with LASO	Stephani Swickley	LANS	Office phone: 606-1628 Cell phone: 412-8937 E-mail: sfuller@lanl.gov
Field Project Manager	Day-to-day project coordination Coordination of IPT Develop estimates Analyze and monitor risk Deliver scope, schedule, budget, quality Communication focal point for field activities Bring appropriate resource to project Provide project-specific direction to STR	Ted Ball	LANS	Office phone: 665-3996 Cell phone: 699-8403 E-mail: tedball@lanl.gov
Corrective Actions Program Operations Manager (OM)	Provides all coordination with the landowning FOD Set startup requirements Release work Manage emergencies Coordinates the critiques of off normal occurrences Implement institutional programs Approves work on the POD Designated RLM for all field work Establish and maintain safety, security, environmental compliance envelope	Mike Alexander	LANS	Office phone: 665-4752 Cell phone: 699-1336 E-mail: mikea@lanl.gov
Subcontract Technical Representative	Assists PM and PS in preparation of procurement packages Assists PM and PS in evaluation of packages Review and approve subcontractor accruals and invoices Oversee field management of safety, quality, cost, schedule, security and environmental Subcontract performance Interface between subcontractor and IPT	Mike Fichtel, Marvin Gard	LANS	Fichtel Office phone: 606-0788 Cell phone: 500-7442 E-mail: mfichtel@lanl.gov Gard Office phone:665-1341 Cell phone: 412-9694 E-mail: mgard@lanl.gov
Drilling Technical Lead, Geology Lead	Resource to IPT on drilling technical decisions Coordinate activities of SMEs during well planning, drilling work plan preparation, Lead in field technical issues	Mark Everett	LANS	Office phone: 667-5931 Cell phone: 231-6002 E-mail: meverett@lanl.gov

	Review of subcontractor reports Coordination with NMED of LANS submittals such as drilling work plans, summary sheets, drilling completion reports Manage onsite geologists			
Onsite Geologists	Log drill cuttings Work with subcontractor site supervisor and STR on troubleshooting	Steve Pearson, Ted Ball	LANS	Ball Office phone: 665-3996 Cell phone: 699-8403 E-mail: tedball@lanl.gov Pearson Office phone: 667-3005 Cell phone: 699-3684 E-mail: spearson@lanl.gov
Shift Operations Manager	Negotiate Operating Requirements with FODs Conduct MOV with STR Work with Construction Manager to ensure roads and pads comply with requirements Ensure compliance with FOD requirements during field operations Ensure compliance with SWPPP	Steve Maze	LANS	Office phone: 665-3098 Cell phone: 500-6359 E-mail: maze@lanl.gov
Construction Manager for Earth Work	Manage excavation permit process Coordinate with SMEs and SOMs on drill pad locations and requirements Coordinate and manage heavy equipment operators Constructing roads and pads and BMPs Coordinate and manage heavy equipment operators during pad and road maintenance and site closure	Johnny Salazar	LANS	Office phone: 667-1997 Cell phone: 699-4058 E-mail: Salazar_johnny@lanl.gov
Waste Management Coordinator	Prepare waste characterization strategy forms (WCSF) Sample waste Conduct waste determinations Conduct waste inspections	Victor Garde	LANS	Office phone: 665-5645 Cell phone: 500-4747 E-mail: vgarde@lanl.gov
Health and Safety Professional	Safety Oversight of Drilling Operations Present safety briefings Support accident critiques Review IWDs	Sam Rogers	LANS	Cell phone: 412-3441 E-mail: sar@lanl.gov

Subcontractor Site Supervisor	Manage subcontractor activities on the site Communicate with STR and technical lead on well progress and trouble shooting	Vern Christensen Aaron Adams	Subcontractor	Cell phone: (602) 471-0796 E-mail:vern@yjdrilling.com
Subcontractor Lead Driller	Drill wells per the field implementation plan (FIP) Place waste into designated containers per the FIP	Marion Phillips Joshua Saldana	Subcontractor	

2.0 Conduct of Operations

The LANL *Conduct of Operations Manual* (ISD315-1.1) will be followed during drilling-related activities to ensure that notification and investigation of abnormal event(s) proceed through clear lines of organization and communication. Conduct of Operations will be performed in accordance with Environmental Programs Standard Operation Procedure (SOP) 5018 Integrated Fieldwork and Planning.

