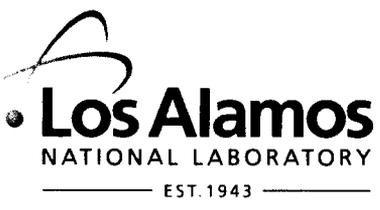


03

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NMED
Hazardous Waste Bureau

Date: APR 16 2015
Refer To: ADESH-15-060
LAUR: 15-21849

Locates Action No.: N/A

John Kieling, Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Subject: Submittal of the Plugging and Abandonment Summary Report for Wells LAWS-01, LAWS-02, LAWS-03, Test Well DT-5, Test Well DT-5A, Test Well DT-9, Test Well SIMO, and Test Well SIMO-1

Dear Mr. Kieling:

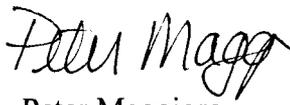
Enclosed please find two hard copies with electronic files of the Plugging and Abandonment Summary Report for Wells LAWS-01, LAWS-02, LAWS-03, Test Well DT-5, Test Well DT-5A, Test Well DT-9, Test Well SIMO, and Test Well SIMO-1. LAWS-02, LAWS-03, and Test Well DT-5A were completed per the Replacement Work Plans for the Plugging and Abandonment of Wells for 2014, dated March 5, 2014, for which the New Mexico Environment Department (NMED) had no comments. Work plans for Test Well DT-5, Test Well DT-9, SIMO, and SIMO-1 were submitted electronically and approved by e-mail. The work plan for plugging and abandoning LAWS-01 was not reviewed by NMED. This plugging and abandonment work was completed by Los Alamos National Laboratory as part of its ongoing program to plug and abandon wells that are no longer in use.

If you have any questions, please contact Ted Ball at (505) 665-3996 (tedball@lanl.gov) or Gene Turner at (505) 667-5794 (gene.turner@nnsa.doe.gov).

Sincerely,


Alison M. Dorries, Division Leader
Environmental Protection Division
Los Alamos National Laboratory

Sincerely,


Peter Maggiore
Office of the Manager
Los Alamos Field Office



AD/CG/DM/TB:sm

Enclosures: Two hard copies with electronic files – Plugging and Abandonment Summary Report for Wells LAWS-01, LAWS-02, LAWS-03, Test Well DT-5, Test Well DT-5A, Test Well DT-9, Test Well SIMO, and Test Well SIMO-1 (EP2015-0023)

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LA-UR-15-21849
April 2015
EP2015-0023

**Plugging and Abandonment
Summary Report for Wells
LAWS-01, LAWS-02, LAWS-03,
Test Well DT-5, Test Well DT-5A,
Test Well DT-9, Test Well SIMO,
and Test Well SIMO-1**



Prepared by the Environmental Programs Directorate

Los Alamos National Laboratory, operated by Los Alamos National Security, LLC, for the U.S. Department of Energy under Contract No. DE-AC52-06NA25396, has prepared this document pursuant to the Compliance Order on Consent, signed March 1, 2005. The Compliance Order on Consent contains requirements for the investigation and cleanup, including corrective action, of contamination at Los Alamos National Laboratory. The U.S. government has rights to use, reproduce, and distribute this document. The public may copy and use this document without charge, provided that this notice and any statement of authorship are reproduced on all copies.

Plugging and Abandonment Summary Report for Wells LAWS-01, LAWS-02, LAWS-03, Test Well DT-5, Test Well DT-5A, Test Well DT-9, Test Well SIMO, and Test Well SIMO-1

April 2015

Responsible project manager:

Ted Ball		Project Manager	Environmental Programs	4/8/15
Printed Name	Signature	Title	Organization	Date

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Peter Maggiore			DOE-NA-LA	4/15/15
Printed Name	Signature	Title	Organization	Date

EXECUTIVE SUMMARY

This report details the methods Los Alamos National Laboratory (the Laboratory) used to plug and abandon wells LAWS-01, LAWS-02, LAWS-03, DT-5, DT-5A, DT-9, SIMO, and SIMO-1. The wells were plugged and abandoned in accordance with direction from the New Mexico Environment Department (NMED), the Laboratory's Work Plans to Plug and Abandon Wells and Boreholes at Los Alamos National Laboratory, and NMED's Notice of Approval with Modifications [for the] Work Plans to Plug and Abandon Wells and Boreholes at Los Alamos National Laboratory.

Plugging and abandonment activities occurred from June 26, 2014, to December 9, 2014. Before the boreholes were abandoned, all aboveground and belowground appurtenances were removed. Water-level measurements and the total depths of the boreholes and wells were verified using a water-level meter, tremie pipe, and/or video equipment before abandonment.

Wells LAWS-01, LAWS-02, and LAWS-03; and test wells DT-5 and DT-5A were plugged and abandoned using a Pulstar 100k pump hoist rig. Test well DT-9 was plugged and abandoned using a Pulstar 20k pump hoist and Foremost DR-24HD drill rig. Test wells SIMO and SIMO-1 were plugged and abandoned using a CME-55 auger drilling rig. Hydrated bentonite chips/pellets, Portland Type I/II cement, and municipal water were used to plug and abandon the wells.

The wells were cement-grouted to approximately 2.0 ft below ground surface, and a small concrete surface plug/pad was installed near the ground surface and/or on top of the existing surface pad. If the existing surface pad did not have a brass marker, an aluminum survey marker was emplaced in the surface plug/pad. The surface completion was surveyed in accordance with Section IX.B.2.f of the Compliance Consent on Order.

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Acronyms and Abbreviations

amsl	above mean sea level
bgs	below ground surface
Consent Order	Compliance Order on Consent
ESH	Environment, Safety, and Health
I.D.	inside diameter
LANL	Los Alamos National Laboratory
MDA	material disposal area
NAD	North American datum
NMED	New Mexico Environment Department
NMOSE	New Mexico Office of the State Engineer
O.D.	outside diameter
PVC	polyvinyl chloride
TA	technical area
TD	total depth

1.0 INTRODUCTION

This report summarizes the methods Los Alamos National Laboratory (LANL or the Laboratory) used to plug and abandon wells LAWS-01, LAWS-02, LAWS-03, DT-5, DT-5A, DT-9, SIMO, and SIMO-1. The wells are located in and around Los Alamos County, New Mexico, as shown in Figure 1.0-1.

Well abandonment was consistent with the requirements and guidelines in Section X.D (Well Abandonment) of the Compliance Order on Consent (the Consent Order). Additionally, the plugging and abandonment procedures complied with 19.27.4 New Mexico Administrative Code Rules and Regulations Governing Well Driller Licensing; Construction, Repair and Plugging of Wells.

The following documents helped guide the implementation of the scope of work for the plugging and abandonment project:

- Replacement Work Plans for the Plugging and Abandonment of Wells for 2014 (LANL 2014, 254668);
- The New Mexico Environment Department's (NMED's) Notice of Approval with Modifications [for the] Work Plans to Plug and Abandon Wells and Boreholes at Los Alamos National Laboratory (NMED 2014, 525052);
- Communications with NMED (Ball 2014, 600206; Dale 2014, 600253; Dale 2014, 600254);
- Work Plan to Plug and Abandon Intermediate Well LAWS-01 (TerranearPMC 2014, 600267);
- Work Plan to Plug and Abandon Test Well DT-5 (TerranearPMC 2014, 600268); and
- Field Implementation Plan to Plug and Abandon Boreholes LAWS-02, LAWS-03, DT-5A, and R-25 (TerranearPMC 2014, 600311).

A Plugging Plan of Operations was filed with the New Mexico Office of the State Engineer (NMOSE) for six of the eight wells that are on Laboratory property (NMOSE 2014, 600207; NMOSE 2014, 600208; NMOSE 2014, 600209; NMOSE 2014, 600210; NMOSE 2014, 600211; NMOSE 2014, 600212). NMOSE plans were not filed for two wells situated on San Ildefonso land (SIMO and SIMO-1) because NMOSE lacks jurisdiction over Pueblo lands. In addition, records were filed with NMOSE for the six wells drilled on Laboratory property (NMOSE 2014, 600278; NMOSE 2014, 600279; NMOSE 2014, 600280; NMOSE 2014, 600281; NMOSE 2014, 600282; NMOSE 2014, 600283).

2.0 BACKGROUND

This section describes the location, construction, and conditions of each well before plugging and abandonment activities.

2.1 Wells LAWS-01, LAWS-02, and LAWS-03

Wells LAWS-01, LAWS-02, and LAWS-03 are located in Technical Area TA 72 (TA-72) at the site of the Los Alamos Canyon low-head weir.

LAWS-01 was drilled to a depth of 281.5 ft below ground surface (bgs) and completed as a four-screen well. A 12-in.-diameter hole was augered to approximately 9.0 ft bgs to the top of basalt. A 10 3/4-in. outside diameter (O.D.) carbon steel surface casing was set and the borehole was advanced to 281.5 ft bgs using air-rotary, casing-advance methods. Flush threaded 4.5-in.-O.D. schedule 80 polyvinyl chloride (PVC) well casing was installed to 278 ft total depth (TD) with four screens set at 83–93 ft bgs, 158.0–168.0 ft bgs,

188.0–198.0 ft bgs, and 263.0–273.0 ft bgs. A FLUTE water-monitoring system was deployed with the associated transducers and sampling ports.

LAWS-02 was drilled at a 43-degree angle to 156.0 ft (length) under the Los Alamos Canyon weir site. A 12-in.-diameter hole was augered approximately 9.0 ft to the top of basalt. A 10 ¾-in.-O.D. carbon-steel surface casing was set, and the borehole was advanced to 156.0 ft bgs (length) using air-rotary, casing-advance methods. A scalloped 6.6-in.-O.D. schedule 80 PVC well casing was installed in the borehole before a FLUTE vadose zone–monitoring system was installed.

LAWS-03 was drilled at a 34-degree angle to 136.0 ft (length) under the Los Alamos Canyon weir site. A 12-in.-diameter hole was augered approximately 9.0 ft to the top of the basalt. A 10 ¾-in.-O.D. carbon-steel surface casing was set, and the borehole was advanced to 136.0 ft (length) using air-rotary, casing-advance methods. A scalloped 6.6-in.-O.D. schedule 80 PVC well casing was installed in the borehole but collapsed below 80.0 ft (casing length) from borehole formation materials. The upper scalloped portion of PVC was replaced with perforated 6.6-in.-O.D. schedule 40 PVC well casing to 80.0 ft (casing length) before a FLUTE vadose zone–monitoring system was installed.

Pre-abandonment Conditions

TD of well LAWS-01 was measured to 278.0 ft bgs with a static water level of 154.4 ft bgs on July 29, 2014, after the FLUTE water-monitoring system was removed from the well casing. TD and the static water level were verified with a water-level meter.

The bottom of well LAWS-02 was measured at 140.0 ft (casing length) with no water present on July 31 after the FLUTE vadose zone–monitoring system was removed from the well casing. TD and the lack of water were verified with a tremie pipe before plugging materials were added.

The FLUTE vadose zone–monitoring system installed in well LAWS-03 was not present in the well casing before plugging and abandonment activities were undertaken. The obstruction at 80.0 ft bgs (casing length) in well LAWS-03 was measured and the lack of water was verified with a tremie pipe before plugging materials were added.

Figures 2.1-1, 2.1-2, and 2.1-3 are well construction diagrams that depict the construction details and pre-abandonment conditions of wells LAWS-01, LAWS-02, and LAWS-03, respectively.

2.2 Test Wells DT-5 and DT-5A

Test wells DT-5 and DT-5A are located at TA-49 within Area 5 in close proximity to Material Disposal Area (MDA) AB.

DT-5 was drilled to 927.0 ft bgs in 1960 (Purtymun 1995, 045344) with air-rotary equipment. Circulation could not be maintained in the borehole because of numerous fractures, and the hole was terminated at 927.0 ft bgs. The well was constructed with 180.0 ft of 8 ¾-in.-O.D. casing and was open hole from 180.0–927.0 ft bgs.

DT-5A was drilled to 1821.0 ft bgs in 1960 (Purtymun 1995, 045344) with air-rotary equipment. The well was constructed with 12 ¾-in.-O.D. casing cemented in place from surface to 525.0 ft bgs. Inside the 12 ¾-in.-O.D. casing is 1821.0 ft of 8 ¾-in.-O.D. casing with torch-cut slots throughout the casing below 1172 ft bgs.

Pre-abandonment Conditions

A video log of DT-5 was collected using the Laboratory's camera trailer on July 11, 2014. TD of DT-5 was measured at 924.4 ft bgs with no water present on July 24. TD and the lack of water were verified with Laboratory video-logging equipment and a water-level meter.

A video log of DT-5A was collected using the Laboratory's camera trailer on July 24. TD of DT-5A was measured at 1788.0 ft bgs with water present at 1187.5 ft bgs. TD and the presence of water were verified with Laboratory video-logging equipment and a water-level meter. In addition, on July 25, a natural gamma log of DT-5A was obtained by Laboratory personnel from 1780.0 ft bgs to the surface.

The video logs for DT-5 and DT-5A are presented in Appendix A (on DVD). Natural gamma logs are presented in Appendix B.

Figures 2.2-1 and 2.2-2 are well construction diagrams that depict the construction details and pre-abandonment conditions of DT-5 and DT-5A, respectively.

2.3 Test Well DT-9

Test well DT-9 is located on Frijoles Mesa at TA-49.

DT-9 was drilled to 1501.0 ft bgs in 1960 (Purtymun 1995, 045344) with cable-tool methods. The well was constructed with 1335.0 ft of 12 3/4-in.-O.D. casing, with torch-cut slots below 819.0 ft bgs (Weir and Purtymun 1962, 011890). Inside the 12 3/4-in.-O.D. casing is 186.0 ft of 8 3/4-in.-O.D. casing with torch-cut slots throughout the casing. The 8 3/4-in.-O.D. casing is swaged into the 12 3/4-in. casing from 1317.0 ft to 1313.0 ft bgs.

Pre-abandonment Conditions

A video log of DT-9 was collected using the Laboratory's camera trailer on September 9, 2014, after the sampling system was removed. TD of DT-9 was recorded at 1308.0 ft bgs with water present at 1017.0 ft bgs. In addition, a natural gamma log of DT-9 was recorded on September 9 from 1300.0 ft bgs to the surface.

The video log for DT-9 is presented in Appendix A (on DVD). Natural gamma logs are presented in Appendix B.

Figure 2.3-1 is a well construction diagram that depicts the construction details and pre-abandonment conditions of DT-9.

2.4 Test Wells SIMO and SIMO-1

Test wells SIMO and SIMO-1 are located on San Ildefonso Pueblo, east of the Laboratory, in Mortandad Canyon.

SIMO was drilled to 104.0 ft bgs in 1990 (Stoker et al. 1991, 007530) with a hollow-stem auger. The well was constructed with 104.0 ft of 2.0-in.-diameter schedule 40 PVC well casing with two perforated screens set at 50.0–60.0 ft bgs and 80.0–90.0 ft bgs.

SIMO-1 was drilled to 163 ft bgs in 1992 (Purtymun 1995, 045344). No other construction information is provided about this well other than a description that states its construction is similar to test well SIMO's, with screens at various depths. Thus, it is assumed the well is constructed with 116.0–163.0 ft of 2.0-in.-diameter schedule 40 PVC well casing with several perforated screen sections.

Pre-abandonment Conditions

TD of test well SIMO was measured to 57.0 ft bgs with no water present on November 17, 2014. TD and lack of water were verified with tremie pipe before plugging materials were added.

Two 2.0-in.-diameter schedule 40 PVC well casings were discovered at test well SIMO-1. TD of the easternmost casing was measured to 55.4 ft bgs with no water present on November 17. TD of the westernmost casing was measured to 22.9 ft bgs with no water present on November 17. TD and the lack of water were verified with a tremie pipe before plugging materials were added.

Figures 2.4-1 and 2.4-2 are well construction diagrams that depict the construction details and pre-abandonment conditions of test wells SIMO and SIMO-1, respectively.

3.0 PLUGGING AND ABANDONMENT

Plugging and abandonment activities included mobilization, removal of the sampling system, sealing and grouting, casing cutting and removal, and demobilization. All activities were performed following appropriate standard operating procedures and Laboratory-approved health and safety documents. The wells were plugged and abandoned in accordance with NMED-approved work plans and with NMOSE Plugging Plans.

3.1 Wells LAWS-01, LAWS-02, and LAWS-03

Plugging and abandonment activities at wells LAWS-01, LAWS-02, and LAWS-03 took place from June 26 to August 2, 2014. The final surface plugs were constructed on August 2, 2014.

LAWS-01

Plugging and abandonment activities at well LAWS-01 occurred from June 30 to August 2, 2014. The FLUTe water-monitoring system was removed from LAWS-01 on June 30, and plugging materials were added on July 29 and July 30. LAWS-01 was plugged with approximately 9.1 ft³ of 3/8-in. hydrated bentonite chips from 278.0 ft bgs (TD) to 150.9 ft bgs via tremie pipe. Approximately 16.7 ft³ of neat cement grout was emplaced from 150.9–2.0 ft bgs via tremie pipe. The protective casing was cut level with the surface pad, and the surface plug was constructed with 0.3 ft³ of concrete from 2.0 ft bgs to the top of the surface pad. The volume and type of abandonment materials used to abandon LAWS-01 are presented in Table 3.1-1. The final well configuration after abandonment is shown in Figure 3.1-1.

LAWS-02

Plugging and abandonment activities at well LAWS-02 occurred from June 26 to August 2, 2014. The FLUTe vadose zone–monitoring system was partially removed from LAWS-02 on June 26. On June 27, removal of the monitoring system resumed until the system became wedged in the well casing. The monitoring system was successfully removed on July 29 using a 1 ½-in. tremie pipe and hook. Plugging materials were added on July 31 and August 1. LAWS-02 was plugged with approximately 32.3 ft³ of 3/8-in. hydrated bentonite chips and ¼-in. bentonite pellets from 140.0 ft (casing length) to 10.0 ft (casing

length) via tremie pipe. Approximately 10.0 ft³ of neat cement grout was emplaced from 10.0 ft (casing length) to 2.0 ft (casing length). The protective casing was cut level with the surface pad and the surface plug was constructed with 1.3 ft³ of concrete from 2.0 ft (casing length) to the top of the surface pad. The volume and type of abandonment materials used to abandon LAWS-02 are presented in Table 3.1-2. The final well configuration after abandonment is shown in Figure 3.1-2.

LAWS-03

Plugging and abandonment activities at well LAWS-03 occurred from July 30 to August 2, 2014. On July 30, approximately 56.8 ft³ of neat cement grout was tremied into LAWS-03 below 60.0 ft (casing length). No significant seal was established, and it was determined the cement was either lost to the formation and/or the well casing below the obstruction at 80.0 ft (casing length). Subsequently, LAWS-03 was plugged with approximately 14.0 ft³ of 3/8-in. hydrated bentonite chips from 80.0 ft (casing length) to 7.0 ft (casing length) via tremie pipe. Approximately 6.0 ft³ of neat cement grout was emplaced from 7.0 ft (casing length) to 2.0 ft (casing length). The protective casing was cut level with the surface pad and the surface plug was constructed with 1.3 ft³ of concrete from 2.0 ft (casing length) to the top of the surface pad. The volume and type of abandonment materials used to abandon LAWS-03 are presented in Table 3.1-3. The final well configuration after abandonment is shown in Figure 3.1-3.

3.2 Test Wells DT-5 and DT-5A

Plugging and abandonment activities at test wells DT-5 and DT-5A occurred from July 23 to August 30, 2014.

DT-5

Plugging and abandonment activities at test well DT-5 occurred from July 24 to July 27, 2014. DT-5 was plugged with approximately 221.2 ft³ of 3/8-in. hydrated bentonite chips from 924.4 ft bgs (TD) to 196.2 f bgs via tremie pipe. Approximately 73.5 ft³ of neat cement grout was emplaced from 196.2 ft bgs to 2.5 ft bgs via tremie pipe. The 8 3/4-in.-O.D. well casing was cut and removed from 2.0 ft bgs. The surface pad was constructed on July 27, with 2.7 ft³ of concrete from 2.5 ft bgs to the surface. The volume and type of abandonment materials used to abandon DT-5 are presented in Table 3.2-1. The final borehole configuration is shown in Figure 3.2-1.

DT-5A

Plugging and abandonment activities at test well DT-5A occurred intermittently from July 23 to August 30, 2014. The sampling system was removed with a Pulstar 100k pump hoist on July 23. Well DT-5A was plugged with approximately 184.7 ft³ of 3/8-in. hydrated bentonite chips from 1788.0 ft bgs (TD) to 1170.3 ft bgs via tremie pipe. Portland Type I/II cement was emplaced from 1170.3–857.7 ft bgs with a tremie pipe. The tremie was removed from the well casing, and a pneumatic casing cutter was installed. The 8 3/4-in.-O.D. well casing was cut and removed from 241.3 ft bgs. The tremie pipe was reinstalled and cement was emplaced from 857.7–2.0 ft bgs. Approximately 707.2 ft³ of neat cement grout was emplaced from 1170.3–2.0 ft bgs. The 12 3/4-in. surface casing was cut level with the surface pad. The surface plug was constructed on August 30, with 1.7 ft³ of concrete from 2.0 ft bgs to the top of the surface pad. The volume and type of abandonment materials used to abandon DT-5A are presented in Table 3.2-2. The final well configuration after abandonment is shown in Figure 3.2-2.

3.3 Test Well DT-9

Plugging and abandonment activities at test well DT-9 occurred from September 8 to December 9, 2014. The sampling system was removed with a Pulstar 20k pump hoist on September 8 and 9. Approximately 387.6 ft³ of neat cement grout was emplaced from 1501 ft bgs (TD) to 1013.5 ft bgs via tremie pipe. Because of significant cement loss at 1013.5 ft bgs, DT-9 was plugged with approximately 634.2 ft³ of 3/8-in. hydrated bentonite chips from 1013.5–284.1 ft bgs.

A Foremost DR-24HD drill rig was used to cut the 12-in.-diameter casing at 280.0 ft bgs on December 4, but the casing could not be removed. A second cut was made at 40.0 ft bgs on December 5, but removing the casing was unsuccessful. Approximately 200.5 ft³ of neat cement grout was emplaced in the well casing via tremie pipe from 284.1–280.0 ft bgs, and it was determined the cement was flowing out of the casing cut at 280.0 ft bgs and into the annular space. Approximately 537.6 ft³ of 3/8-in. hydrated bentonite chips was used to seal the annulus to 282.6 ft bgs outside the 12 3/4-in.-O.D. well casing. Approximately 353.0 ft³ of neat cement grout was emplaced in the well casing and annulus via tremie pipe from 282.6–43.0 ft bgs. Approximately 15.4 ft³ of 3/8-in. hydrated bentonite chips was used to seal the well casing and casing cut (40.0 ft bgs) from 43.0–31.0 ft bgs. The 12 3/4-in.-O.D. well casing was cut and removed from 0.5 ft bgs. Approximately 32.1 ft³ of neat cement grout was emplaced from 31.0 ft bgs to surface. The volume and type of abandonment materials used to abandon DT-9 are presented in Table 3.3-1. The final borehole configuration after abandonment is shown in Figure 3.3-1.