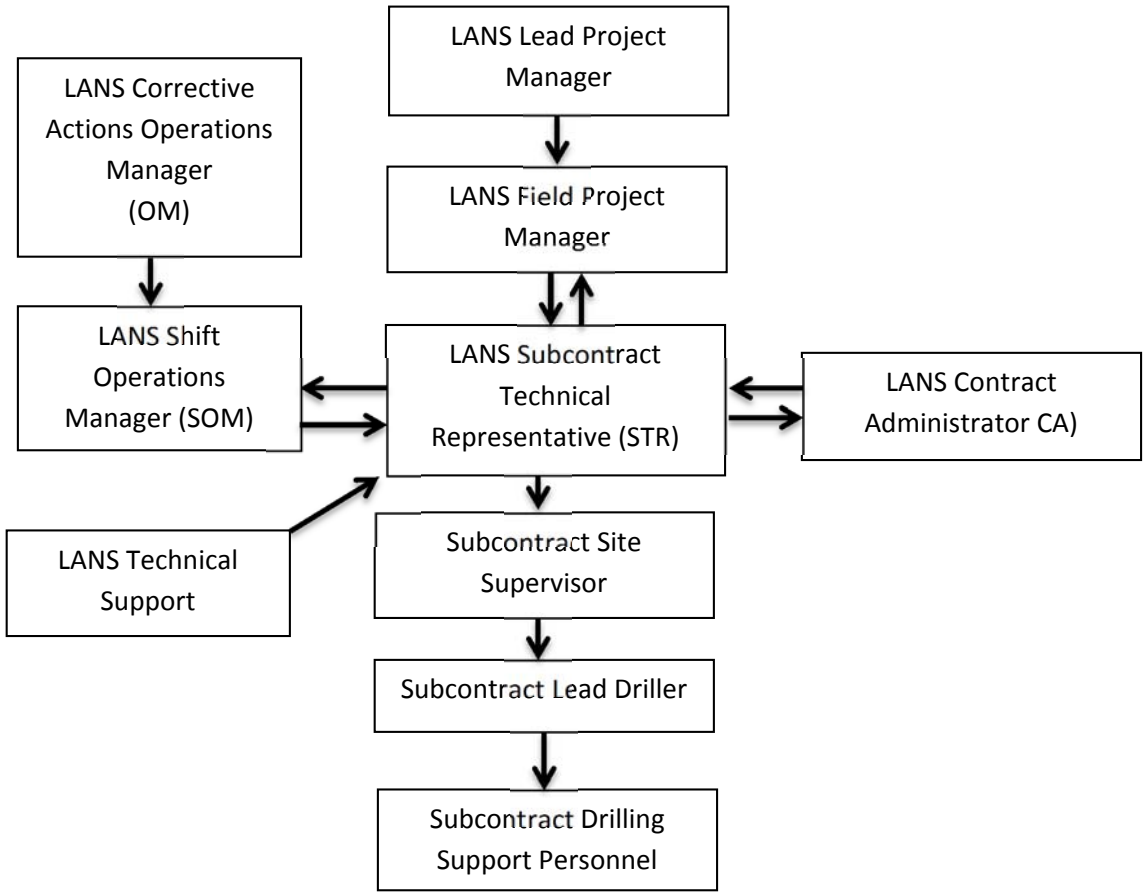
2.1 Operations Organization and Administration

Roles and Responsibilities for the project are presented in Table 1.4-1.

A designated person in charge (PIC) which has completed the LANL PIC training, will be present at the drill site at all times that the drill rig is running.

2.2 Communications

The project organization chart is shown in Figure 2.2-1; contact information is listed in Table 1.4-1. Both will be posted on site.



2.3 Notifications

Any off normal incident in the field will be reported by the person-in-charge (PIC) at the site, to the LANS STR and the Subcontract Site Supervisor. The LANS STR will notify the LANS SOM. The SOM is responsible for notifying the LANS FOD, LANS OM, and the LANS ES&H representative for the project, the LANS Field Project Manager and the LANS Lead Project Manager.

3.0 Project Objective, Purpose and Scope

3.1 Project Objective

The objective of the CrEx-1 well installation project is to install a groundwater extraction well into the top of the regional zone of saturation at approximately 1,000 ft bgs. The extraction well must be sized and screened so that it is capable of delivering at least 150 gallons of groundwater per minute to the surface.

3.2 Purpose

There are two purposes for installing this groundwater extraction well as part of the Chromium Interim Measures. The primary objective is to provide hydrologic and engineering information to the team formulating the final remedial measure for the Chromium remedy. The second is to remove some of the chromium contaminated groundwater from plume.

3.3 Scope

3.3.1 Site Preparation/Maintenance

LANS will construct the access road and drilling pad, including some laydown space. The pad will be approximately 200 ft by 200 ft. Additional laydown area is provided at the R-50 drilling pad and the Pajarito Laydown Yard, off Pajarito Road, outside LANL access control. LANS will provide maintenance of BMPs and access roads. Subcontractor personnel are responsible for site housekeeping.

3.3.2 Water Use and Water Storage

Municipal water will be obtained from a fire hydrant along Puye Road. LANS will furnish a backflow preventer that must be used at the hydrant.

The well will be drilled with a combination of municipal water, drilling additives such as foam, and drilling mud. Municipal water, groundwater and drilling fluids mixed with drill cuttings will be contained in a lined retention pond constructed by LANS. Drilling mud will be separated from cuttings in the mud pits and re-used during the drilling operation. Drilling mud will be contained in mud pits.

Groundwater generated during the initial stages of well development when surging, bailing and pumping the well will also be placed in the pit with the cuttings. Following this initial development phase, groundwater will be contained in 21,000-gallon portable tanks, furnished by

LANL and staged on the drill pad. It is estimated that 6 tanks will be required for containment of this development water.

3.4 Drilling Methods

The drilling method will be left to the subcontractor. The performance requirement is that the well be capable of delivering representative groundwater to the surface at a sustainable rate of 150 gallons per minute. To achieve the required flow rates a six inch diameter pump will be required, set in a screened interval that is approximately 200 ft long and at least 2 inches larger in diameter than the pump. Therefore standard 8-in diameter stainless steel pipe and screens can be used for the well. The screened interval must be surrounded by at least 3 inches of filter pack.

Therefore, a minimum 14.75-in diameter borehole through the target depth of 1,000 to 1,200 ft bgs is required.

Due to known borehole stability issues, the depth of the well and the required diameter of the borehole, it is anticipated that mud rotary drilling methods will be required. LANS has negotiated approval of these methods with the NMED.

3.5 Dust Control

The drilling subcontractor will take measures to control dust generated by drilling operations. Dust suppression on the access road will be provided by LANS.

3.6 Waste Management

Onsite waste management for the well will comply with the waste characterization strategy form (WCSF) provided by LANS. Subcontractor must read and understand the WCSF.

Cuttings from the upper part of the borehole will go into a lined cuttings pit provided by LANL. Cuttings from the lower part of the borehole will go into a mud and cuttings pit for solids settling and mud reuse.

For waste characterization purposes, an aliquot of cuttings from the upper part of the borehole drilled with potable water and additives shall be collected every 40 feet and placed in a labeled 55-gallon drum. Also, for waste characterization purposes, an aliquot of cuttings from the lower part of the borehole drilled with potable water, formation water, and mud shall be collected every 40 feet and placed in a second, labeled 550gallon drum.

LANS will be responsible for evaporating the fluids off of both the cuttings pit and the mud pit and closing these two pits.

3.7 Logging and Geophysics

3.7.1 Logging

Drill cuttings will be collected by the drilling subcontractor on ten-foot intervals from the cyclone or cuttings bosbefore being discharged into the lined cuttings pit. Approximately two liters of

cuttings will be collected from each interval. Cuttings will be collected in labeled cloth sample bags. Intervals with no recovery of cuttings will be noted by the subcontract driller. LANS geologists will manage and archive the cuttings.

3.7.2 Geophysics

Once the borehole reaches total depth, Schlumberger will be mobilized by the drilling subcontractor, as directed in the subcontract, to perform the following geophysical suite for open hole

- Triple Litho-Density,
- Natural Gamma,
- Natural Gamma Spectrometer,
- Accelerator Porosity Sonde,
- Thermal and Epithermal Neutrons,
- Combined magnetic resonance,
- Formation micro-imaging,
- Litho scanner, and
- Caliper log.

The uncased suite of tests will be used for the bottom 300'?

For the upper part of the borehole, which will be cased, the geophysical suite wil consist of:

- APS
- Litho scanner
- Gamma and Spec gamma, and
- TLD

For Schlumberger mobilization to LANL, regardless of whether they bring radioactive logging sources on-site, LANS personnel from Radiation Protection Group (RP-3) must be notified at least 24 hours in advance. If down-hole radioactive source tools are used, RP-1 will perform radiological screening and documentation upon arrival and departure.