3.4 Test Wells SIMO and SIMO-1

Plugging and abandonment activities at test wells SIMO and SIMO-1 occurred on November 17, 2014.

SIMO

SIMO was plugged with Portland Type I/II cement grout from 57.0–4.0 ft bgs. Cement was emplaced through 1-in. PVC tremie pipe. After it was plugged with cement, the upper 10.0 ft of well casing was drilled out using a 4 1/4-in.-inside diameter (I.D.-) hollow-stem auger (7 5/8-in. O.D.). The auger hole was filled with 10.0 ft of concrete, and an aluminum survey pin was placed in the concrete surface pad. The volume and type of abandonment materials used to abandon SIMO are presented in Table 3.4-1. The final well configuration after abandonment is shown in Figure 3.4-1.

SIMO-1

Two PVC well casings were discovered at SIMO-1 during abandonment activities. The east SIMO-1 well casing was plugged from 55.4 ft bgs to surface with approximately 1.3 ft³ of neat cement grout. The west SIMO-1 well casing was plugged from 22.9 ft bgs to surface with approximately 0.7 ft³ of neat cement grout. Cement was emplaced via 1-in.-diameter PVC tremie pipe. After it was plugged with cement, the upper 10.0 ft of the well casings were drilled out using a 4 1/4-in. I.D. hollow-stem auger (7 5/8-in. O.D.). The auger holes were filled with approximately 4.9 ft³ of neat cement grout from 10.0–1.0 ft bgs. A 1.0-ft concrete surface pad was constructed, and an aluminum survey pin was installed in the concrete surface pad. The volume and type of abandonment materials used to abandon SIMO-1 are presented in Table 3.4-2. The final well configuration after abandonment is shown in Figure 3.4-2.

4.0 SURFACE COMPLETIONS

Concrete surface plugs were installed to the top of the existing surface pads at LAWS-01, LAWS-02, LAWS-03, and DT-5A (brass survey markers were present in the pads). Concrete surface pads were installed at DT-5, DT-9, SIMO, and SIMO-1, and aluminum survey markers were installed in the pads. The brass or aluminum markers were surveyed in accordance with Section IX.B.2.f of the Consent Order.

4.1 Geodetic Survey

Geodetic surveys were conducted on the surface completions (Table 4.1-1) with a Trimble RTK global positioning system. The survey data collected conform to Laboratory Information Architecture project standards IA-CB02, "GIS Horizontal Spatial Reference System," and IA-D802, "Geospatial Positioning Accuracy Standard for A/E/C and Facility Management." All coordinates are expressed relative to the New Mexico State Plane Coordinate System Central Zone (North American Datum [NAD] 83); elevation is expressed relative to feet above mean sea level (amsl) using the National Geodetic Vertical Datum of 1929. The survey point was the brass or aluminum pin placed in the concrete plug/pad.

5.0 POST-ABANDONMENT ACTIVITIES

Post-abandonment activities are described below.

5.1 Site Restoration

Plugging and abandonment activities at the wells required only minimal restoration efforts to return the sites to preplugging and abandonment conditions.

5.2 Waste Management

Waste generated from the plugging and abandonment project included purge water, decontamination water, cement wash-out water, drill cuttings, and contact waste.

All waste streams produced during plugging and abandonment activities were sampled in accordance with the "Waste Characterization Strategy Form for Plug and Abandonment (P&A) of LANL Wells" (LANL 2011, 205839).

All wastes will be managed in accordance with the waste characterization strategy form and EP-DIR-SOP-10012, Characterization of Environmental Programs Waste. Characterization of contact waste will be based upon acceptable knowledge from historical site data per Laboratory Procedure P930-1, LANL Waste Acceptance Criteria.

6.0 DEVIATIONS FROM PLANNED ACTIVITIES

LAWS-01 was planned to be plugged and abandoned with cement grout placed from bottom to top with a tremie pipe. Instead of using cement under the static water level (154.4 ft bgs) and incurring significant cement loss, hydrated bentonite chips were emplaced from TD (278.0 ft bgs) to 150.9 ft bgs with a tremie pipe. Portland Type I/II cement was emplaced from 150.9–2.0 ft bgs with a tremie pipe.

LAWS-02 was planned to be plugged and abandoned with cement grout placed from bottom to top with a tremie pipe. Because of the amount of cement loss that occurred at LAWS-03, hydrated bentonite chips/pellets were emplaced from TD (140.0-ft casing length) to 10.0 ft (casing length) with a tremie pipe.

Portland Type I/II cement was emplaced from 10.0–2.0 ft (casing length) inside the well casing and from 10.0–2.0 ft (casing length) within the annulus.

LAWS-03 was planned to be plugged and abandoned with cement grout placed from bottom to top with a tremie pipe. Cement grout was tremied into the well casing with no significant seal established. Hydrated bentonite chips were placed from the top of the obstruction (80.0-ft casing length) to 7.0 ft (casing length) with a tremie pipe. Portland Type I/II cement was emplaced from 7.0–2.0 ft (casing length) inside the well casing and from 10.0–2.0 ft (casing length) within the annulus.

No deviations from planned activities occurred at test well DT-5.

DT-5A was planned to be plugged and abandoned with bentonite chips placed from bottom to top with a tremie pipe to approximately 520.0 ft bgs. The 8 ¾-in.-O.D. casing was to be cut and removed from 520 ft bgs. After the upper 520.0 ft of 8 ¾-in.-O.D. casing was removed, the remaining portion of the borehole was to be filled with neat cement. To reduce cement loss to the exposed formation behind the torch-cut slots in the 8 ¾-in.-O.D. casing, hydrated bentonite chips were placed from TD (1788.0 ft bgs) to 1170.3 ft bgs with a tremie pipe. After the torch-cut slots were plugged, Portland Type I/II cement was placed from 1170.3–857.7 ft bgs with a tremie pipe. The tremie was removed from the well casing and a pneumatic casing cutter was installed. The 8 ¾-in.-O.D. well casing was cut and removed from 241.3 ft bgs (scale on the sidewalls prevented the casing cutter from being lowered past 260.0 ft bgs). The tremie pipe was reinstalled and cement was emplaced from 857.7–2.0 ft bgs.

DT-9 was planned to be plugged and abandoned with cement grout emplaced from bottom to top with a tremie pipe. Portland Type I/II cement was emplaced with a tremie pipe from TD (1501.0 ft bgs) to 1013.5 ft bgs. Because of significant cement loss, hydrated bentonite chips were used to fill the well casing from 1013.5–284.1 ft bgs. The 12-in.-diameter casing was then cut at 280.0 ft bgs, but efforts to remove the well casing were unsuccessful. The well casing was then recut at 40.0 ft bgs, but removal efforts were again unsuccessful. Additional cement was emplaced, but no significant seal was established because of the loss of cement out of the casing cut at 280.0 ft bgs. Hydrated bentonite chips were used to fill the borehole annulus below the casing cut. Portland Type I/II cement was emplaced from 282.6–43.0 ft bgs. Hydrated bentonite chips were emplaced from 43.0–31.0 ft bgs to seal the annulus and casing cut at 40.0 ft bgs. Portland Type I/II cement was then emplaced from 31.0 ft bgs to the surface.

During abandonment of SIMO-1, it was discovered that two PVC well casings had been installed. Both SIMO-1 well casings were abandoned. No deviations from planned activities occurred at test well SIMO.

All deviations from submitted plugging plans were discussed via phone or email with the NMOSE.

7.0 SUMMARY

Before abandonment activities were undertaken, all aboveground and belowground appurtenances were removed. Plugging and abandonment was completed with a Pulstar 100k pump hoist, a Pulstar 20k pump hoist, a Foremost DR-24HD, and/or a CME-55 auger rig. All wells were plugged with hydrated bentonite chips/pellets and/or Portland Type I/II cement via tremie pipe. Concrete surface plugs/pads were constructed and the brass or aluminum pins were surveyed. All wells were plugged and abandoned in accordance with NMED-approved work plans and with NMOSE plugging plans. All deviations from submitted plugging plans were discussed with the NMOSE.

8.0 REFERENCES AND MAP DATA SOURCES

8.1 References

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID or ESH ID. This information is also included in text citations. ER IDs were assigned by the Environmental Programs Directorate's Records Processing Facility (IDs through 599999), and ESH IDs are assigned by the Environment, Safety, and Health (ESH) Directorate (IDs 600000 and above). IDs are used to locate documents in the Laboratory's Electronic Document Management System and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the ESH Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

Ball, T., August 8, 2014. Additional Wells for P&A [and attachments]. E-mail message to M. Dale (NMED) from T. Ball (LANL), Los Alamos, NM. (Ball 2014, 600206)

Dale, M., July 17, 2014. RE: Plugging Plan of Operation for DT-5 and DT-5A at LANL. E-mail message to T. Ball (LANL) from M. Dale (NMED), Santa Fe, New Mexico. (Dale 2014, 600253)

Dale, M., August 12, 2014. RE: Additional Wells for P&A. E-mail message to T. Ball (LANL) from M. Dale (NMED), Santa Fe, New Mexico. (Dale 2014, 600254)

LANL (Los Alamos National Laboratory), August 16, 2011. "Waste Characterization Strategy Form for Plug and Abandonment (P&A) of LANL Wells," Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2011, 205839)

LANL (Los Alamos National Laboratory), February 2014. "Replacement Work Plans for the Plugging and Abandonment of Wells for 2014," Los Alamos National Laboratory document LA-UR-14-21071, Los Alamos, New Mexico. (LANL 2014, 254668)

NMED (New Mexico Environment Department), July 17, 2014. "Replacement Work Plans for the Plugging and Abandonment of Wells for 2014," New Mexico Environment Department letter to P. Maggiore (DOE-NA-LA) and J.D. Mousseau (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2014, 525052)

NMOSE (New Mexico Office of the State Engineer), February 19, 2015. "Plugging Record [for Well DT-9]," Santa Fe, New Mexico. (NMOSE 2014, 600280)

NMOSE (New Mexico Office of the State Engineer), July 3, 2014. "Well Plugging Plan of Operations [for LAWS-01]," Santa Fe, New Mexico. (NMOSE 2014, 600210)

NMOSE (New Mexico Office of the State Engineer), July 3, 2014. "Well Plugging Plan of Operations [for LAWS-02]," Santa Fe, New Mexico. (NMOSE 2014, 600211)

NMOSE (New Mexico Office of the State Engineer), July 3, 2014. "Well Plugging Plan of Operations [for LAWS-03]," Santa Fe, New Mexico. (NMOSE 2014, 600212)

NMOSE (New Mexico Office of the State Engineer), July 18, 2014. "Well Plugging Plan of Operations [for DT-5]," Santa Fe, New Mexico. (NMOSE 2014, 600207)

- NMOSE (New Mexico Office of the State Engineer), July 18, 2014. "Well Plugging Plan of Operations [for DT-5A]," Santa Fe, New Mexico. (NMOSE 2014, 600208)
- NMOSE (New Mexico Office of the State Engineer), September 18, 2014. "Well Plugging Plan of Operations [for DT-9]," Santa Fe, New Mexico. (NMOSE 2014, 600209)
- NMOSE (New Mexico Office of the State Engineer), October 9, 2014. "Plugging Record [for Well DT-5]," Santa Fe, New Mexico. (NMOSE 2014, 600278)
- NMOSE (New Mexico Office of the State Engineer), October 9, 2014. "Plugging Record [for Well DT-5A]," Santa Fe, New Mexico. (NMOSE 2014, 600279)
- NMOSE (New Mexico Office of the State Engineer), October 9, 2014. "Plugging Record [for Well LAWS-01]," Santa Fe, New Mexico. (NMOSE 2014, 600281)
- NMOSE (New Mexico Office of the State Engineer), October 9, 2014. "Plugging Record [for Well LAWS-02]," Santa Fe, New Mexico. (NMOSE 2014, 600282)
- NMOSE (New Mexico Office of the State Engineer), October 9, 2014. "Plugging Record [for Well LAWS-03]," Santa Fe, New Mexico. (NMOSE 2014, 600283)
- Purtymun, W.D., January 1995. "Geologic and Hydrologic Records of Observation Wells, Test Holes, Test Wells, Supply Wells, Springs, and Surface Water Stations in the Los Alamos Area," Los Alamos National Laboratory report LA-12883-MS, Los Alamos, New Mexico. (Purtymun 1995, 045344)
- Stoker, A.K., W.D. Purtymun, S.G. McLin, and M.N. Maes, May 1991. "Extent of Saturation in Mortandad Canyon," Los Alamos National Laboratory document LA-UR-91-1660, Los Alamos, New Mexico. (Stoker et al. 1991, 007530)
- TerranearPMC, May 2014. "Work Plan to Plug and Abandon Intermediate Well LAWS-01," Los Alamos, New Mexico. (TerranearPMC 2014, 600267)
- TerranearPMC, May 2014. "Work Plan to Plug and Abandon Test Well DT-5," Los Alamos, New Mexico. (TerranearPMC 2014, 600268)
- TerranearPMC, May 2014. "Field Implementation Plan to Plug and Abandon Boreholes LAWS-02, LAWS-03, DT-5A, and R-25," plan prepared for Los Alamos National Laboratory, Los Alamos, New Mexico. (TerranearPMC 2014, 600311)
- Weir, J.E., Jr., and W.D. Purtymun, 1962. "Geology and Hydrology of Technical Area 49, Frijoles Mesa, Los Alamos County, New Mexico," U.S. Geological Survey Administrative Release, Albuquerque, New Mexico. (Weir and Purtymun 1962, 011890)

8.2 Map Data Sources for Plugging and Abandonment Report Location Map

Point Feature Locations of the Environmental Restoration Project Database; Los Alamos National Laboratory, Waste and Environmental Services Division, EP2008-0109; 12 April 2010.

Hypsography, 100 and 20 Foot Contour Interval; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 1991.

Surface Drainages, 1991; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program, ER2002-0591; 1:24,000 Scale Data; Unknown publication date.

Paved Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Dirt Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Division; 4 December 2009.

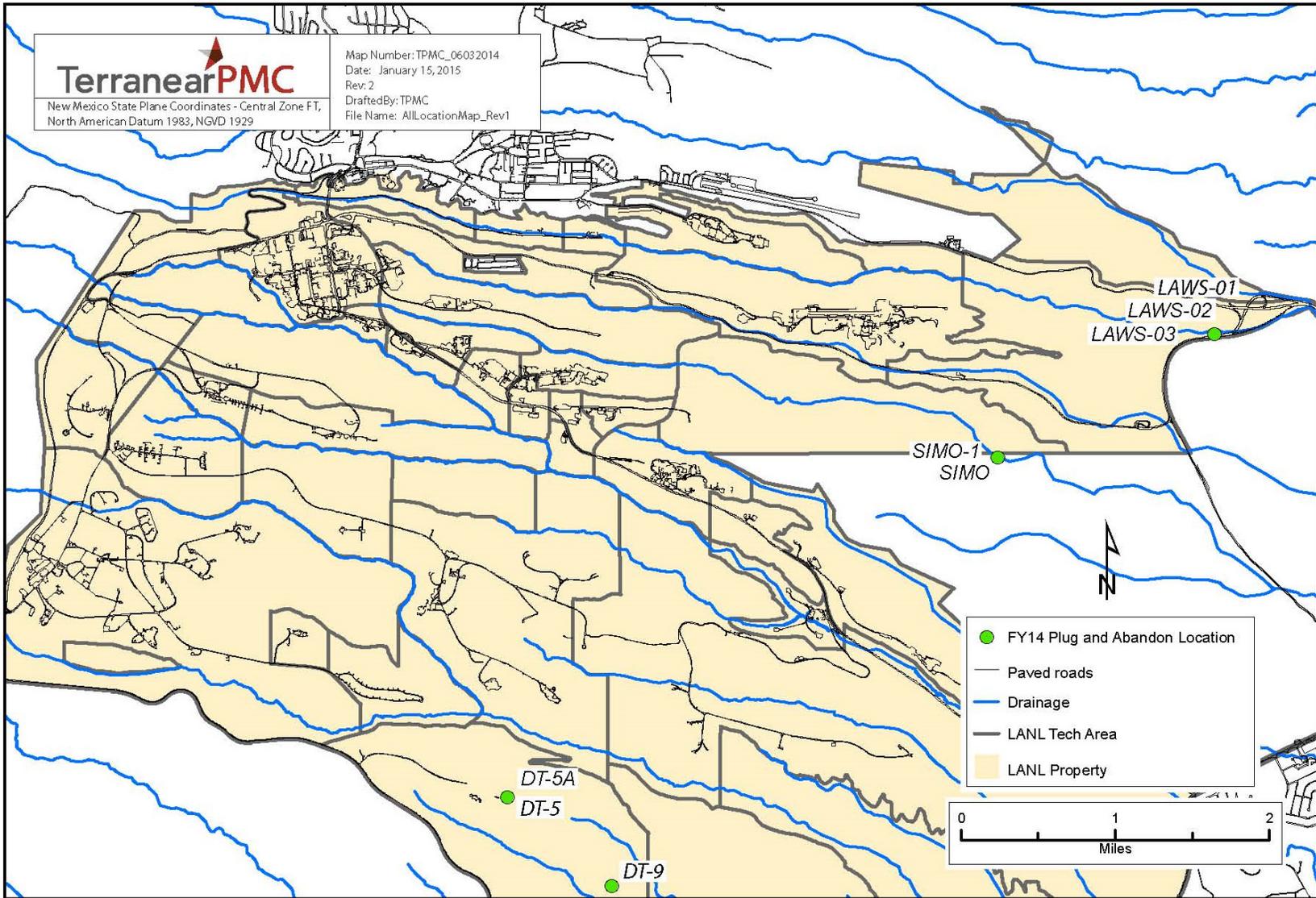


Figure 1.0-1 Location of plugged and abandoned wells LAWS-01, LAWS-02, LAWS-03, DT-5, DT-5A, DT-9, SIMO, and SIMO-1

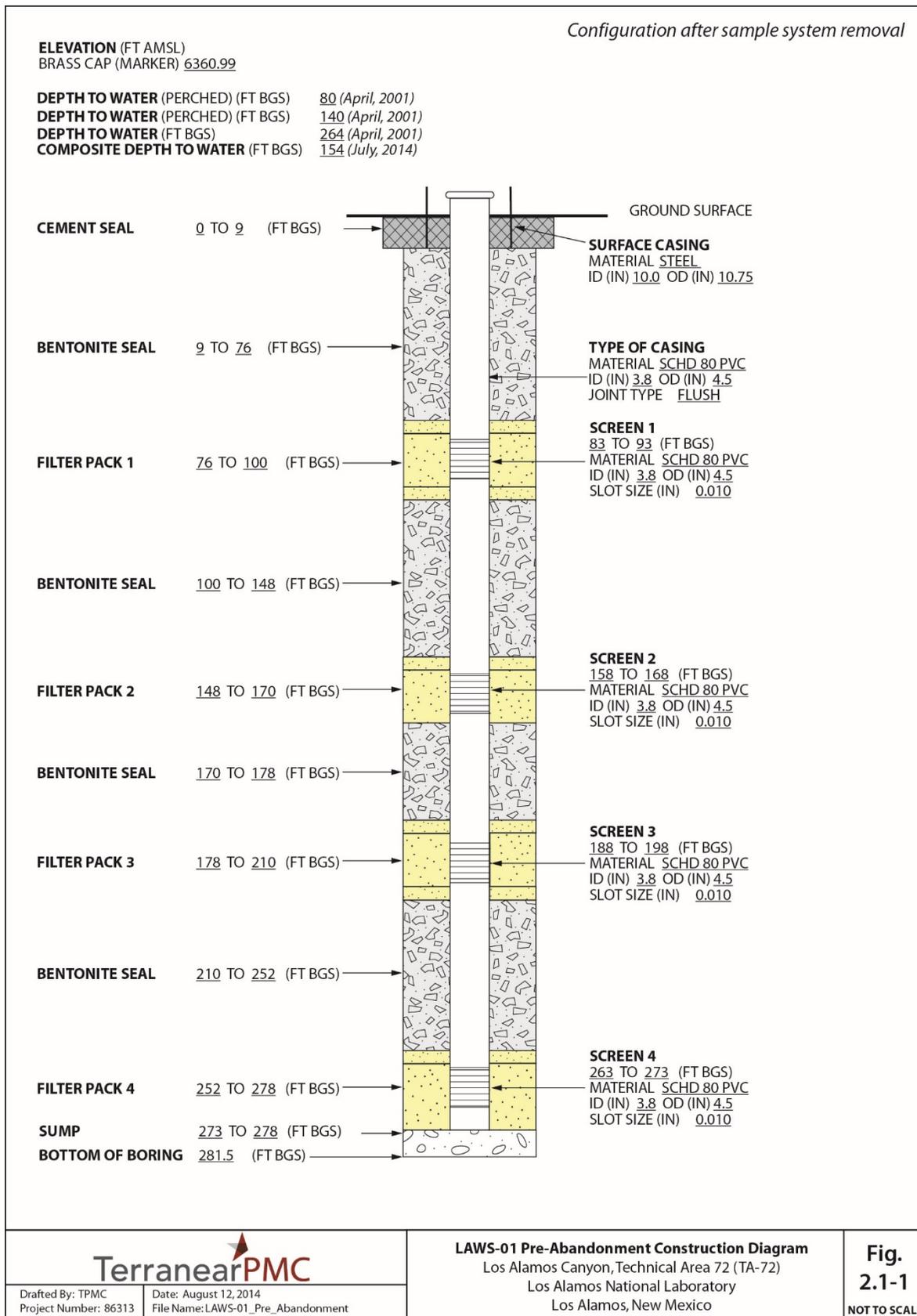


Figure 2.1-1 Well LAWS-01 pre-abandonment construction diagram

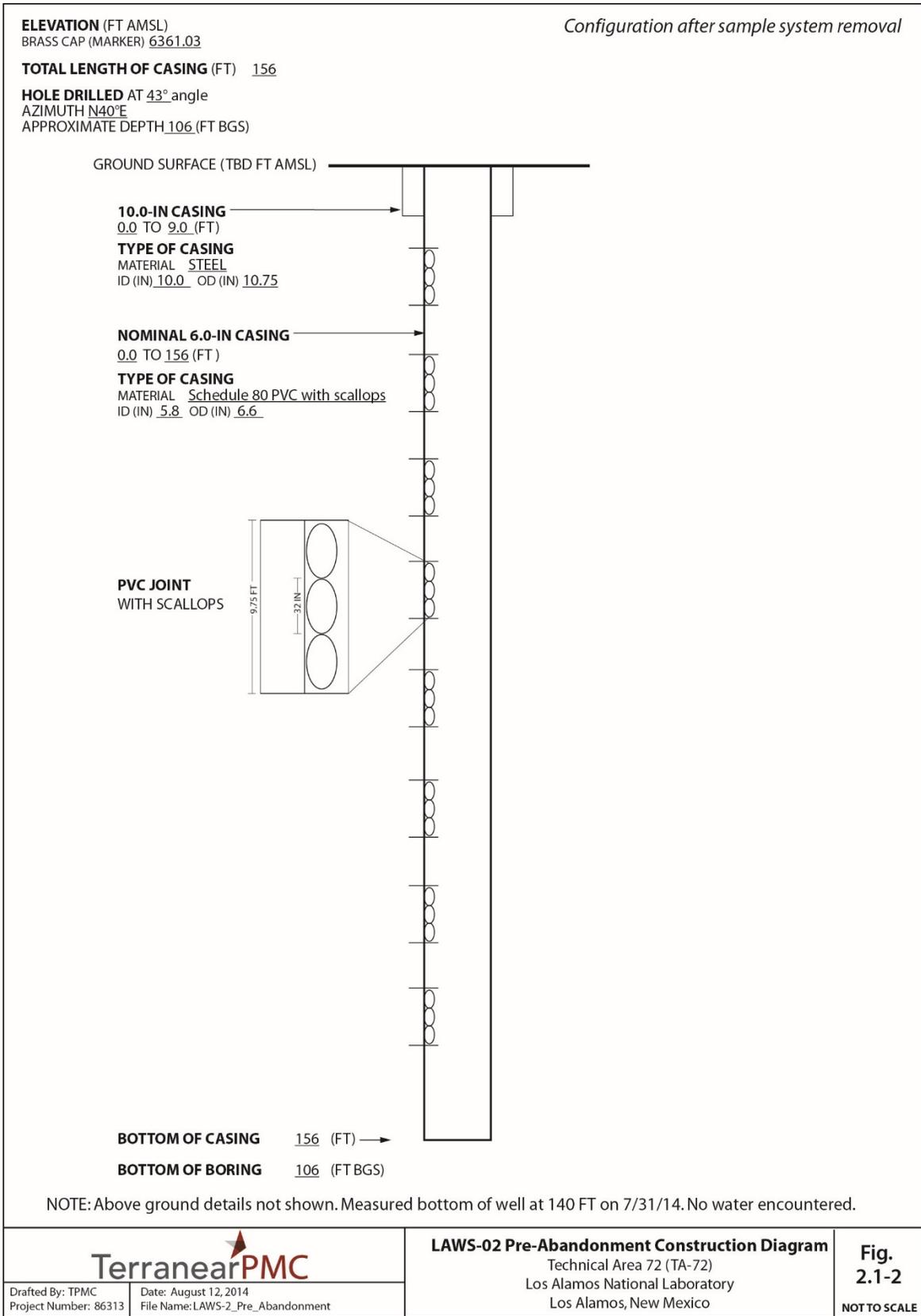


Figure 2.1-2 Well LAWS-02 pre-abandonment construction diagram

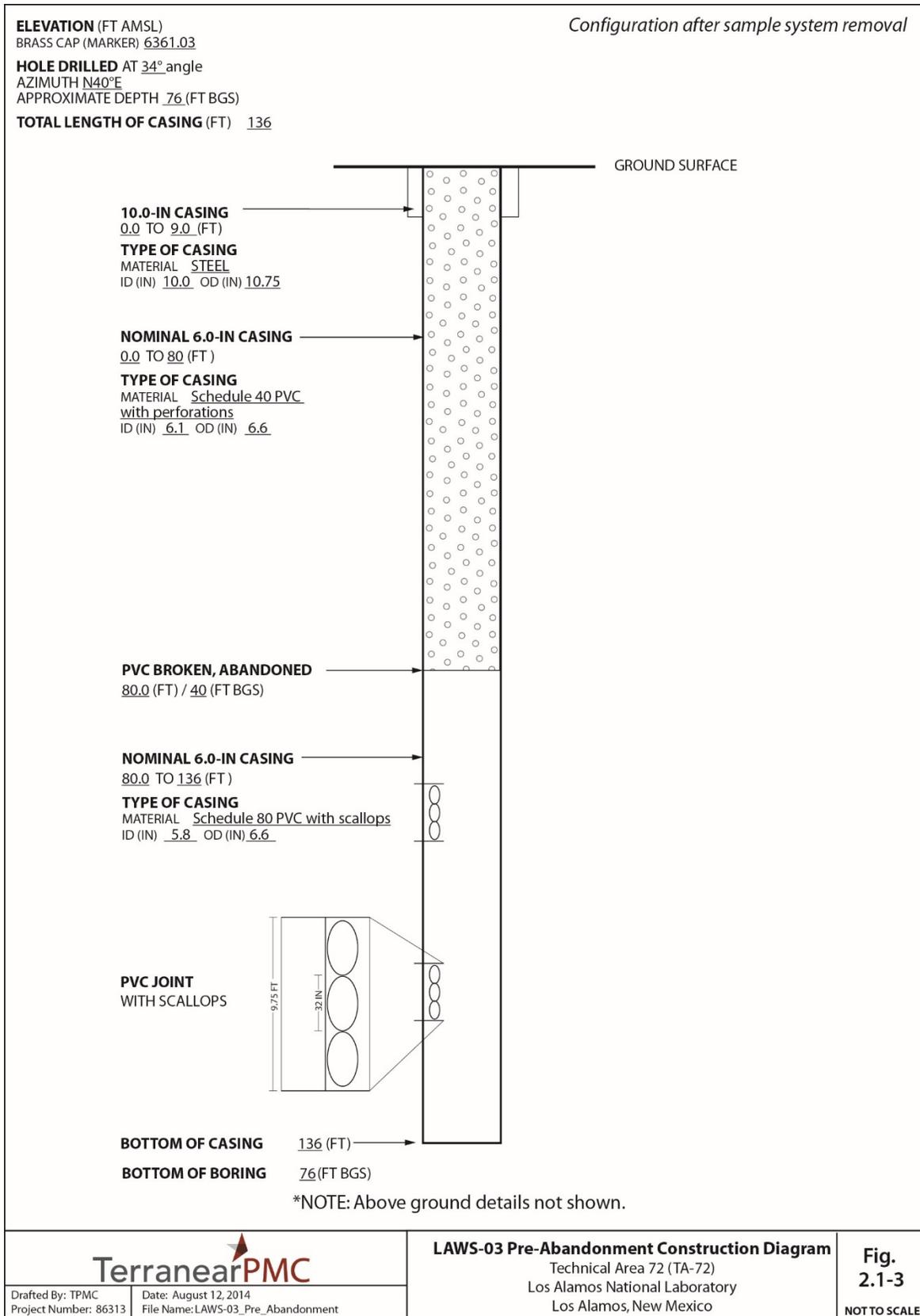


Figure 2.1-3 Well LAWS-03 pre-abandonment construction diagram

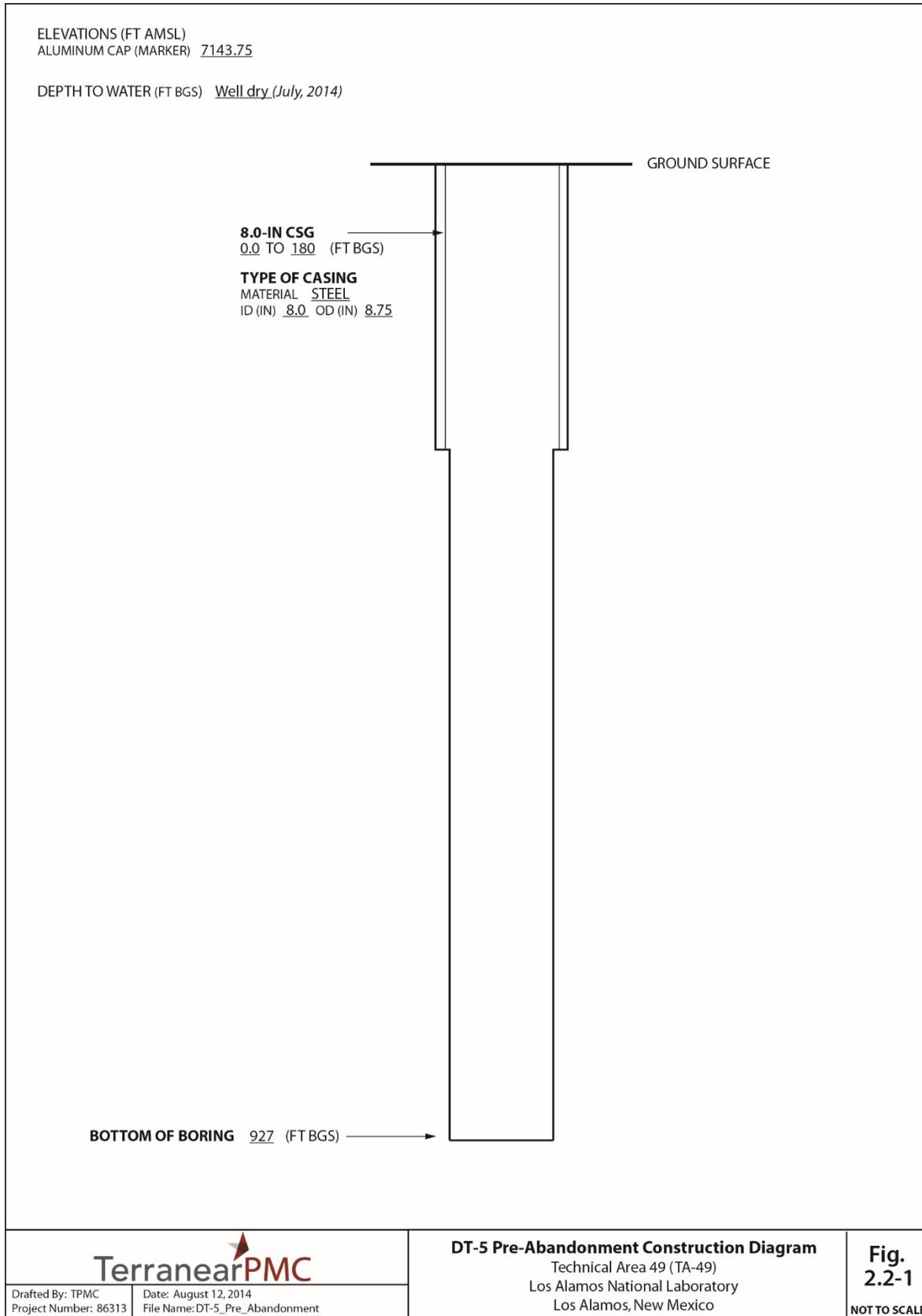


Figure 2.2-1 Test well DT-5 pre-abandonment construction diagram

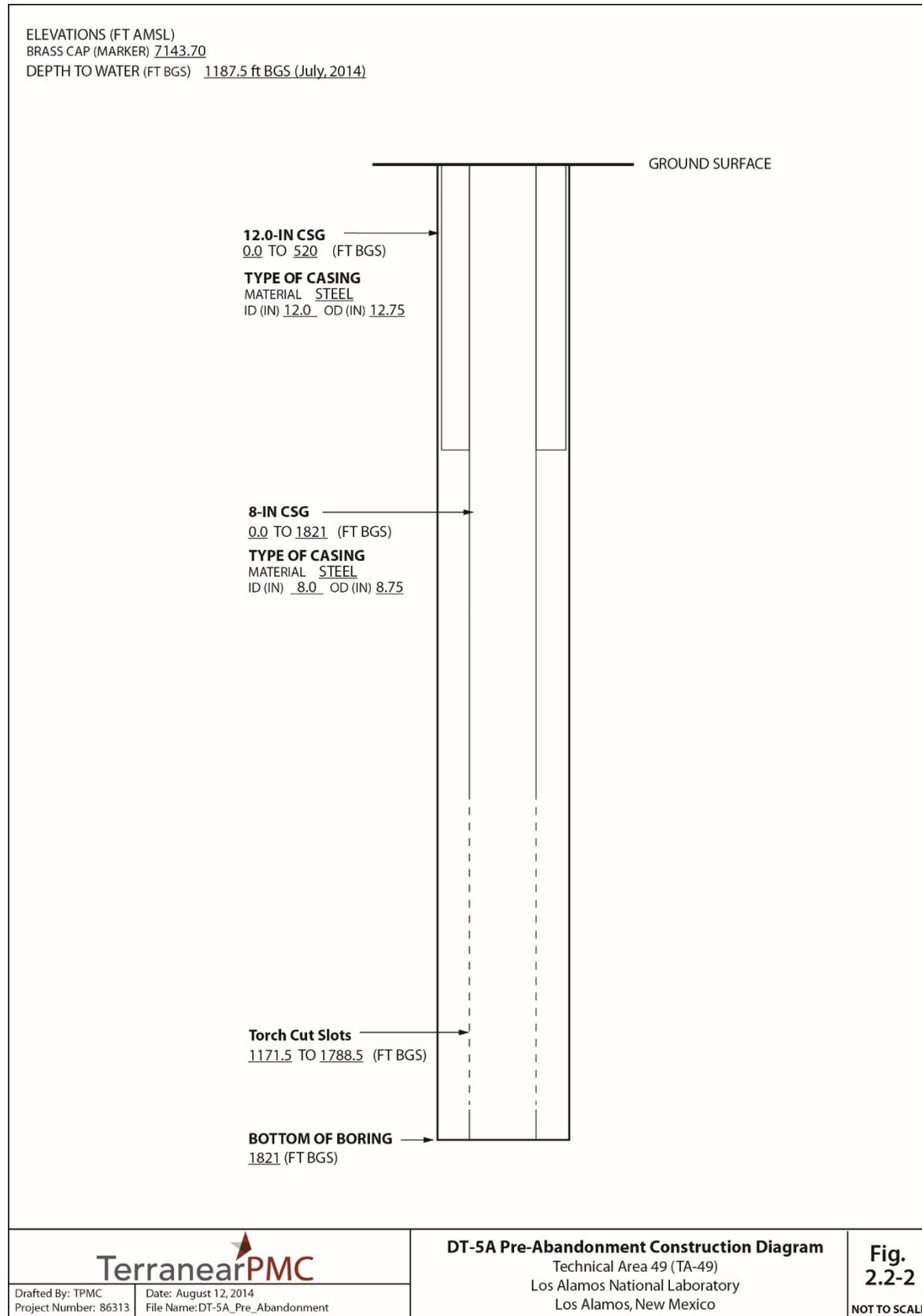
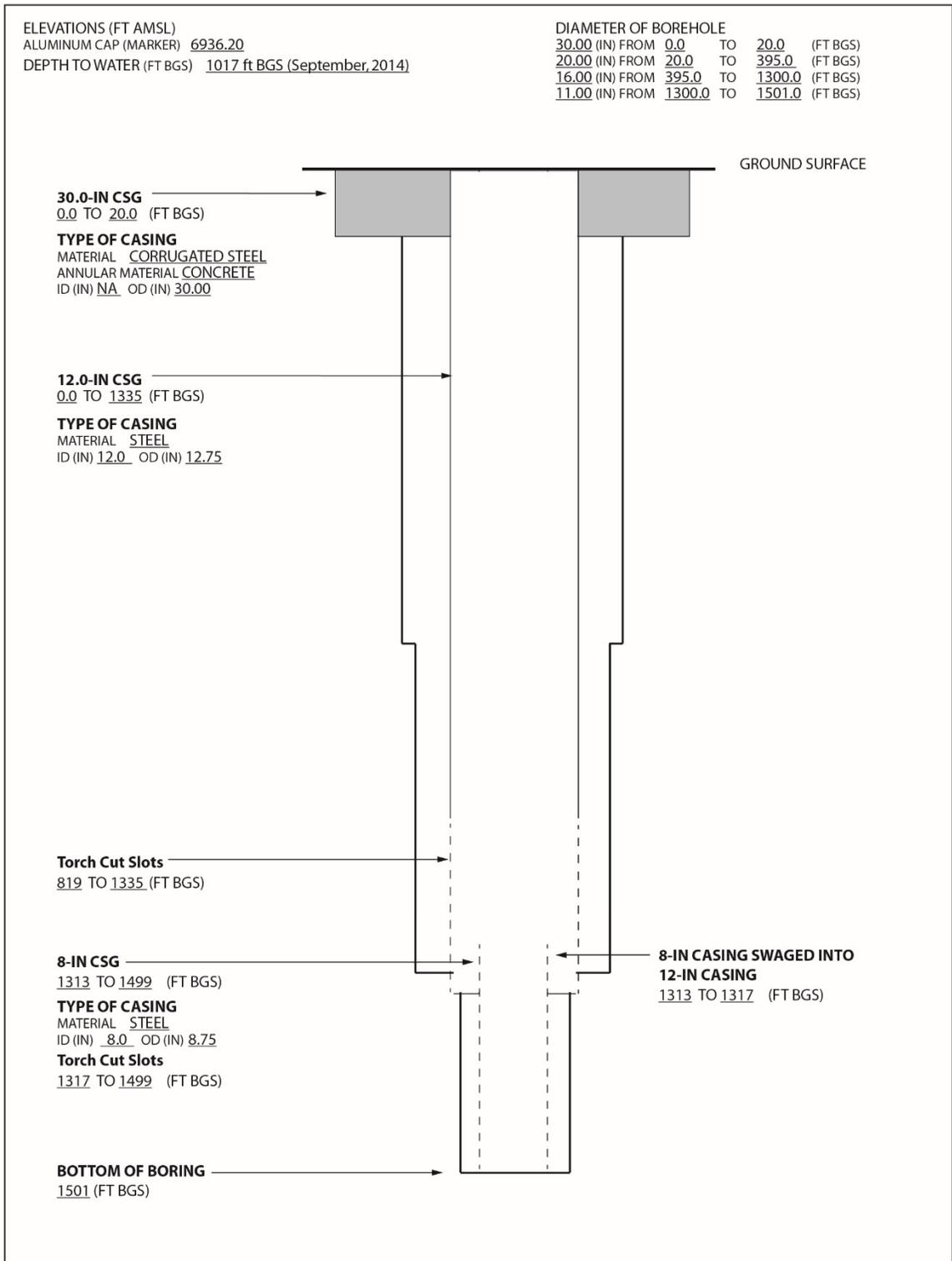


Figure 2.2-2 Test well DT-5A pre-abandonment construction diagram



		DT-9 Pre-Abandonment Construction Diagram Technical Area 49 (TA-49) Los Alamos National Laboratory Los Alamos, New Mexico	Fig. 2.3-1 NOT TO SCALE
Drafted By: TPMC Project Number: 86313	Date: January 1, 2015 File Name: DT-9_Pre_Abandonment		