Schlumberger will process the geophysical logs and provide a preliminary geophysical log montage electronically within 24 hours of geophysical logging to aid in well design. The drilling subcontractor will provide three hard copies before geophysical subcontractor demobilization and one electronic copy of all geophysical logs to the STR within thirty (30) days of logging. A final report from Schlumberger will be submitted at the end of the project.

3.8 Well Design

The well will be completed with up to a 100 ft-long screen near the top of the regional zone of saturation. The final well design will be based on data acquired during drilling, including information from lithologic logs of cuttings, water-level measurements, geophysical logs, and driller's observations.

Well CrEx-1 will be a single screen well, constructed of 8.0-in inside diameter (ID)/8.625-in outside diameter (OD), passivated A304 stainless steel casing, well screens and centralizers. The pre-beveled casing joints and screens will be welded by a LANS certified welder. The screen will be 0.040-in slot, rod-based, wire-wrapped stainless steel.

Using a steam pressure washer, potable water and LiquiNox detergent, the well steel and screens will be thoroughly decontaminated before being lowered down-hole. All decontamination water must be captured and contained for disposition as waste by LANL.

3.9 Well Installation

Well screen and casing will be continuously suspended from the borehole collar and not allowed to rest on the bottom of the borehole during well construction.

Each component of the well will be documented by LANS geologists. A 10-ft stainless steel sump, including end cap, will be positioned below the well screen. Centralizers will be positioned on the well casing above and below the screen and at 50 ft intervals along the screen so that the placement of the filter pack, overlying bentonite seal, and annular grout will not be hindered.

All annular materials will be installed through a tremie pipe using potable water. For each interval, the actual amount of annular fill materials installed will be compared to calculated volumes. Two methods of measuring annular fill depths will be used; a plastic wire tape with a heavy sounding rod at the end, or the tremie pipe. Each measurement will be recorded and any discrepancies will be resolved prior to adding additional material.

From the borehole TD to 10 ft below the screen, the borehole will be backfilled with a bentonite seal consisting of 100 percent bentonite chips transported down-hole by the tremie pipe and potable water. The seal will be allowed to cure for a minimum of 4 hours. Prior to installing the filter pack around the screen, the depth to the cured bentonite seal will be measured and documented to ensure that the top of the seal is at least 5 ft below the screen. The well screen filter pack will consist of 10/20 sand from 10 feet below to 20 feet above the well screen.

A 2 ft interval of finer 20/40 sand will be used to provide a transition zone between the filter pack sand and the bentonite seal above the screen. Prior to installing the transition sand, the depth to top of the filter pack will be measured and the screen swabbed for 30 minutes to settle the filter pack material. After swabbing, the measurement will be repeated and more filter pack material added, if necessary. The fine sand filter pack will extend a minimum of 20 ft above the screen before the transition sand is installed.

The bentonite seal above the transition sand will extend to 60 ft bgs and consist of 100 percent bentonite chips transported down-hole by the tremie pipe and potable water. The bentonite seal will be allowed to cure for a minimum of four hours before the cement surface seal is added.

The remaining space will be sealed to the ground surface with cement. If borehole stability permits, lifts greater than 20 ft may be used to accelerate backfilling using bulk materials (e.g. supersacks). Supersacks cannot be suspended above workers during this operation.

3.10 Well Development

It is anticipated that both chemical and mechanical means will be required to develop the well to the required cleanliness of less than 5 nephelometric turbidity units (NTUs) for the produced groundwater. LANS has negotiated with NMED a list of approved chemical additives to be used for well development. The drilling subcontractor will consult with the LANS STR and obtain approval before use of any chemical additives.

Well development will begin no sooner than 24 hours after well completion. The objective of well development is to remove introduced drilling additives and/or drilling mud from the borehole wall in the screened interval. Development will be per AWWA A-100 standards. This process is described in the subcontractor's bid description as follows:

- Subcontractor will introduce Baroid Aqua-Clear PFD into the well according to manufactures recommendations relative to well depth, water volume and contact time
- The well will be swabbed and bailed using a dual swab to disperse drilling fluids remaining in the well
- During the swabbing operation, the subcontractor will periodically bail the well to remove sediments
- The process will be continued until as much sediment as possible is removed using this method
- If water quality parameters of less than 5 NTU are not met using this process, subcontractor will proceed to air lifting and pumping to achieve the desired 5 NTU goal
- The process will continue until the parameters required in the SOW are achieved.