Figure 2.3-1 Test well DT-9 pre-abandonment construction diagram

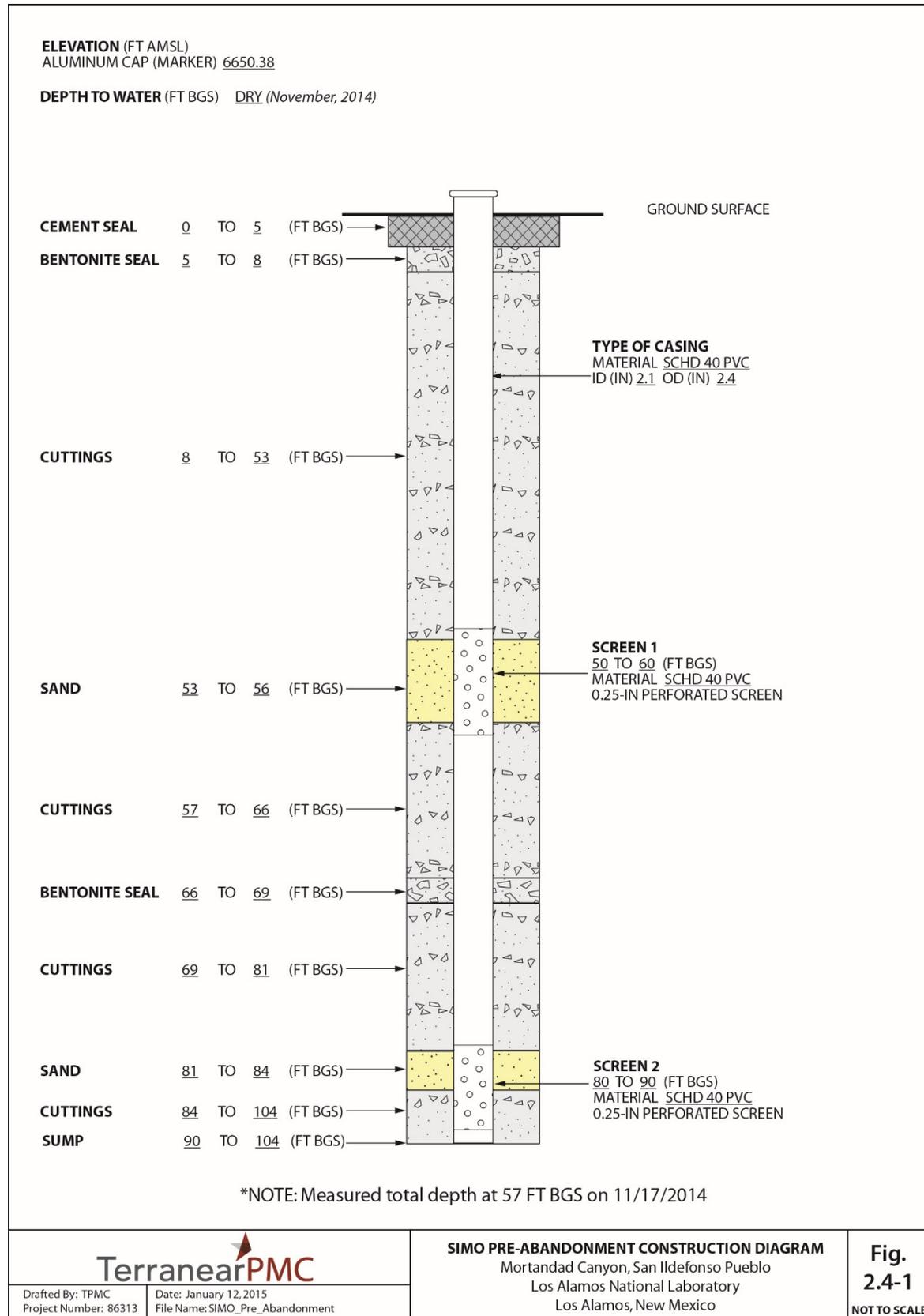


Figure 2.4-1 Test well SIMO pre-abandonment construction diagram

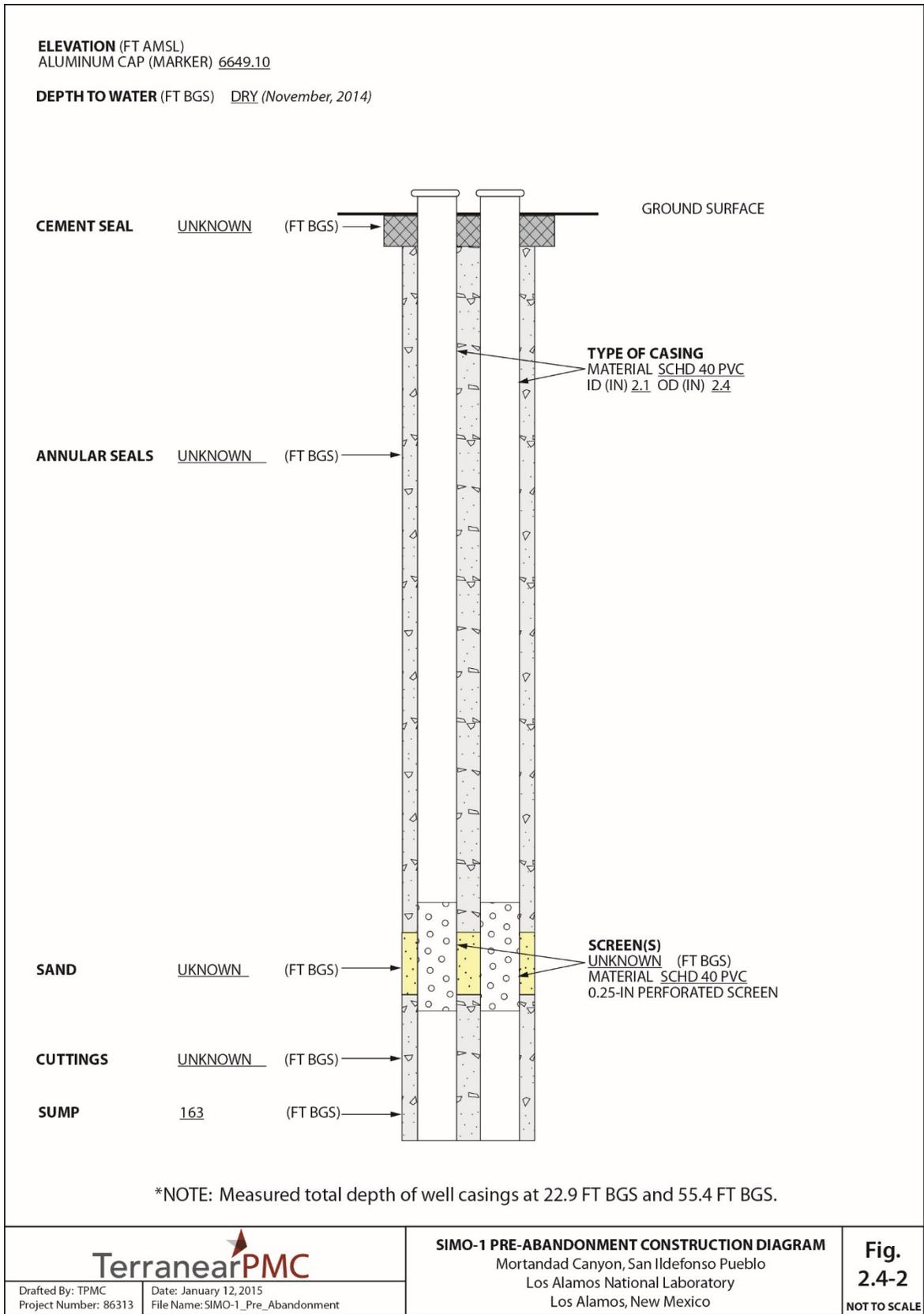


Figure 2.4-2 Test well SIMO-1 pre-abandonment construction diagram

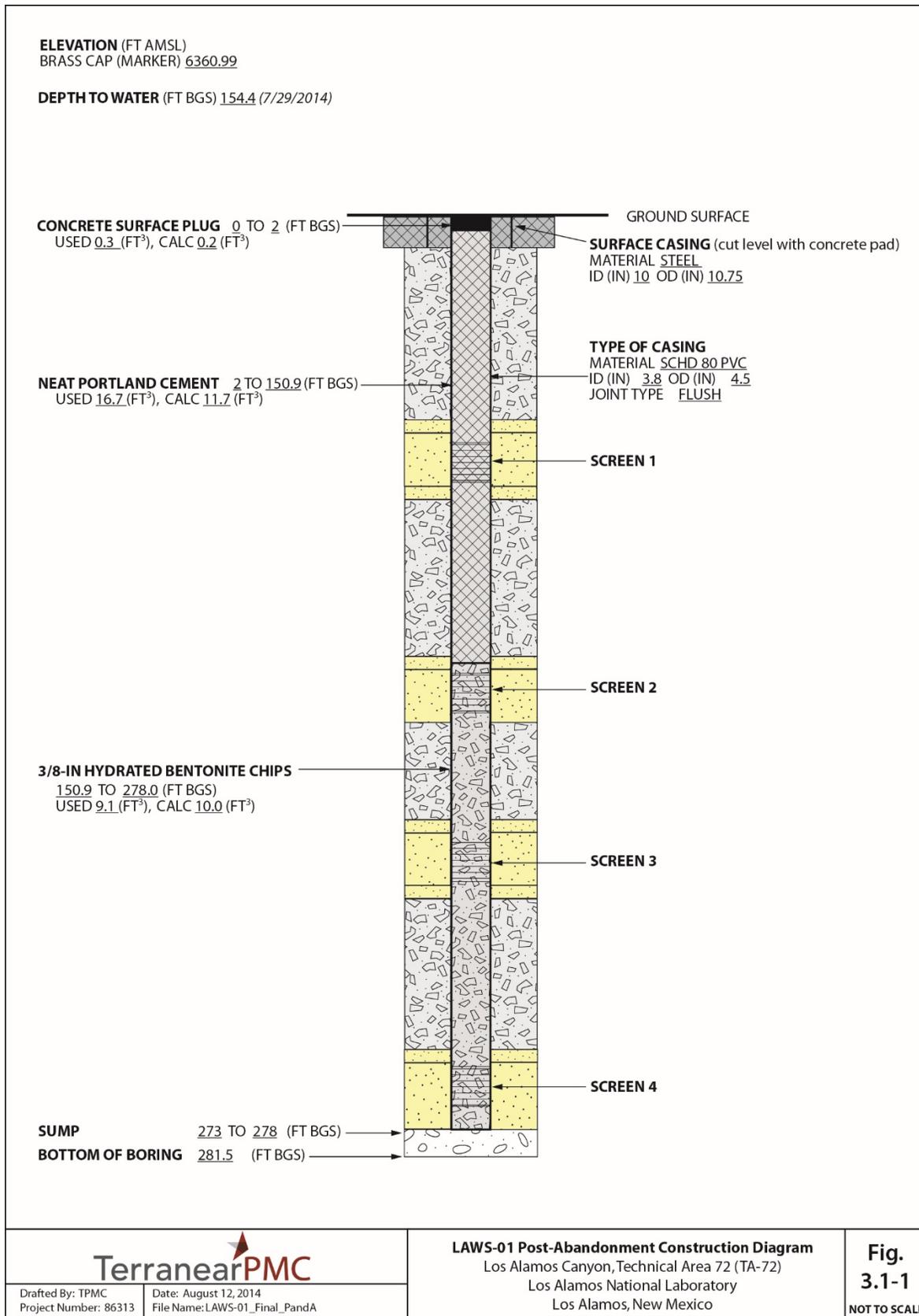


Figure 3.1-1 Well LAWS-01 post-abandonment construction diagram

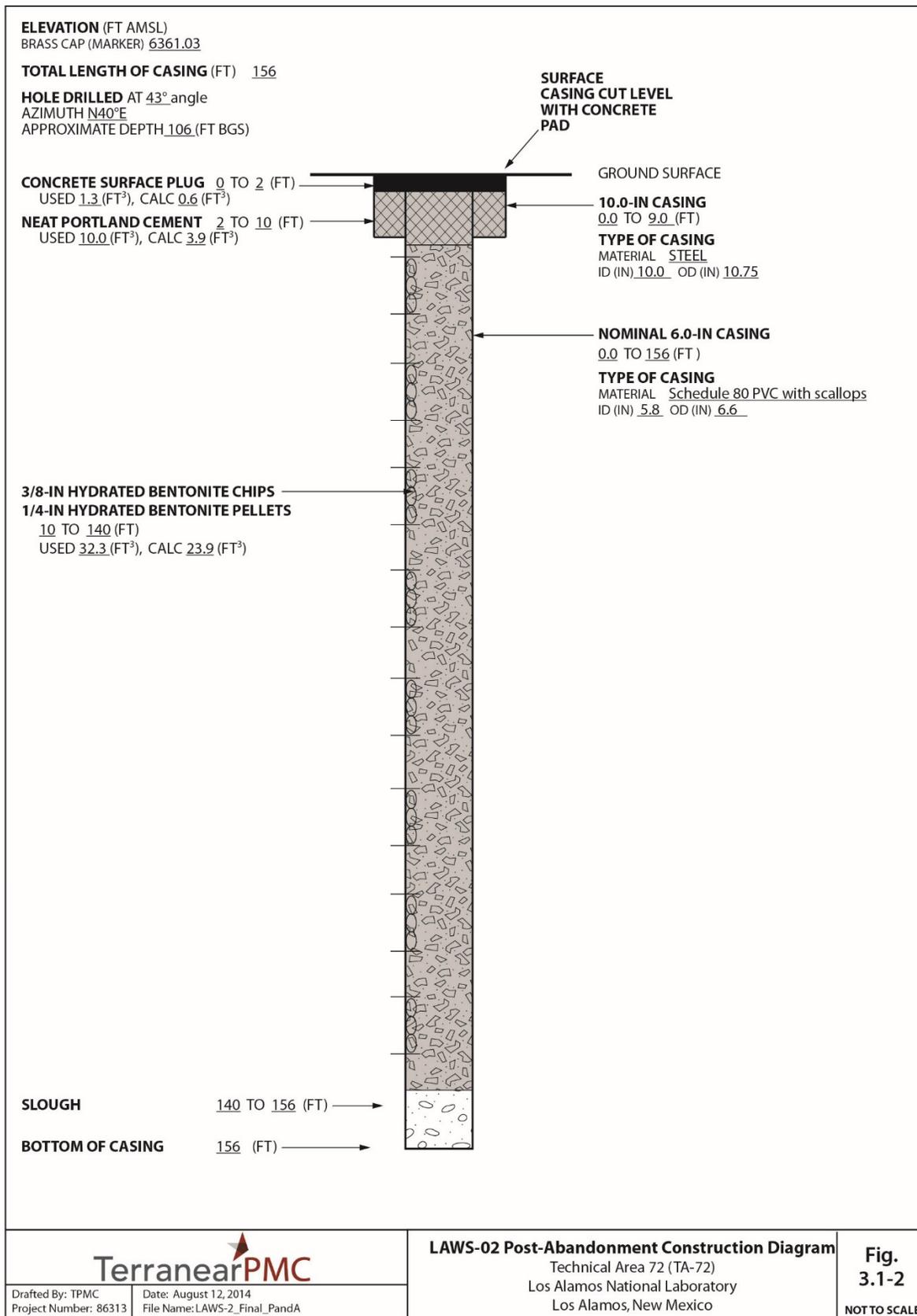


Figure 3.1-2 Well LAWS-02 post-abandonment construction diagram

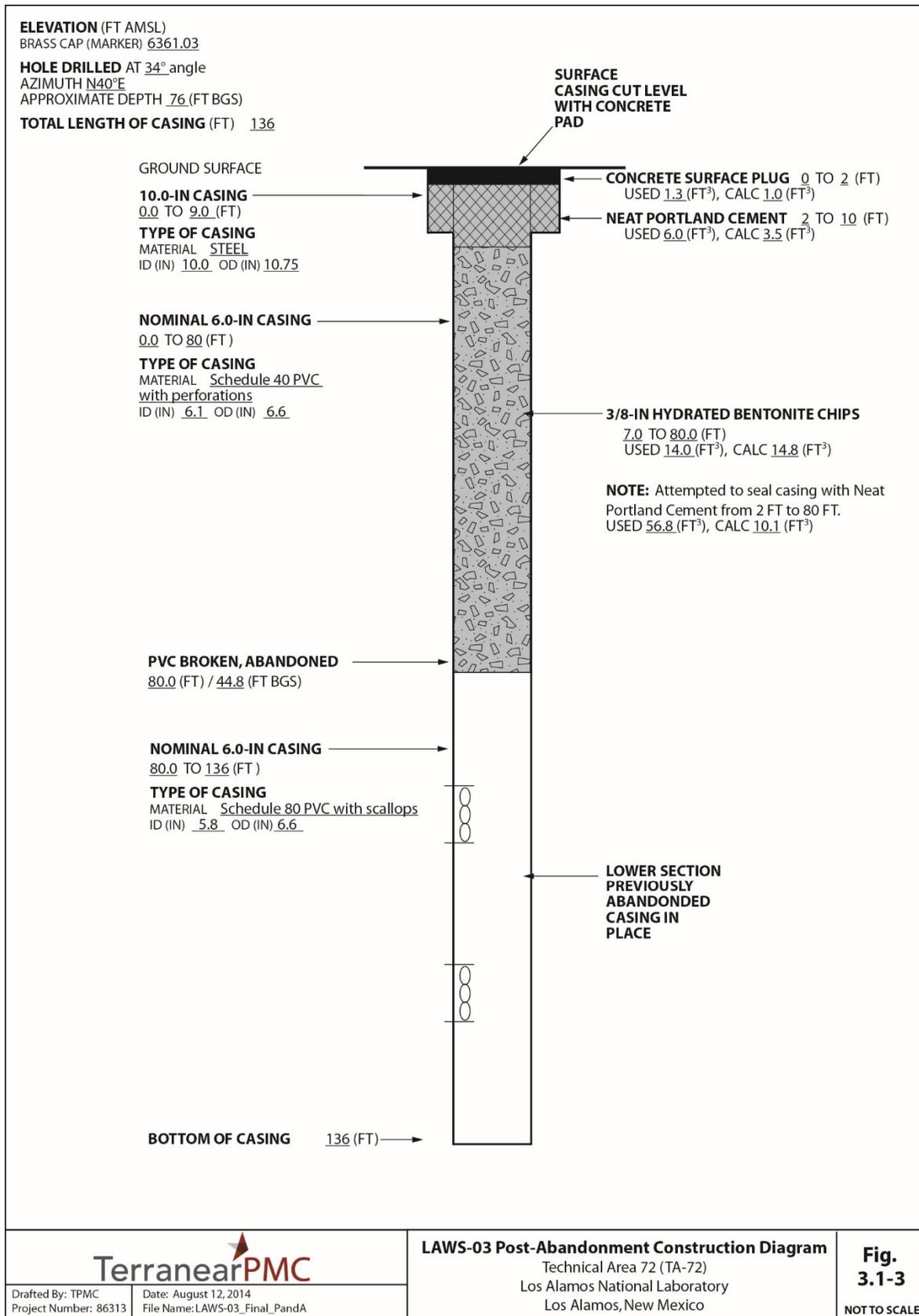


Figure 3.1-3 Well LAWS-03 post-abandonment construction diagram

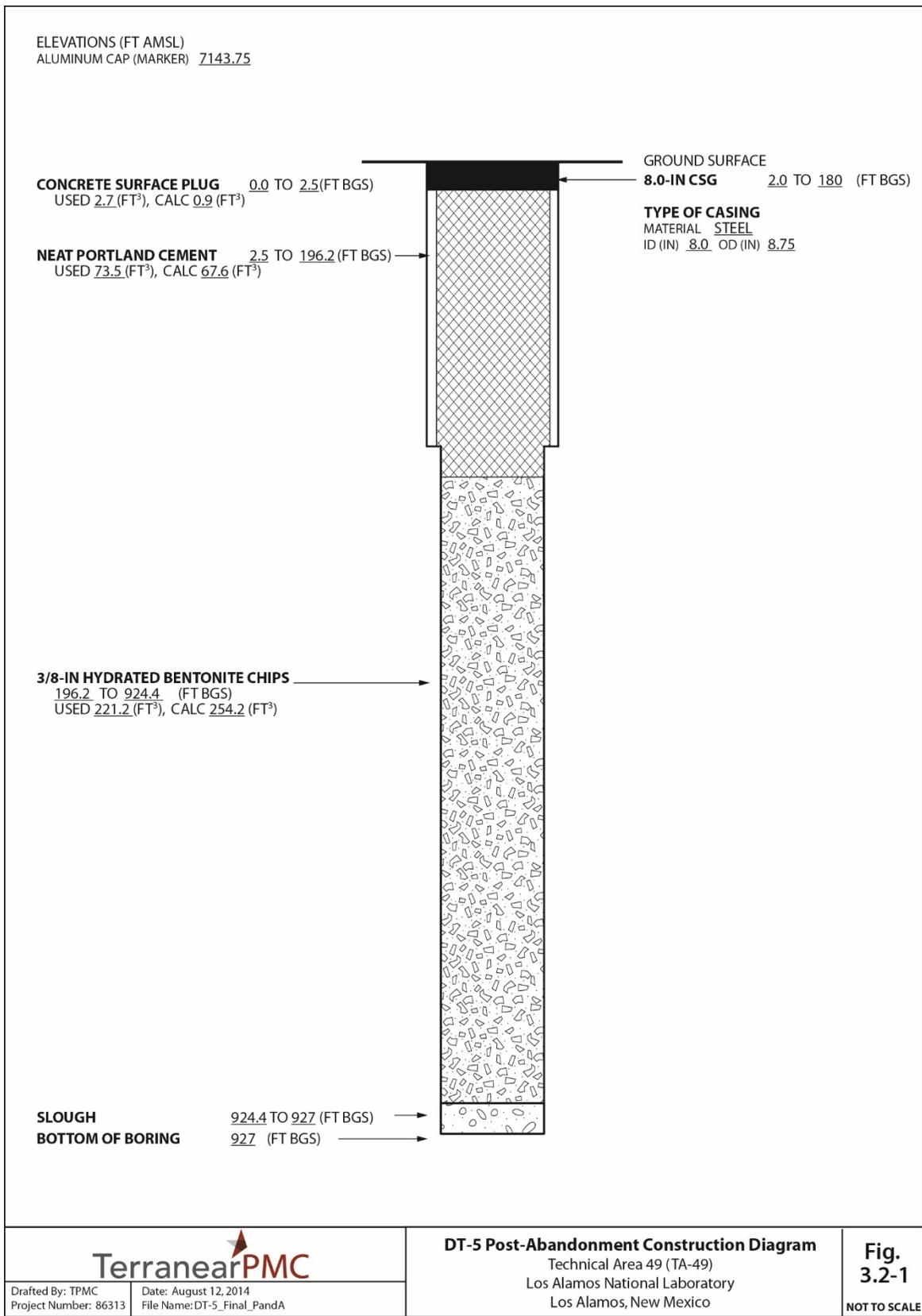


Figure 3.2-1 Test well DT-5 post-abandonment construction diagram

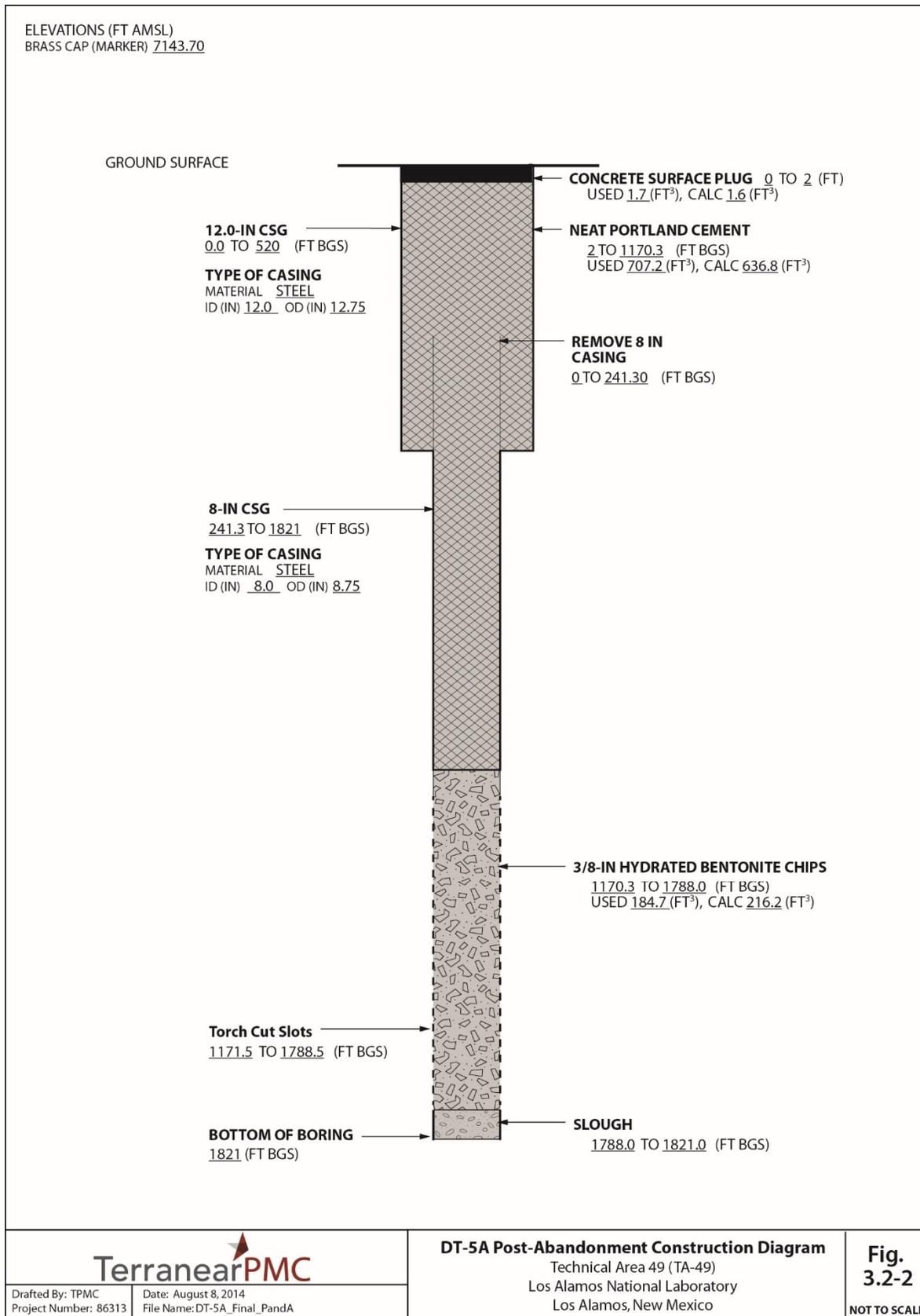


Figure 3.2-2 Test well DT-5A post-abandonment construction diagram

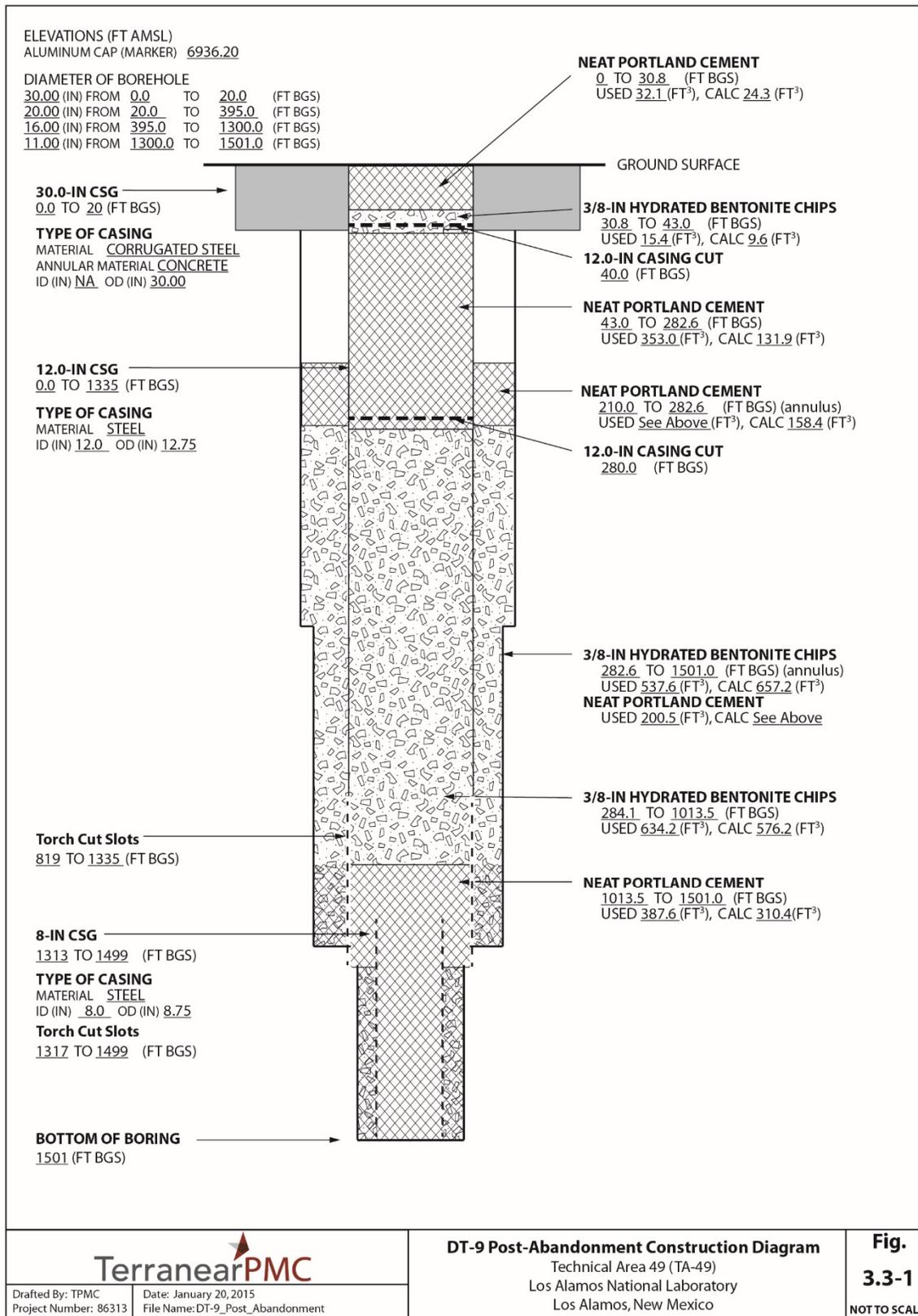


Figure 3.3-1 Test well DT-9 post-abandonment construction diagram

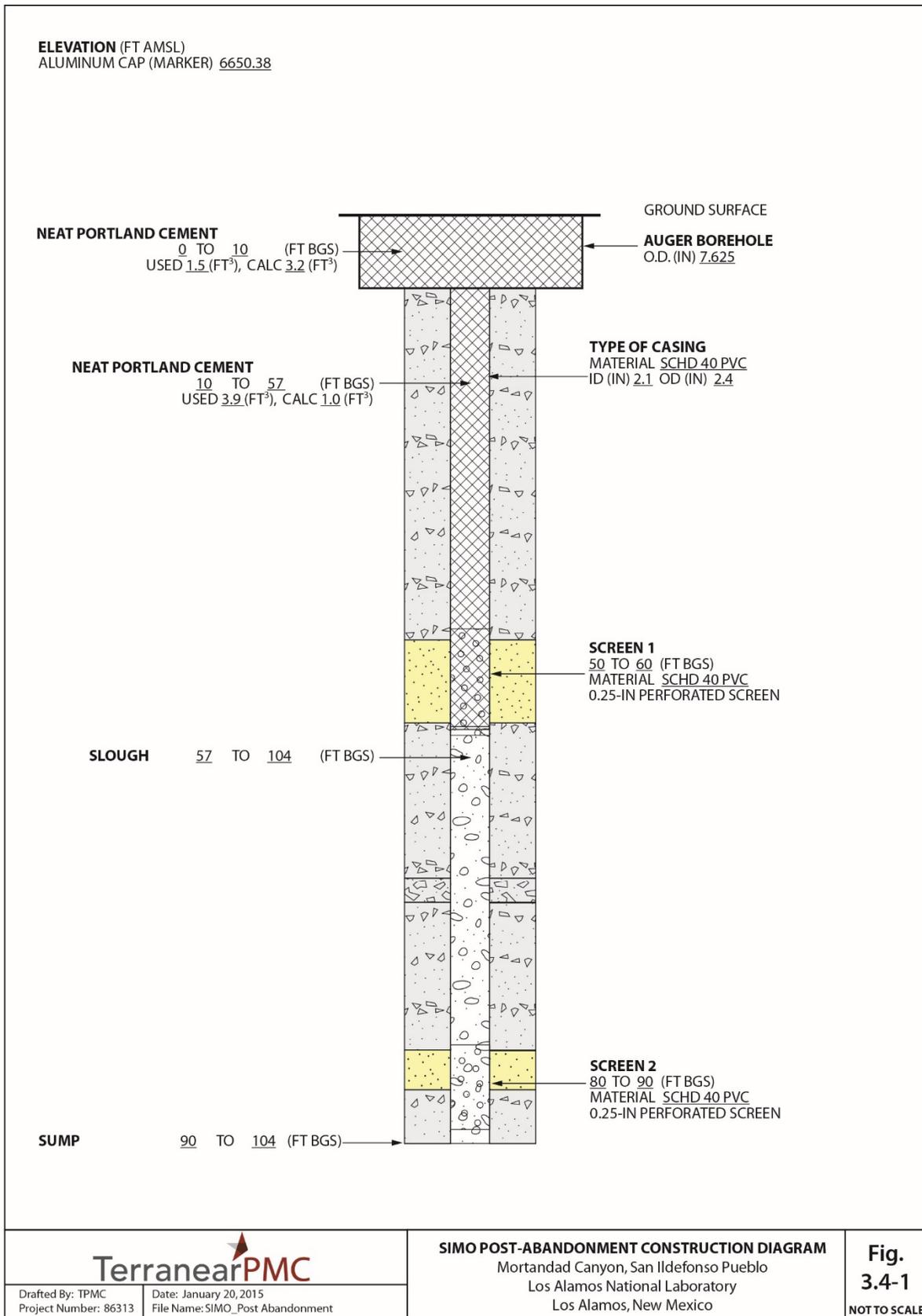


Figure 3.4-1 Test well SIMO post-abandonment construction diagram

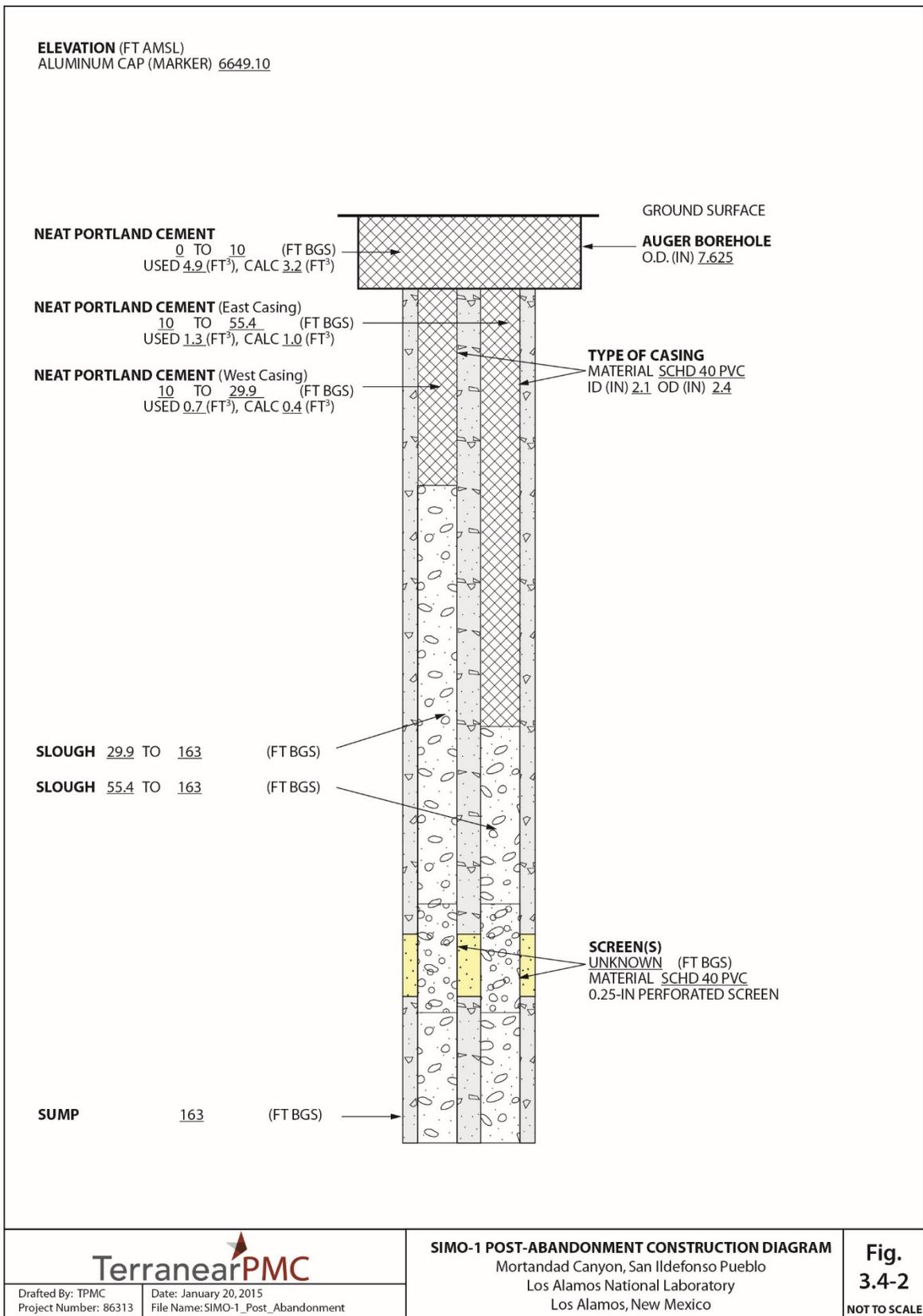


Figure 3.4-2 Test well SIMO-1 post-abandonment construction diagram

**Table 3.1-1
Quantity and Materials Used to Plug and Abandon Well LAWS-01**

Date	Depth Interval (ft bgs bottom to top)	Quantity Portland Type I/II Used (lb)	Quantity Municipal Water Used (gal.)	Quantity 3/8-in. Bentonite Used (lb)	Calculated Volume (ft ³)	Actual Volume (ft ³)
7/29/14	278–258.8	0	500	100	1.5	1.4
7/30/14	258.8–150.9	0	1000	550	8.5	7.7
7/30/14	150.9–2.0	1175	75	0	11.7	16.7
Total		1175	1575	650	21.7	25.8

**Table 3.1-2
Quantity and Materials Used to Plug and Abandon Well LAWS-02**

Date	Depth Interval (ft bgs bottom to top)	Quantity Portland Type I/II Used (lb)	Quantity Municipal Water Used (gal.)	Quantity 3/8-in. and 1/4-in. Bentonite Used (lb)	Calculated Volume (ft ³)	Actual Volume (ft ³)
7/31/14	140.0–120.0	0	1500	350	3.7	4.9
8/1/14	120.0–10.0	0	700	2000	20.2	27.4
8/1/14	10.0–2.0	705	45	0	3.9	10.0
Total		705	2245	2350	27.8	42.3

**Table 3.1-3
Quantity and Materials Used to Plug and Abandon Well LAWS-03**

Date	Depth Interval (ft bgs bottom to top)	Quantity Portland Type I/II Used (lb)	Quantity Municipal Water Used (gal.)	Quantity 3/8-in. Bentonite Used (lb)	Calculated Volume (ft ³)	Actual Volume (ft ³)
7/30/14	Below 80.0	3995	255	0	10.1	56.8*
7/31/14	80.0–7.0	0	500	1000	14.8	14.0
8/1/14	7.0–2.0	423	27	0	3.5	6.0
Total		4418	782	1000	34.1	76.8

*Total volume of cement added on July 30, 2014, was lost either to the formation or around the obstruction at 80.0 ft.

**Table 3.2-1
Quantity and Materials Used to Plug and Abandon Test Well DT-5**

Date	Depth Interval (ft bgs bottom to top)	Quantity Portland Type I/II Used (lb)	Quantity Municipal Water Used (gal.)	Quantity 3/8-in. Bentonite Used (lb)	Calculated Volume (ft ³)	Actual Volume (ft ³)
7/24/14	924.4–719.4	0	315	3150	71.6	62.3
7/25/14	719.4–464.1	0	600	6000	89.0	77.5
7/26/14	464.1–196.2	0	665	6650	93.6	81.4
7/26/14	196.2–2.5	5170	330	0	67.6	73.5
Total		5170	1910	15,800	321.8	294.7

**Table 3.2-2
Quantity and Materials Used to Plug and Abandon Test Well DT-5A**

Date	Depth Interval (ft bgs bottom to top)	Quantity Portland Type I/II Used (lb)	Quantity Municipal Water Used (gal.)	Quantity 3/8-in. Bentonite Used (lb)	Calculated Volume (ft ³)	Actual Volume (ft ³)
8/4/14	1788.0–1778.0	0	800	250	3.5	3.5
8/5/14	1778.0–1640.4	0	3000	2795	48.2	39.1
8/6/14	1640.4–1625.5	0	800	300	5.2	4.2
8/7/14	1625.5–1583.6	0	2500	1000	14.7	14.0
8/8/14	1583.6–1471.1	0	6000	2500	39.4	35.0
8/9/14	1471.1–1401.3	0	4500	1450	24.4	20.3
8/18/14	1401.3–1351.2	0	2400	1000	17.5	14.0
8/19/14	1351.2–1262.4	0	5600	1900	31.1	26.6
8/20/14	1262.4–1217.2	0	4000	1000	15.8	14.0
8/21/14	1217.2–1170.3	0	3200	1000	16.4	14.0
8/22/14	1170.3–857.7	6580	420	0	109.4	93.6
8/27/14	857.7–243.3	16,920	1080	0	215.0	240.6
8/28/14	243.3–234.9	14,100	900	0	128.4 ¹	200.5
8/29/14	234.9–2.0	12,126	774	0	184.0	172.5
Total		49,726	35,974	13,195	853.0	891.9

* Volume includes annulus between 8-in. and 12-in. casing strings from 241.3 (8-in. casing cut/removed) to 520 ft bgs (bottom of 12-in. casing).

**Table 3.3-1
Quantity and Materials Used to Plug and Abandon Test Well DT-9**

Date	Depth Interval (ft bgs bottom to top)	Quantity Portland Type I/II Used (lb)	Quantity Municipal Water Used (gal.)	Quantity 3/8-in. Bentonite Used (lb)	Calculated Volume (ft ³)	Actual Volume (ft ³)
9/12/14	1501.0–1243.5	2820	180	0	128.7	40.1
9/13/14	1243.5–1115.2	5640	360	0	101.4	80.2
9/14/14	1115.2–1015.3	8460	540	0	78.9	120.3
9/15/14	1015.3–1013.5	10,340	660	0	1.4	147.0
12/2/14	1013.5–747.7	0	1400	16,800	210.0	235.2
12/3/14	747.7–284.1	0	1500	28,500	366.2	399.0
12/6/14	284.1–280.81	14,100	900	0	5.8	200.5
12/6/14	1501–Unknown ^{a,b}	0	2100	2400	540.5	33.6
12/7/14	Unknown–368.4 ^a	0	3600	24,000	See above	336.0
12/8/14	368.4–282.6 ^a	0	2286	12,000	110.9	168.0
12/8/14	282.6–210.0 ^a	11,186	714	0	158.4	159.1
12/9/14	210.0–43.0	13,630	870	0	131.9	193.9
12/9/14	43.0–30.8	0	786	1100	9.6	15.4
12/9/14	30.8–0	2256	144	0	24.3	32.1
Total		68,432	16,040	84,800	1868.0	2160.4

^a Calculated volumes include the annulus between 12-in.-I.D. well casing and the borehole. See Figure 2.3-1 for borehole sizes.

^b No reliable tag was successfully measured at the end of the shift on 12/6/14.

**Table 3.4-1
Quantity and Materials Used to Plug and Abandon Test Well SIMO**

Date	Depth Interval (ft bgs bottom to top)	Quantity Portland Type I/II Used (lb)	Quantity Municipal Water Used (gal.)	Quantity Quikrete Concrete Mix used (lb)	Calculated Volume (ft ³)	Actual Volume (ft ³)
11/17/14	57.0–10.0	282	20	0	1.0	3.9
11/17/14	10.0–0.0	0	30	200	3.2	1.5
Total		282	50	200	4.2	5.4

**Table 3.4-2
Quantity and Materials Used to Plug and Abandon Test Well SIMO-1**

Date	Depth Interval (ft bgs bottom to top)	Quantity Portland Type I/II Used (lb)	Quantity Municipal Water Used (gal.)	Quantity Quikrete Concrete Mix Used (lb)	Calculated Volume (ft ³)	Actual Volume (ft ³)
11/17/14	55.4–10.0 (east casing)	90	18	0	1.0	1.3
11/17/14	29.9–10.0 (west casing)	51	12	0	0.4	0.7
11/17/14	10.0–0.0	329	30	50	3.2	4.9
Total		470	60	50	4.6	6.9

**Table 4.1-1
Survey Coordinates of Brass/Aluminum Pin Embedded in Surface Pad**

Identification	Northing	Easting	Elevation
LAWS-01	1770845.95	1649518.71	6360.99
LAWS-02	1770847.26	1649529.75	6361.03
LAWS-03	1770845.27	1649536.23	6361.03
DT-5	1754837.20	1625311.27	7143.75
DT-5A	1754789.39	1625309.92	7143.70
DT-9	1751497.21	1628990.71	6936.20
SIMO	1766633.93	1641883.46	6650.38
SIMO-1	1766694.57	1641897.64	6649.10

Note: All coordinates are expressed as New Mexico State Plane Coordinate System Central Zone (NAD 83); elevation is expressed in feet amsl using the National Geodetic Vertical Datum of 1929.