Development will begin with the addition of chemicals to aid in the breakdown of the mud and additives wall cake and allow them to be removed from the well through bailing, swabbing and pumping. Following the introduction of chemicals, the well will be bailed. Bailing will continue until water clarity visibly improves as determined by the LANS Geologist. Bailed water and suspended sediment will be placed in the cuttings pit.

After bailing, the screened interval will be swabbed using a surge block to enhance filter pack development. The surge block consists of a 7-in OD, 1-in thick rubber disc attached to static rods. The swabbing tool will be lowered into the well and drawn repeatedly across the screened interval for approximately 12 hours. Water turbidity need not be measured during either bailing or swabbing.

Once bailing and swabbing are completed and the water appears to be clear and sand free, a submersible pump will be deployed into the well. The pump should be capable of delivering at least 150 gpm to the surface. Wiring connections that will be submerged must be water-proof and inspected by the LANS electrician. All hard-wire connections to the development pump and generator must be performed by LANS electricians.

Water will be pumped to the surface as the pump is moved slowly up and down through the screened interval. During pumping development of the screen, draw-down in the well will be monitored using a depth to water meter. Care must be taken to not dewater the screen and expose the filter pack to the air. The flow rate will be adjusted to ensure this does not occur.

Water from this phase of well development will be containerized in 21,000 gallon transportable tanks to be placed on site by LANL. At the end of pump development of the well, water should have less than 5 NTUs as measured using a flow through cell. Also at the end of development, the pump shall be placed at 20-ft intervals along the screen and water samples collected by LANL for chromium analysis.

3.11 Hydraulic Testing

A step test will be conducted by the subcontractor at the level of the maximum chromium content in the groundwater, as determined at the end of development. The step test will consist of 5 steps of 2-hours each at 20 percent, 40 percent, 60 percent, 80 percent and 100 percent of the maximum pumping rate.

Once the step test is complete, a constant-rate pumping test will be performed on the screen by LANS using a subcontractor provided pump. Results of the hydraulic testing will influence extraction system pumping rates.

Prior to performing the pumping test, one day of pre-test background data (water level and barometric pressure) will be collected using non-vented pressure transducers. A pump with appropriately sized motor and appropriate non-vented transducers will be used for the pumping test. Transducers will be specified by LANS and provided by the drilling subcontractor. The discharge pipe will have check valves every 300 feet. The screen will be pumped at a constant rate for 24 hours followed by the collection of 24 hours of water level recovery data.

3.12 Pumping System

The extraction system has been designed based on knowledge of other wells in the area. The system will be selected by the subcontractor, approved by LANL and ordered by the subcontractor. All components of the pumping system will be new and decontaminated prior to installation. Decontamination water will be collected and handled as waste.

4.0 Surface Completion and Site Restoration

4.1 Surface Completion

LANL will provide the surface completion design and will conduct this work.

4.2 Site Restoration

LANS is responsible for site restoration. Site restoration will conform to the requirements of the LANS Storm Water Pollution Prevention Plan (SWPPP). The access road and part of the drilling pad will be left in place and maintained by LANS to facilitate maintenance of the water treatment

system. The pad will ultimately be reduced in size during site restoration. The liquid in the above ground, open-topped tank containing drilling mud will be drained into the pit and the mud allowed to dry out. If the mud is determined to be land-applicable, the mud will then be combined with the cuttings, otherwise it will be disposed of as industrial waste. The cuttings pit will be allowed to dry out and if the cuttings are determined to be applicable for land disposal, cuttings in the pit will be compacted and covered by reclaimed base course gravel while the plastic liner of the cuttings will be removed and disposed of as municipal waste.

5.0 Schedule

Activity	Start Date	End Date
Procurement	2/3/14	6/2/14
Readiness	6/3/14	6/27/14
Mobilization	6/30/14	7/2/14
Drilling	7/3/14	7/28/14
Geophysical Logging	7/29/14	8/1/14
Well Installation	8/2/14	8/6/14
Well Development	8/7/14	8/14/14
Hydraulic Testing	8/15/14	8/20/14
Pump Installation	8/21/14	8/24/14
Well Acceptance	8/25/14	8/26/14
Site Restoration	8/27/14	TBD