Appendix A

*Video Logs of DT-5, DT-5A, and DT-9
(on DVDs included with this document)*

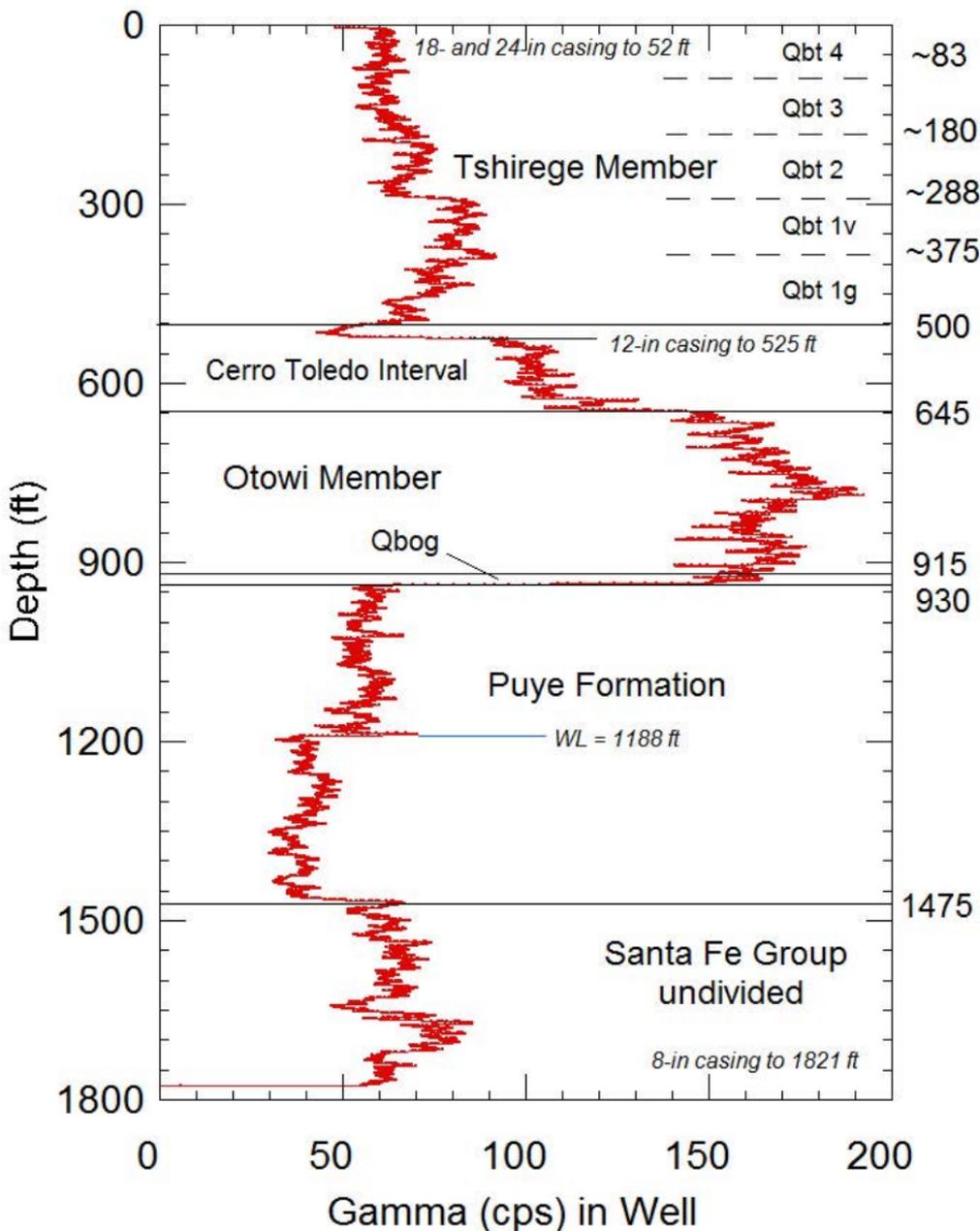
***TO VIEW THE VIDEO
THAT ACCOMPANIES
THIS DOCUMENT,
PLEASE CALL THE
HAZARDOUS WASTE
BUREAU AT 505-476-6000
TO MAKE AN
APPOINTMENT***

Appendix B

*Natural Gamma Logs of DT-5A and DT-9
(on CD included with this document)*

DT-5A

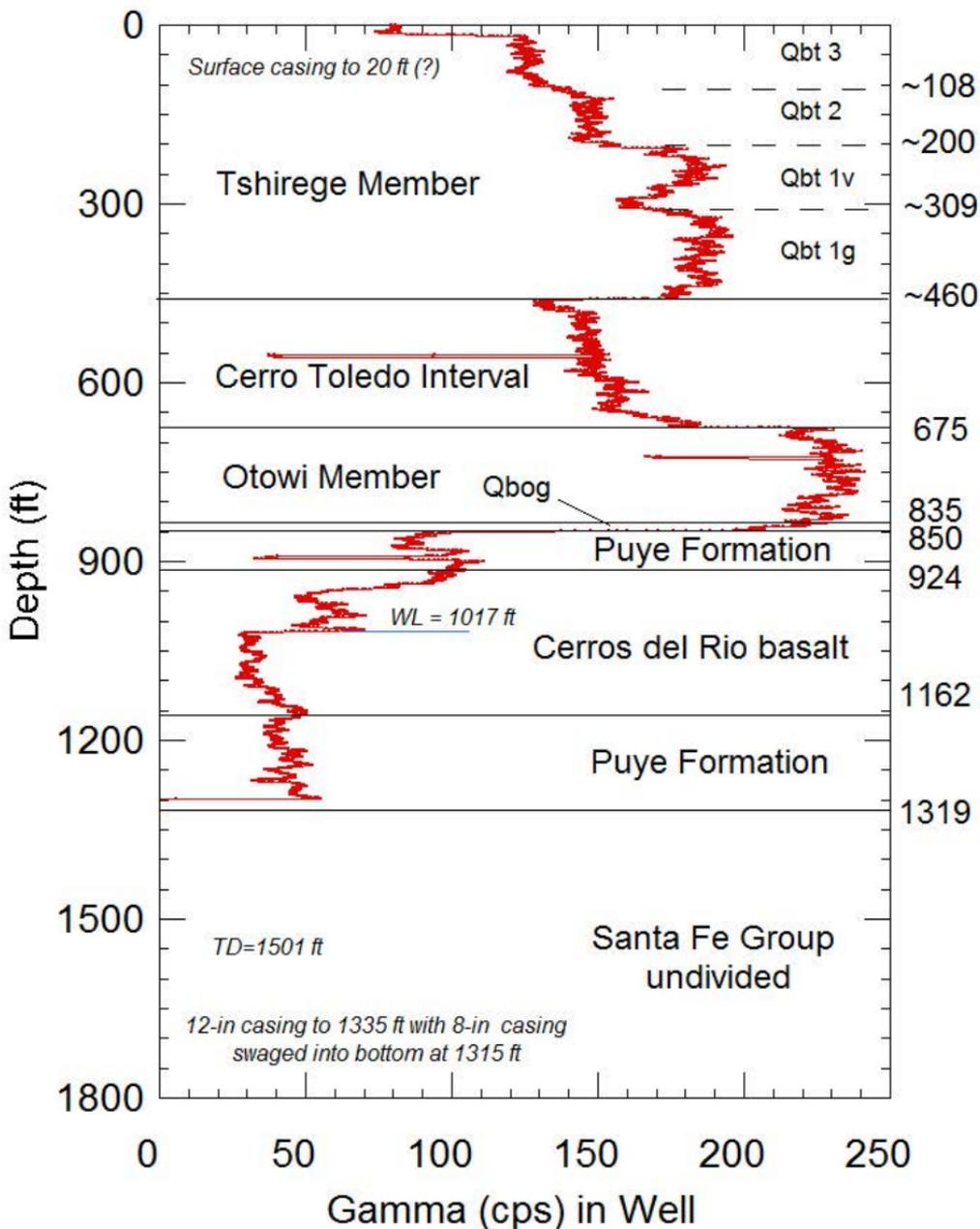
(Surface Elev. 7144.2 ft)



Contacts inferred by comparison to gamma at R-29 and R-30

DT-9

(Surface Elev. 6936 ft)



Contacts inferred by comparison to gamma at R-29 and R-30

Appendix C

*NMOSE Plugging Plans of Operation and Plugging Records
(on CD included with this document)*



PLUGGING RECORD



NOTE: A Well Plugging Plan of Operations shall be approved by the State Engineer prior to plugging - 19.27.4 NMAC

I. GENERAL / WELL OWNERSHIP:

State Engineer Well Number: DT-5

Well owner: U.S. Department of Energy/Los Alamos National Laboratory Phone No.: 505-667-3005

Mailing address: P.O. Box 1663

City: Los Alamos State: New Mexico Zip code: 87545

II. WELL PLUGGING INFORMATION:

- 1) Name of well drilling company that plugged well: Boart Longyear
- 2) New Mexico Well Driller License No.: 1161 Expiration Date: 10/31/2014
- 3) Well plugging activities were supervised by the following well driller(s)/rig supervisor(s): Boart Longyear
- 4) Date well plugging began: 7/24/14 Date well plugging concluded: 7/27/14
- 5) GPS Well Location: East: 1625310.0
North: 1754789.4
Well coordinates are New Mexico State Plane Grid Coordinates, Central Zone (North American Datum, 1983 [NAD 1983]).
- 6) Depth of well confirmed at initiation of plugging as: 924.4 ft below ground level (bgl),
by the following manner: Manual tag line measurement
- 7) Static water level measured at initiation of plugging: Dry ft bgl
- 8) Date well plugging plan of operations was approved by the State Engineer: 07/18/2014
- 9) Were all plugging activities consistent with an approved plugging plan? Yes If not, please describe differences between the approved plugging plan and the well as it was plugged (attach additional pages as needed):

Hydrated bentonite chips were placed from TD (924.4 ft bgl) to 196.2 ft bgl with a tremie pipe. Portland Type I/II cement was placed from 196.2 to 2.5 ft bgl with a tremie pipe. The well casing was cut level with ground surface and a concrete surface plug was emplaced from 2.5 ft bgl to surface.

10) Log of Plugging Activities - Label vertical scale with depths, and indicate separate plugging intervals with horizontal lines as necessary to illustrate material or methodology changes. Attach additional pages if necessary.

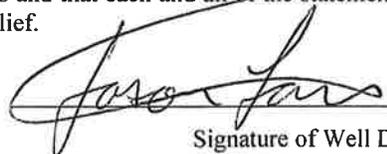
For each interval plugged, describe within the following columns:

Depth (ft bgl)	Plugging Material Used (include any additives used)	Volume of Material Placed (gallons)	Theoretical Volume of Borehole/ Casing (gallons)	Placement Method (tremie pipe, other)	Comments ("casing perforated first", "open annular space also plugged", etc.)
0 2.5	Concrete	20.2 gallons	6.7 gallons	Other	Surface plug
	Portland Type I/II Cement	549.8 gallons	505.6 gallons	Tremie	
196.2	3/8-in. Hydrated Bentonite Chips	1654.6 gallons	1901.4 gallons	Tremie	
924.4					

MULTIPLY		BY		AND OBTAIN
cubic feet	x	7.4805	=	gallons
cubic yards	x	201.97	=	gallons

III. SIGNATURE:

I, _____, say that I am familiar with the rules of the Office of the State Engineer pertaining to the plugging of wells and that each and all of the statements in this Plugging Record and attachments are true to the best of my knowledge and belief.


Signature of Well Driller

10-9-14
Date

ELEVATIONS (FT AMSL)
BRASS CAP (MARKER) TBD

CONCRETE SURFACE PLUG 0.0 TO 2.5 (FT BGS)
USED 2.7 (FT³), CALC 0.9 (FT³)

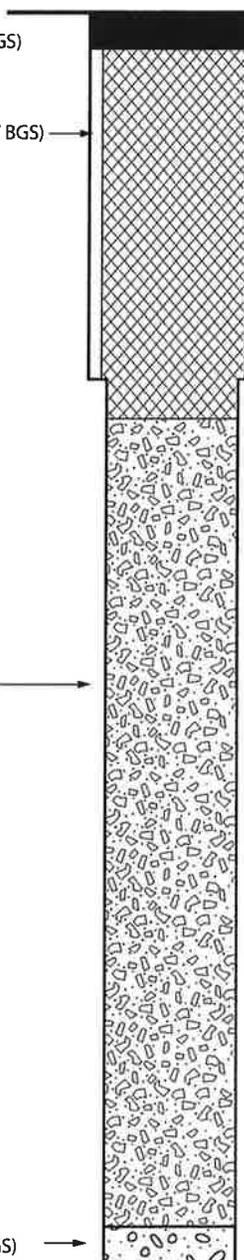
NEAT PORTLAND CEMENT 2.5 TO 196.2 (FT BGS)
USED 73.5 (FT³), CALC 67.6 (FT³)

3/8-IN HYDRATED BENTONITE CHIPS
196.2 TO 924.4 (FT BGS)
USED 221.2 (FT³), CALC 254.2 (FT³)

SLOUGH 924.4 TO 927 (FT BGS)
BOTTOM OF BORING 927 (FT BGS)

GROUND SURFACE (TBD FT AMSL)
8.0-IN CSG 2.0 TO 180 (FT BGS)

TYPE OF CASING
MATERIAL STEEL
ID (IN) 8.0 OD (IN) 8.75



TerraneerPMC

Drafted By: TPMC Date: August 12, 2014
Project Number: 86313 File Name: DT-5_Final_Panda

DT-5 Post-Abandonment Well Construction
Technical Area 49 (TA-49)
Los Alamos National Laboratory
Los Alamos, New Mexico

As-Built

DT-5

NOT TO SCALE



PLUGGING RECORD



NOTE: A Well Plugging Plan of Operations shall be approved by the State Engineer prior to plugging - 19.27.4 NMAC

I. GENERAL / WELL OWNERSHIP:

State Engineer Well Number: DT-5A

Well owner: U.S. Department of Energy/Los Alamos National Laboratory Phone No.: 505-667-3005

Mailing address: P.O. Box 1663

City: Los Alamos State: New Mexico Zip code: 87545

II. WELL PLUGGING INFORMATION:

- 1) Name of well drilling company that plugged well: Boart Longyear
- 2) New Mexico Well Driller License No.: 1161 Expiration Date: 10/31/2014
- 3) Well plugging activities were supervised by the following well driller(s)/rig supervisor(s): Boart Longyear
- 4) Date well plugging began: 8/4/14 Date well plugging concluded: 8/30/14
- 5) GPS Well Location: East: 1625310.0
North: 1754789.4
Well coordinates are New Mexico State Plane Grid Coordinates, Central Zone (North American Datum, 1983 [NAD 1983]).
- 6) Depth of well confirmed at initiation of plugging as: 1788 ft below ground level (bgl),
by the following manner: Video log
- 7) Static water level measured at initiation of plugging: 1187.5 ft bgl
- 8) Date well plugging plan of operations was approved by the State Engineer: 07/18/2014
- 9) Were all plugging activities consistent with an approved plugging plan? No If not, please describe differences between the approved plugging plan and the well as it was plugged (attach additional pages as needed):

Hydrated bentonite chips were placed from TD (1788 ft bgl) to 1170.3 ft bgl with a tremie pipe (the proposed top of the bentonite seal was 520 ft bgl; Portland Type I/II cement was used instead after the perforated casing slots were sealed with hydrated bentonite chips). Portland Type I/II cement was placed from 1170.3 to 857.7 ft bgl with a tremie pipe. The tremie was removed from the well casing and a pneumatic casing cutter was installed. The 8-in. well casing was cut and removed from 241.3 ft bgl (the proposed cut was 520 ft bgl, however scale on the sidewalls prevented the casing cutter from being lowered past 260 ft bgl). The tremie pipe was reinstalled and cement was placed from 857.7 to 2.0 ft bgl. The 12-in. well casing was cut level with ground surface and a concrete surface plug was emplaced from 2.0 ft bgl to surface.

10) Log of Plugging Activities - Label vertical scale with depths, and indicate separate plugging intervals with horizontal lines as necessary to illustrate material or methodology changes. Attach additional pages if necessary.

For each interval plugged, describe within the following columns:

<u>Depth</u> (ft bgl)	<u>Plugging Material Used</u> (include any additives used)	<u>Volume of Material Placed</u> (gallons)	<u>Theoretical Volume of Borehole/ Casing</u> (gallons)	<u>Placement Method</u> (tremie pipe, other)	<u>Comments</u> ("casing perforated first", "open annular space also plugged", etc.)
0 2.0	Concrete	12.7 gallons	12.0 gallons	Other	Surface plug
	Portland Type I/II Cement	5289.9 gallons	4763.3 gallons	Tremie	Calculated and actual volumes also include annular space between 8-in. and 12-in. well casings from 241.3 to 520 ft bgl 8-in. casing cut and removed from 241.3ft bgl to surface
1170.3	3/8-in. Hydrated Bentonite Chips	1381.6 gallons	1617.2 gallons	Tremie	
1788.0					

MULTIPLY		BY		AND OBTAIN
cubic feet	x	7.4805	=	gallons
cubic yards	x	201.97	=	gallons

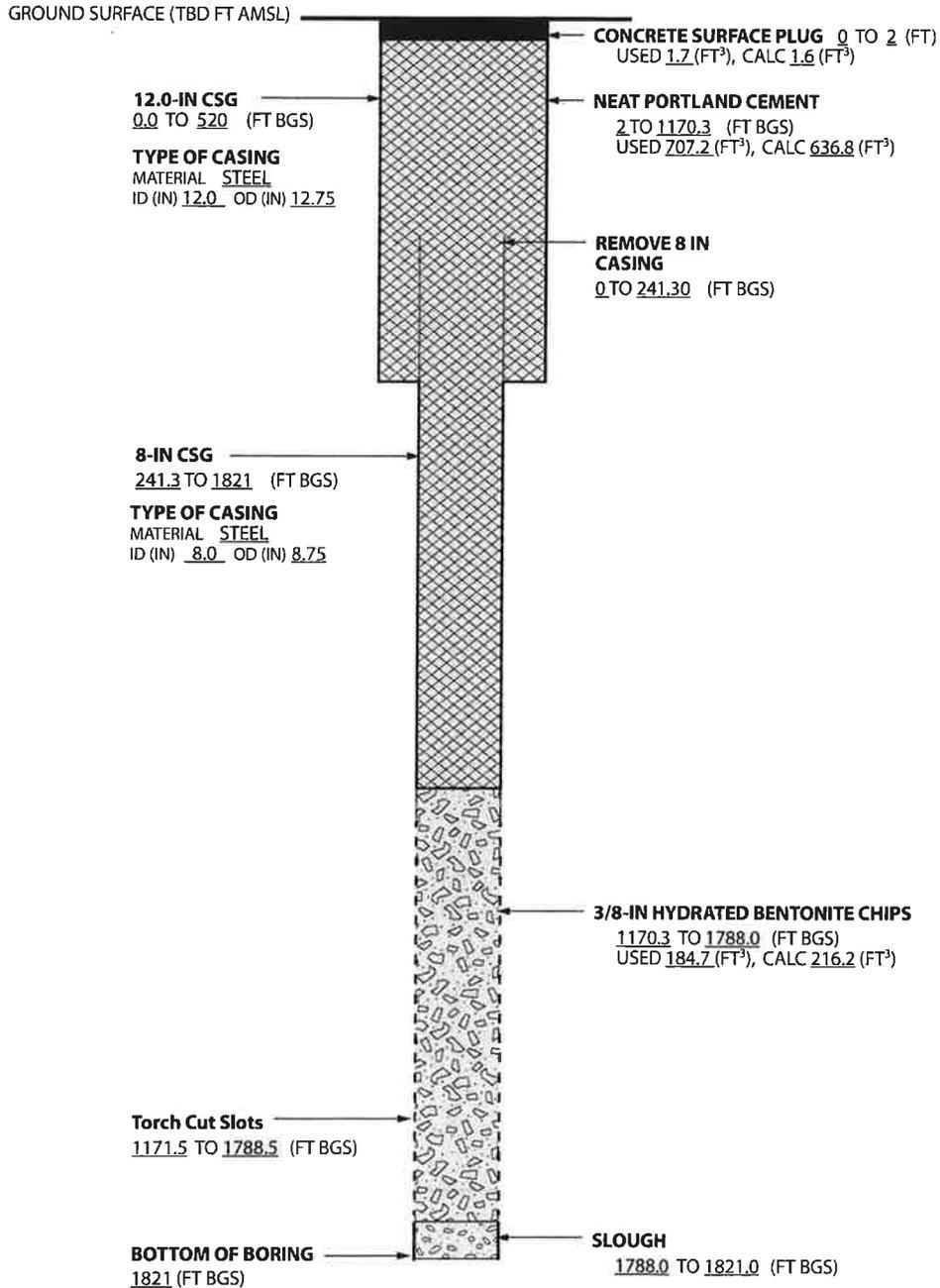
III. SIGNATURE:

I, _____, say that I am familiar with the rules of the Office of the State Engineer pertaining to the plugging of wells and that each and all of the statements in this Plugging Record and attachments are true to the best of my knowledge and belief.


Signature of Well Driller

10-9-14
Date

ELEVATIONS (FT AMSL)
BRASS CAP (MARKER) TBD



TerranearPMC

Drafted By: TPMC Date: August 8, 2014
Project Number: 86313 File Name: DT-5A_Final_PandA

DT-5A Post-Abandonment Well Construction
Technical Area 49 (TA-49)
Los Alamos National Laboratory
Los Alamos, New Mexico

As-Built
DT-5A
NOT TO SCALE



PLUGGING RECORD



NOTE: A Well Plugging Plan of Operations shall be approved by the State Engineer prior to plugging - 19.27.4 NMAC

I. GENERAL / WELL OWNERSHIP:

State Engineer Well Number: DT-9
Well owner: U.S. Department of Energy/Los Alamos National Laboratory Phone No.: 505-667-3005
Mailing address: P.O. Box 1663
City: Los Alamos State: New Mexico Zip code: 87545

II. WELL PLUGGING INFORMATION:

- 1) Name of well drilling company that plugged well: Boart Longyear
- 2) New Mexico Well Driller License No.: 1161 Expiration Date: 10/31/2016
- 3) Well plugging activities were supervised by the following well driller(s)/rig supervisor(s): Boart Longyear
- 4) Date well plugging began: 9/8/14 Date well plugging concluded: 12/9/14
- 5) GPS Well Location: East: 1628993.6
North: 1751492.6
Well coordinates are New Mexico State Plane Grid Coordinates, Central Zone (North American Datum, 1983 [NAD 1983]).
- 6) Depth of well confirmed at initiation of plugging as: 1308 ft below ground level (bgl),
by the following manner: Video log of well on 9/9/14
- 7) Static water level measured at initiation of plugging: 1017 ft bgl
- 8) Date well plugging plan of operations was approved by the State Engineer: 09/18/2014
- 9) Were all plugging activities consistent with an approved plugging plan? No If not, please describe differences between the approved plugging plan and the well as it was plugged (attach additional pages as needed):

Cement was emplaced with tremie pipe above 1308 ft bgl (plug recorded on LANL video logging equipment) to 1013 ft bgl. Cement emplacement was suspended due to cement loss out of the torch-cut screen slots. Bentonite was emplaced in the well casing from 1013 ft bgl to 284 ft bgl. The 12-in. well casing was then cut with a pneumatic casing cutter at 280 ft bgl. The field crew was unable to remove the upper 280 ft of 12-in. casing from the borehole. The 12-in. casing was re-cut at 40 ft bgl, but the upper 40 ft of 12-in. casing could not be removed from the borehole. Cementing was continued above 284 ft bgl inside the well casing. Cementing was suspended due to cement loss into the annulus at the 280 ft bgl casing cut. Bentonite was used to fill the annulus to 283 ft bgl. Cement was emplaced in the casing from 283 to 43 ft bgl. Bentonite was then used to seal the upper casing cut from 43 to 31 ft bgl. The casing was cemented from 31 ft bgl to surface.

10) Log of Plugging Activities - Label vertical scale with depths, and indicate separate plugging intervals with horizontal lines as necessary to illustrate material or methodology changes. Attach additional pages if necessary.

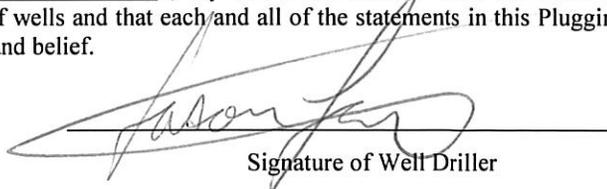
For each interval plugged, describe within the following columns:

Depth (ft bgl)	Plugging Material Used (include any additives used)	Volume of Material Placed (gallons)	Theoretical Volume of Borehole/ Casing (gallons)	Placement Method (tremie pipe, other)	Comments ("casing perforated first", "open annular space also plugged", etc.)
0	Portland I/II Cement	240 gallons	Casing: 182 gallons	Other	Note: Annulus diameter outside of 12" casing is unknown. Theoretical volumes are calculated based on assumed 18" borehole diameter.
31	Hydrated Bentonite	115 gallons	Casing: 72 gallons	Other	
43	Portland I/II Cement (annulus and casing)	2640 gallons	Annulus and casing: 1948 gallons	Other	
283	Hydrated Bentonite (annulus and casing)	8765 gallons	Annulus and casing: 13,049 gallons	Tremie	
	Portland I/II Cement (annulus and casing)	1500 gallons			Annulus filled from 1501 ft bgl.
1013	Portland I/II Cement (in casing)	2899 gallons cement Bentonite volume in above total.	Casing: 2322 gallons	Tremie	
1501					

MULTIPLY		BY		AND OBTAIN
cubic feet	x	7.4805	=	gallons
cubic yards	x	201.97	=	gallons

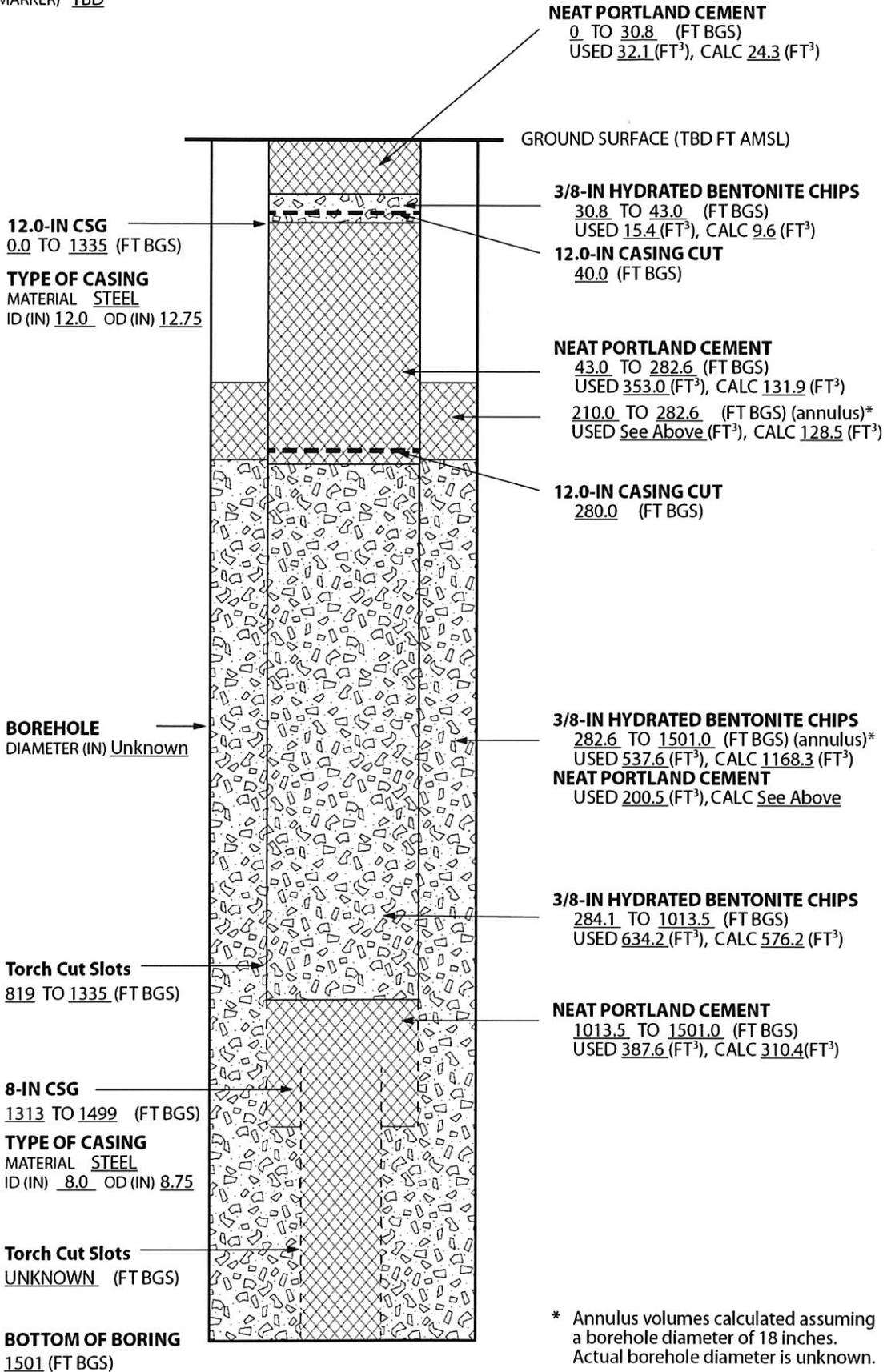
III. SIGNATURE:

I, Jason Lamb, say that I am familiar with the rules of the Office of the State Engineer pertaining to the plugging of wells and that each and all of the statements in this Plugging Record and attachments are true to the best of my knowledge and belief.


Signature of Well Driller

2-19-15
Date

ELEVATIONS (FT AMSL)
ALUMINUM CAP (MARKER) TBD



* Annulus volumes calculated assuming a borehole diameter of 18 inches. Actual borehole diameter is unknown.



PLUGGING RECORD



NOTE: A Well Plugging Plan of Operations shall be approved by the State Engineer prior to plugging - 19.27.4 NMAC

I. GENERAL / WELL OWNERSHIP:

State Engineer Well Number: LAWS-01

Well owner: U.S. Department of Energy/Los Alamos National Laboratory Phone No.: 505-667-3005

Mailing address: P.O. Box 1663

City: Los Alamos State: New Mexico Zip code: 87545

II. WELL PLUGGING INFORMATION:

- 1) Name of well drilling company that plugged well: Boart Longyear
- 2) New Mexico Well Driller License No.: 1161 Expiration Date: 10/31/2014
- 3) Well plugging activities were supervised by the following well driller(s)/rig supervisor(s): Boart Longyear
- 4) Date well plugging began: 7/29/14 Date well plugging concluded: 8/2/14
- 5) GPS Well Location: East: 1649524.5
North: 1770854.0
Well coordinates are New Mexico State Plane Grid Coordinates, Central Zone (North American Datum, 1983 [NAD 1983]).
- 6) Depth of well confirmed at initiation of plugging as: 278 ft below ground level (bgl),
by the following manner: Manual tag line measurement
- 7) Static water level measured at initiation of plugging: 154.4 ft bgl
- 8) Date well plugging plan of operations was approved by the State Engineer: 07/03/2014
- 9) Were all plugging activities consistent with an approved plugging plan? No If not, please describe differences between the approved plugging plan and the well as it was plugged (attach additional pages as needed):

LAWS-01 was proposed to be plugged/abandoned with cement grout placed from bottom to top with a tremie pipe. Hydrated bentonite chips were placed from TD (278 ft bgl) to 150.9 ft bgl with a tremie pipe. Portland Type I/II cement was placed from 150.9 to 2.0 ft bgl with a tremie pipe. The surface and well casings were cut level with ground surface and a concrete surface plug was emplaced from 2.0 ft bgl to surface.

10) Log of Plugging Activities - Label vertical scale with depths, and indicate separate plugging intervals with horizontal lines as necessary to illustrate material or methodology changes. Attach additional pages if necessary.

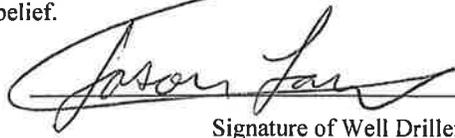
For each interval plugged, describe within the following columns:

<u>Depth</u> (ft bgl)	<u>Plugging Material Used</u> (include any additives used)	<u>Volume of Material Placed</u> (gallons)	<u>Theoretical Volume of Borehole/ Casing</u> (gallons)	<u>Placement Method</u> (tremie pipe, other)	<u>Comments</u> ("casing perforated first", "open annular space also plugged", etc.)
0 2	Concrete	2.2 gallons	1.5 gallons	Other	Surface plug
	Portland Type I/II Cement	124.9 gallons	87.5 gallons	Tremie	
150.9	3/8-in. Hydrated Bentonite Chips	68.1 gallons	74.8 gallons	Tremie	
278					

MULTIPLY		BY		AND OBTAIN
cubic feet	x	7.4805	=	gallons
cubic yards	x	201.97	=	gallons

III. SIGNATURE:

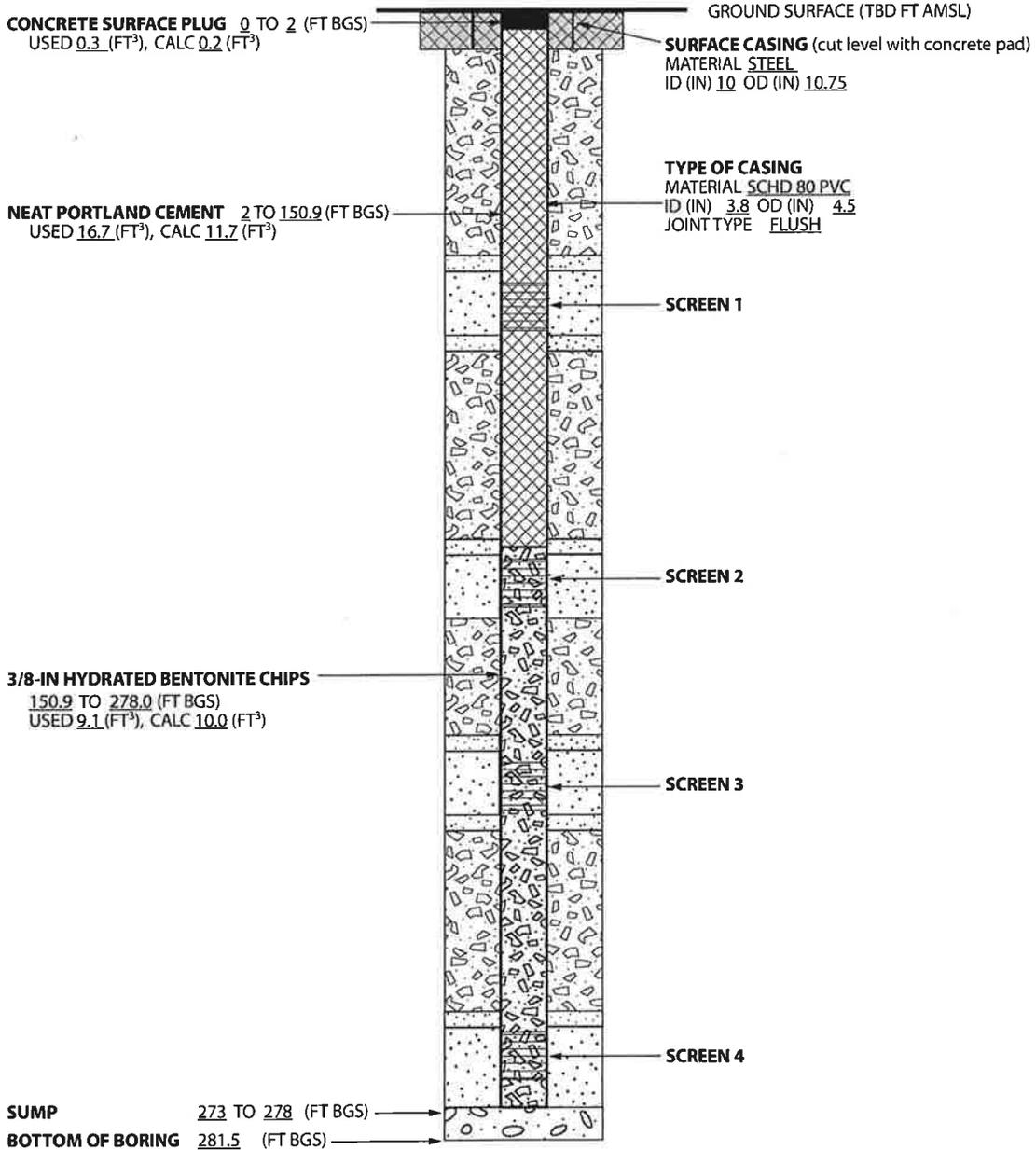
I, _____, say that I am familiar with the rules of the Office of the State Engineer pertaining to the plugging of wells and that each and all of the statements in this Plugging Record and attachments are true to the best of my knowledge and belief.


Signature of Well Driller

10-9-14
Date

ELEVATION (FT AMSL)
BRASS CAP (MARKER) 6304.8

DEPTH TO WATER (FT BGS) 154.4 (7/29/2014)



TerranearPMC

Drafted By: TPMC Date: August 12, 2014
Project Number: 86313 File Name: LAWS-01_Final_PandA

LAWS-01 POST-ABANDONMENT CONSTRUCTION DIAGRAM
Los Alamos Canyon, Technical Area 72 (TA-72)
Los Alamos National Laboratory
Los Alamos, New Mexico

**Fig.
X.X**

NOT TO SCALE



PLUGGING RECORD



NOTE: A Well Plugging Plan of Operations shall be approved by the State Engineer prior to plugging - 19.27.4 NMAC

I. GENERAL / WELL OWNERSHIP:

State Engineer Well Number: LAWS-02
Well owner: U.S. Department of Energy/Los Alamos National Laboratory Phone No.: 505-667-3005
Mailing address: P.O. Box 1663
City: Los Alamos State: New Mexico Zip code: 87545

II. WELL PLUGGING INFORMATION:

- 1) Name of well drilling company that plugged well: Boart Longyear
- 2) New Mexico Well Driller License No.: 1161 Expiration Date: 10/31/2014
- 3) Well plugging activities were supervised by the following well driller(s)/rig supervisor(s): Boart Longyear
- 4) Date well plugging began: 7/31/14 Date well plugging concluded: 8/2/14
- 5) GPS Well Location: East: 1649536.9
North: 1770848.3
Well coordinates are New Mexico State Plane Grid Coordinates, Central Zone (North American Datum, 1983 [NAD 1983]).
- 6) Depth of well confirmed at initiation of plugging as: 140 ft (length: angle boring)
by the following manner: Tag with tremie pipe
- 7) Static water level measured at initiation of plugging: Dry ft bgl
- 8) Date well plugging plan of operations was approved by the State Engineer: 07/03/2014
- 9) Were all plugging activities consistent with an approved plugging plan? No If not, please describe differences between the approved plugging plan and the well as it was plugged (attach additional pages as needed):

LAWS-02 was proposed to be plugged/abandoned with cement grout placed from bottom to top with a tremie pipe. Hydrated bentonite pellets/chips were placed from TD (140 ft casing length) to 10 ft casing length with a tremie pipe. Portland Type I/II cement was placed from 10.0 to 2.0 ft casing length inside the well casing, and from 10.0 to 2.0 ft casing length within the annulus. The surface and well casings were cut level with ground surface and a concrete surface plug was
emplaced from 2.0 ft casing length to surface.

- 10) Log of Plugging Activities - Label vertical scale with depths, and indicate separate plugging intervals with horizontal lines as necessary to illustrate material or methodology changes. Attach additional pages if necessary.

For each interval plugged, describe within the following columns:

<u>Depth</u> (ft bgl)	<u>Plugging Material Used</u> (include any additives used)	<u>Volume of Material Placed</u> (gallons)	<u>Theoretical Volume of Borehole/ Casing</u> (gallons)	<u>Placement Method</u> (tremie pipe, other)	<u>Comments</u> ("casing perforated first", "open annular space also plugged", etc.)
0 2	Concrete	9.7 gallons	4.5 gallons	Other	Surface plug
10	Portland Type I/II Cement	74.8 gallons	29.2 gallons	Other	Calculated and actual volumes also include annular space between borehole and well casing from 10 to 2 ft bgl
	3/8-in. Hydrated Bentonite Chips and 1/4-in. Hydrated Bentonite Pellets	241.6 gallons	178.8 gallons	Tremie	

MULTIPLY		BY		AND OBTAIN
cubic feet	x	7.4805	=	gallons
cubic yards	x	201.97	=	gallons

III. SIGNATURE:

I, _____, say that I am familiar with the rules of the Office of the State Engineer pertaining to the plugging of wells and that each and all of the statements in this Plugging Record and attachments are true to the best of my knowledge and belief.


Signature of Well Driller

10-9-14
Date

ELEVATION (FT AMSL)
BRASS CAP (MARKER) TBD

TOTAL LENGTH OF CASING (FT) 156

HOLE DRILLED AT 43° angle
AZIMUTH N40°E
APPROXIMATE DEPTH 106 (FT BGS)

SURFACE CASING CUT LEVEL WITH CONCRETE PAD

CONCRETE SURFACE PLUG 0 TO 2 (FT)
USED 1.3 (FT³), CALC 0.6 (FT³)

NEAT PORTLAND CEMENT 2 TO 10 (FT)
USED 10.0 (FT³), CALC 3.9 (FT³)

GROUND SURFACE (TBD FT AMSL)

10.0-IN CASING
0.0 TO 9.0 (FT)

TYPE OF CASING
MATERIAL STEEL
ID (IN) 10.0 OD (IN) 10.75

6.0-IN CASING
0.0 TO 156 (FT)

TYPE OF CASING
MATERIAL Schedule 80 PVC with scallops
ID (IN) 5.8 OD (IN) 6.6

3/8-IN HYDRATED BENTONITE CHIPS
1/4-IN HYDRATED BENTONITE PELLETS
10 TO 140 (FT)
USED 32.3 (FT³), CALC 23.9 (FT³)

SLOUGH 140 TO 156 (FT) →

BOTTOM OF CASING 156 (FT) →

TerranearPMC

Drafted By: TPMC
Project Number: 86313

Date: August 12, 2014
File Name: LAWS-2_Final_PandA

LAWS-02 Post-Abandonment Well Construction

Technical Area 72 (TA-72)
Los Alamos National Laboratory
Los Alamos, New Mexico

As-Built

LAWS-02

NOT TO SCALE



PLUGGING RECORD



NOTE: A Well Plugging Plan of Operations shall be approved by the State Engineer prior to plugging - 19.27.4 NMAC

I. GENERAL / WELL OWNERSHIP:

State Engineer Well Number: LAWS-03

Well owner: U.S. Department of Energy/Los Alamos National Laboratory Phone No.: 505-667-3005

Mailing address: P.O. Box 1663

City: Los Alamos State: New Mexico Zip code: 87545

II. WELL PLUGGING INFORMATION:

- 1) Name of well drilling company that plugged well: Boart Longyear
- 2) New Mexico Well Driller License No.: 1161 Expiration Date: 10/31/2014
- 3) Well plugging activities were supervised by the following well driller(s)/rig supervisor(s): Boart Longyear
- 4) Date well plugging began: 7/30/14 Date well plugging concluded: 8/2/14
- 5) GPS Well Location: East: 1649542.9
North: 1770848.8
Well coordinates are New Mexico State Plane Grid Coordinates, Central Zone (North American Datum, 1983 [NAD 1983]).
- 6) Depth of well confirmed at initiation of plugging as: 80 ft (length: angle boring)
by the following manner: Tag with tremie pipe
- 7) Static water level measured at initiation of plugging: Dry ft bgl
- 8) Date well plugging plan of operations was approved by the State Engineer: 07/03/2014
- 9) Were all plugging activities consistent with an approved plugging plan? No If not, please describe differences between the approved plugging plan and the well as it was plugged (attach additional pages as needed):

LAWS-03 was proposed to be plugged/abandoned with cement grout placed from bottom to top with a tremie pipe. Cement grout was tremied to the bottom of the well casing with no significant seal established. Hydrated bentonite chips were placed from TD (80 ft casing length) to 7 ft casing length with a tremie pipe. Portland Type I/II cement was placed from 7.0 to 2.0 ft casing length inside the well casing, and from 10.0 to 2.0 ft casing length within the annulus. The surface and well casings were cut level with ground surface and a concrete surface plug was emplaced from 2.0 ft casing length to surface.

- 10) Log of Plugging Activities - Label vertical scale with depths, and indicate separate plugging intervals with horizontal lines as necessary to illustrate material or methodology changes. Attach additional pages if necessary.

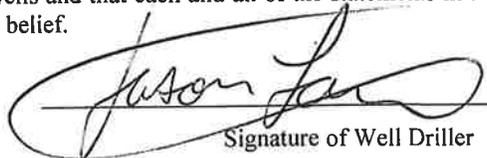
For each interval plugged, describe within the following columns:

<u>Depth</u> (ft bgl)	<u>Plugging Material Used</u> (include any additives used)	<u>Volume of Material Placed</u> (gallons)	<u>Theoretical Volume of Borehole/ Casing</u> (gallons)	<u>Placement Method</u> (tremie pipe, other)	<u>Comments</u> ("casing perforated first", "open annular space also plugged", etc.)
0	Concrete	9.7 gallons	7.5 gallons	Other	Surface plug
2	Portland Type I/II Cement	44.9 gallons	26.2 gallons	Other	Calculated and actual volumes also include annular space between borehole and well casing from 10 to 2 ft bgl
7					
	3/8-in. Hydrated Bentonite Chips	104.7 gallons	110.7 gallons	Tremie	Bentonite installed in well casing from 80 to 7 ft bgl following loss of cement
	Portland Type I/II Cement	424.9 gallons	118.2 gallons	Tremie	Cement did not create a significant seal and likely flowed out well casing perforations into the surrounding formation
80					

MULTIPLY	BY	AND OBTAIN
cubic feet x	7.4805	= gallons
cubic yards x	201.97	= gallons

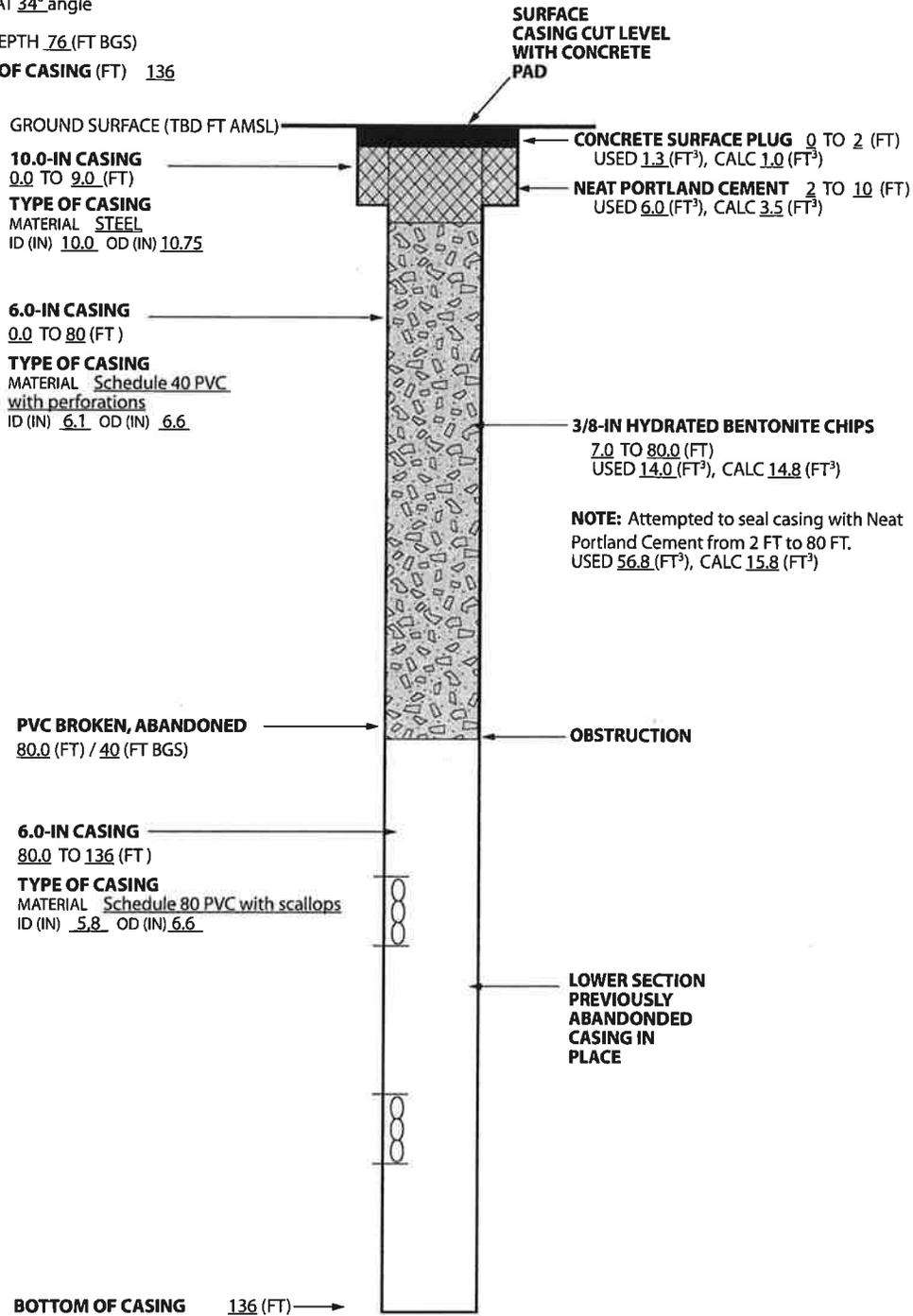
III. SIGNATURE:

I, _____, say that I am familiar with the rules of the Office of the State Engineer pertaining to the plugging of wells and that each and all of the statements in this Plugging Record and attachments are true to the best of my knowledge and belief.


Signature of Well Driller

10-9-14
Date

ELEVATION (FT AMSL)
BRASS CAP (MARKER) TBD
HOLE DRILLED AT 34° angle
AZIMUTH N40°E
APPROXIMATE DEPTH 76 (FT BGS)
TOTAL LENGTH OF CASING (FT) 136





STATE OF NEW MEXICO
OFFICE OF THE STATE ENGINEER
SANTA FE

Scott A. Verhines, P.E.
State Engineer

CONCHA ORTIZ Y PINO BLDG.
POST OFFICE BOX 25102
130 SOUTH CAPITOL
SANTA FE, NEW MEXICO 87504-5102
(505) 827-6091
FAX: (505) 827-3806

July 18, 2014

U.S Department of Energy/ Los Alamos National Laboratory
C/O Steve White
P.O Box 1663
Los Alamos, NM 87545

Re: Plugging Plan of Operation, LANL Wells DT-5 and DT-5A, Los Alamos, NM.

Greetings:

After a review of the Well Plugging Plan of Operations submitted on July 11, 2014, The Office of the Engineer is returning a favorable approval with specific Plugging Conditions and has accepted the Plugging Plan submitted for filing.

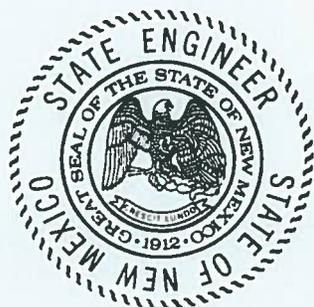
Please return a completed Well Plugging Report that itemizes the actual abandonment process and materials used within 20 days after completion of well plugging. In addition, please include a copy of the approved Plugging Conditions enclosed.

Please address any questions via- telephone to Ramona Martinez at 505.827.6120 or via e-mail at Ramona.Martinez2@state.nm.us.

Sincerely,


Ramona Martinez
Basin Supervisor

Enclosure
cc: file





DISTRICT 6
SCOTT A. VERHINES, P.E.
NEW MEXICO STATE ENGINEER

Materials submitted by Los Alamos National Laboratory (LANL) request the plugging of two wells (DT-5A and DT-5). The wells will be sealed to comply with provisions of NMAC 19.27.4 and the New Mexico Environment Department's Hazardous Waste Bureau. Plugging services will be provided by Boart Longyear (WD-1161).

LANL Well Name	OSE file No.	X coordinate NM State Plane Central zone NAD 1983 (feet)	Y coordinate NM State Plane Central zone NAD 1983 (feet)	Total depth to be sealed (feet)	Casing diameter (s) (inches)	Depth to water (feet b.g.s.)
DT-5A	unknown	1625310.0	1754789.4	1821 b.g.s.	8 12	1186
DT-5	unknown	1625310.0	1754789.4	927 b.g.s.	8	dry above 927

b.g.s. = below ground surface

Contacted Michael Dale (NMED-HWB, 505-661-2673) on July 17, 2014.

Specific Plugging Conditions of Approval for LANL wells DT-5A & DT-5, Los Alamos, NM, Los Alamos County.

1. Water well drilling and well drilling activities, including well plugging, are regulated under 19.27.4 NMAC, which requires any person engaged in the business of well drilling within New Mexico to obtain a Well Driller License issued by the New Mexico Office of the State Engineer (NMOSE). Therefore, the firm of a New Mexico licensed Well Driller shall perform the well plugging.
2. Approximate theoretical volume of sealant required for abandonment of well intervals ranges from 2.61 gallons per foot for 8-inch ID casing to 5.88 gallons per foot for 12-inch ID casing. Some highly porous volcanic formations may result in uptake of considerably higher volumes than calculated. If surface casings are removed, borehole volume may require more than casing. LANL and its contractor should account for volumes of sealant materials used, especially cement. In the event the theoretical volume is exceeded by 25% or more for cement sealant, use of bentonite chips would be appropriate rather than pumping multiple borehole volumes of cement slurry.
3. For multiple intervals from 520 feet b.g.s. to surface (DT-5A) and 200 feet b.g.s. to surface (DT-5) as specified in Plugging Plan of Operations submitted, LANL requests use of cement as a sealant. Fundamental water demand for Type I/II Portland neat cement grout is 5.2 gallons per 94 lb/sack cement. Use of mix water increment in excess of this amount results in a thinned mix of cement prone to shrinkage that may disrupt effective sealing and hydraulic separation. AWWA Well Standards allow use of a maximum of 6.0 gallons water per 94 lb/sack cement if necessary for pumpability of neat cement grout. NMAC 19.27.4.30.C.1 specifies placement of sealant by use of a tremie pipe for depths greater than 20 feet b.g.s.. Thus, applicant's proposal of 6 gallons of water per 94-lbs sack of cement is acceptable.
4. For the intervals from approximately 1821 feet to 520 feet b.g.s. (DT-5A) and 927 to 200 feet b.g.s.(DT-5), applicant requests use of bentonite chips (3/8-inch Hole Plug) as a sealant. NMAC 19.27.4.30.C.1 specifies placement of sealant by use of a tremie pipe. When a tremie is used, it shall extend to near total depth of the well at the initiation of the plugging. The tremie shall be incrementally removed to retain the tremie bottom a limited distance above the top of the rising column of bentonite chips throughout the plugging process.

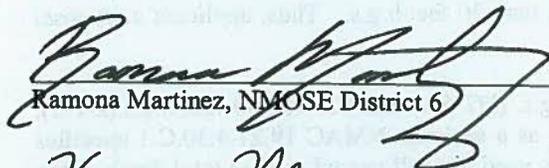
When placing bentonite chips above static water level, the chips shall be hydrated with sufficient potable water to allow the chips to yield. Options include: (A) use tremie for mixture of chips and water (as a carrier), or (B) use of dry-tremie for the chips in short intervals followed or preceded by addition of potable water increment sufficient for yielding of chips.

Potable water shall be added to the well in increments such that the chips are discharged into a column of standing water, if possible. If borehole lithology is too permeable to retain added water prior to chip placement, potable water shall be discharged into the borehole/well following placement of short intervals of chips to provide the bentonite sufficient available water to swell and seal the borehole/casing.

Alternately, a surface pour of the requested bentonite pellets is authorized, provided that the depth of the well be accurately determined prior to plugging, and that the top of the column of chips be sounded and column height / volume of sealant emplaced be recorded at approximate 25' intervals over the course of plugging to gauge appropriate progress of plugging and establish that the chips have not bridged inappropriately up-hole. If bridging occurs using any method of placement, the bridging shall be rectified before continuing with plugging. Sealant manufacturer's recommendations should be followed regarding screening fine particles from the chips and rate of pour to avoid bridging.

5. For DT-5A only, the sequence of plugging includes: 1) tremie bentonite chips inside 8-inch casing to approximately 540 feet b.g.s.; 2) cut 8-inch casing at 520 feet b.g.s. and remove casing; 3) tremie bentonite chips for any annular space to approximately 520-515 feet b.g.s.; and 4) tremie cement from approximately 520 to surface. This sequence protects access to the 8-inch casing and reduces potential losses of cement to lost circulation zones encountered during drilling, which may still be present in the annulus space outside 8-inch casing.
6. The plug may be terminated below grade as necessary to allow approved redevelopment onsite, provided any plug consist of cement or concrete within 10' of ground level, and a minimum 6-inch thickness of reinforced cement grout or concrete completely covers the top of any casing cut off below grade. More stringent local building codes may apply.
7. Should the NMED, or another regulatory agency sharing jurisdiction of the project authorize, or by regulation require a more stringent well plugging procedure than herein acknowledged, the more-stringent procedure should be followed. This, in part, includes provisions regarding pre-authorization to proceed, remediate contaminants, inspect, pull/perforate of casing, or prohibit free discharge of any fluid from the borehole during or related to the plugging process.
8. NMOSE witnessing of the plugging will not be required, but shall be facilitated if a NMOSE observer is onsite. NMOSE witnessing may be requested during normal work hours by calling the District 6 NMOSE Office at 505-827-7848, at least 48-hours in advance. NMOSE inspection will occur dependant on personnel availability.
9. A NMOSE Plugging Record (available at: <http://www.ose.state.nm.us/PDF/WellDrillers/WD-11.pdf>) itemizing actual abandonment process and materials used shall be filed with the State Engineer (NMOSE, PO Box 25102, Santa Fe, NM 87504-5102), within 20 days after completion of well plugging. Please attach a copy of these plugging conditions.

The NMOSE Well Plugging Plan of Operations dated July 2 and July 11, 2014, with annotation, is hereby approved with the aforesaid conditions applied.



Ramona Martinez, NMOSE District 6

Date: 7/12/14



Kevin Myers, NMOSE Hydrology Bureau

Date: 7/17/14



WELL PLUGGING PLAN OF OPERATIONS



NOTE: A Well Plugging Plan of Operations shall be filed with and accepted by the Office of the State Engineer prior to plugging.

I. FILING FEE: There is no filing fee for this form.

II. GENERAL / WELL OWNERSHIP:

Existing Office of the State Engineer POD Number (Well Number) for well to be plugged: DT-5

Name of well owner: U.S. Department of Energy/Los Alamos National Laboratory

Mailing address: P.O. Box 1663

City: Los Alamos State: New Mexico Zip code: 87545

Phone number: 505-667-3005 E-mail: meverett@lanl.gov

III. WELL DRILLER INFORMATION:

Well Driller contracted to provide plugging services: Boart Longyear

New Mexico Well Driller License No.: 1161 Expiration Date: 10/31/2014

IV. WELL INFORMATION:

Note: A copy of the existing Well Record for the well to be plugged should be attached to this plan.

1) GPS Well Location (BRASS CAP): East: 1625310.0
North: 1754789.4

Well coordinates are New Mexico State Plane Grid Coordinates, Central Zone (North American Datum, 1983)[NAD 1983].

2) Reason(s) for plugging well: The borehole represents a conduit to subsurface.

3) Was well used for any type of monitoring program? No If yes, please use section VII of this form to detail what hydrogeologic parameters were monitored. If the well was used to monitor contaminated or poor quality water, authorization from the New Mexico Environment Department may be required prior to plugging.

4) Does the well tap brackish, saline, or otherwise poor quality water? No If yes, provide additional detail, including analytical results and/or laboratory report(s): _____

5) Static water level: Dry, according to LANL's work plan to plug and abandon borehole.

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OFFICE OF STATE ENGINEER
SANTA FE, NEW MEXICO

feet below land surface / feet above land surface (circle one)

- 6) Depth of the well: 927 feet
- 7) Inside diameter of innermost casing: 8.0 inches.
- 8) Casing material: Carbon steel
- 9) The well was constructed with:
 an open-hole production interval, state the open interval: The well may be open hole from 180 ft bgs to 927 ft bgs.
 a well screen or perforated pipe, state the screened interval(s): _____
- 10) What annular interval surrounding the artesian casing of this well is cement-grouted? None
- 11) Was the well built with surface casing? Yes If yes, is the annulus surrounding the surface casing grouted or otherwise sealed? No indication of seal from LANL's construction record. If yes, please describe: _____
- 12) Has all pumping equipment and associated piping been removed from the well? Yes If not, describe remaining equipment and intentions to remove prior to plugging in Section VII of this form.

V. DESCRIPTION OF PLANNED WELL PLUGGING:

Note: If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie pipe, a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional technical information, such as geophysical logs, that are necessary to adequately describe the proposal.

- 1) Describe the method by which ~~cement grout~~ ^{hydrated} shall be placed in the well, or describe requested plugging methodology proposed for the well: 3/8" bentonite chips will be installed from total depth to 200 ft bgs. Then, cement grout will be placed from 200 ft bgs to ground surface with a tremie pipe.
- 2) Will well head be cut-off below land surface after plugging? Well head will be cut-off near ground surface.

- KEM

VI. PLUGGING AND SEALING MATERIALS:

Note: The plugging of a well that taps poor quality water may require the use of a specialty cement or specialty sealant

- 1) For plugging intervals that employ cement grout, complete and attach Table A.
- 2) For plugging intervals that will employ approved non-cement based sealant(s), complete and attach Table B.
- 3) Theoretical volume of grout required to plug the well to land surface: Approximately 249 cubic ft of bentonite chips and 513 gallons of neat cement grout.
- 4) Type of Cement proposed: Portland Type I/II cement
- 5) Proposed cement grout mix: 6 gallons of water per 94 pound sack of Portland cement.
- 6) Will the grout be: _____ batch-mixed and delivered to the site
 mixed on site

7) Grout additives requested, and percent by dry weight relative to cement: None

8) Additional notes and calculations: None

VII. ADDITIONAL INFORMATION: List additional information below, or on separate sheet(s):

Test well DT-5 was drilled to 927 ft bgs in 1960. Water was not encountered. Circulation could not be maintained in the borehole due to numerous fractures and the hole was terminated at 927 ft bgs. The well may have 180 ft of 8-in casing and may be open hole from 180 ft bgs to 927 ft bgs. The well will be backfilled with 3/8" bentonite chips from total depth to 200 ft bgs. Then, cement grouted from 200 ft bgs to the surface.

Hydrated Kcm

VIII. SIGNATURE:

I, Theodore Ball, say that I have carefully read the foregoing Well Plugging Plan of Operations and any attachments, which are a part hereof; that I am familiar with the rules and regulations of the State Engineer pertaining to the plugging of wells and will comply with them, and that each and all of the statements in the Well Plugging Plan of Operations and attachments are true to the best of my knowledge and belief.

Theodore Ball

7/11/14

Signature of Applicant

Date

IX. ACTION OF THE STATE ENGINEER:

*Reviewed by NMSE Hydrology
Jm Jm 7/17/14*

This Well Plugging Plan of Operations is:

- Approved subject to the attached conditions.
- Not approved for the reasons provided on the attached letter.

Witness my hand and official seal this 18th day of July, 2014

Scott A. Verhines, State Engineer

By: [Signature]

TABLE A - For plugging intervals that employ cement grout. Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of grout placement (ft bgl)			Surface
Bottom of proposed interval of grout placement (ft bgl)			200
Theoretical volume of grout required per interval (gallons)			513
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement			6
Mixed on-site or batch-mixed and delivered?			On-site
Grout additive 1 requested			
Additive 1 percent by dry weight relative to cement			
Grout additive 2 requested			
Additive 2 percent by dry weight relative to cement			

TABLE B - For plugging intervals that will employ approved non-cement based sealant(s). Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of sealant placement (ft bgl)	200 ft bgs		
Bottom of proposed sealant or grout placement (ft bgl)	927 ft bgs		
Theoretical volume of sealant required per interval (gallons)	249 cubic ft		
Proposed abandonment sealant (manufacturer and trade name)	Baroid Holeplug 3/8" bentonite chips		



STATE OF NEW MEXICO
OFFICE OF THE STATE ENGINEER
SANTA FE

Scott A. Verhines, P.E.
State Engineer

CONCHA ORTIZ Y PINO BLDG.
POST OFFICE BOX 25102
130 SOUTH CAPITOL
SANTA FE, NEW MEXICO 87504-5102
(505) 827-6091
FAX: (505) 827-3806

July 18, 2014

U.S Department of Energy/ Los Alamos National Laboratory
C/O Steve White
P.O Box 1663
Los Alamos, NM 87545

Re: Plugging Plan of Operation, LANL Wells DT-5 and DT-5A, Los Alamos, NM.

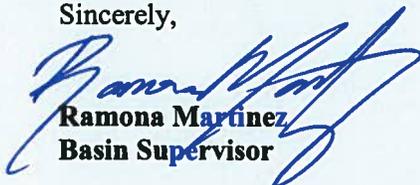
Greetings:

After a review of the Well Plugging Plan of Operations submitted on July 11, 2014, The Office of the Engineer is returning a favorable approval with specific Plugging Conditions and has accepted the Plugging Plan submitted for filing.

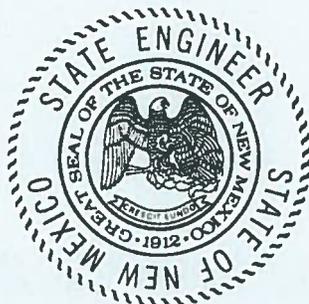
Please return a completed Well Plugging Report that itemizes the actual abandonment process and materials used within 20 days after completion of well plugging. In addition, please include a copy of the approved Plugging Conditions enclosed.

Please address any questions via- telephone to Ramona Martinez at 505.827.6120 or via e-mail at Ramona.Martinez2@state.nm.us.

Sincerely,


Ramona Martinez
Basin Supervisor

Enclosure
cc: file





DISTRICT 6
SCOTT A. VERHINES, P.E.
NEW MEXICO STATE ENGINEER

Materials submitted by Los Alamos National Laboratory (LANL) request the plugging of two wells (DT-5A and DT-5). The wells will be sealed to comply with provisions of NMAC 19.27.4 and the New Mexico Environment Department's Hazardous Waste Bureau. Plugging services will be provided by Boart Longyear (WD-1161).

LANL Well Name	OSE file No.	X coordinate NM State Plane Central zone NAD 1983 (feet)	Y coordinate NM State Plane Central zone NAD 1983 (feet)	Total depth to be sealed (feet)	Casing diameter (s) (inches)	Depth to water (feet b.g.s.)
DT-5A	unknown	1625310.0	1754789.4	1821 b.g.s.	8 12	1186
DT-5	unknown	1625310.0	1754789.4	927 b.g.s.	8	dry above 927

b.g.s. = below ground surface

Contacted Michael Dale (NMED-HWB, 505-661-2673) on July 17, 2014.

Specific Plugging Conditions of Approval for LANL wells DT-5A & DT-5, Los Alamos, NM, Los Alamos County.

1. Water well drilling and well drilling activities, including well plugging, are regulated under 19.27.4 NMAC, which requires any person engaged in the business of well drilling within New Mexico to obtain a Well Driller License issued by the New Mexico Office of the State Engineer (NMOSE). Therefore, the firm of a New Mexico licensed Well Driller shall perform the well plugging.
2. Approximate theoretical volume of sealant required for abandonment of well intervals ranges from 2.61 gallons per foot for 8-inch ID casing to 5.88 gallons per foot for 12-inch ID casing. Some highly porous volcanic formations may result in uptake of considerably higher volumes than calculated. If surface casings are removed, borehole volume may require more than casing. LANL and its contractor should account for volumes of sealant materials used, especially cement. In the event the theoretical volume is exceeded by 25% or more for cement sealant, use of bentonite chips would be appropriate rather than pumping multiple borehole volumes of cement slurry.
3. For multiple intervals from 520 feet b.g.s. to surface (DT-5A) and 200 feet b.g.s. to surface (DT-5) as specified in Plugging Plan of Operations submitted, LANL requests use of cement as a sealant. Fundamental water demand for Type I/II Portland neat cement grout is 5.2 gallons per 94 lb/sack cement. Use of mix water increment in excess of this amount results in a thinned mix of cement prone to shrinkage that may disrupt effective sealing and hydraulic separation. AWWA Well Standards allow use of a maximum of 6.0 gallons water per 94 lb/sack cement if necessary for pumpability of neat cement grout. NMAC 19.27.4.30.C.1 specifies placement of sealant by use of a tremie pipe for depths greater than 20 feet b.g.s.. Thus, applicant's proposal of 6 gallons of water per 94-lbs sack of cement is acceptable.
4. For the intervals from approximately 1821 feet to 520 feet b.g.s. (DT-5A) and 927 to 200 feet b.g.s.(DT-5), applicant requests use of bentonite chips (3/8-inch Hole Plug) as a sealant. NMAC 19.27.4.30.C.1 specifies placement of sealant by use of a tremie pipe. When a tremie is used, it shall extend to near total depth of the well at the initiation of the plugging. The tremie shall be incrementally removed to retain the tremie bottom a limited distance above the top of the rising column of bentonite chips throughout the plugging process.

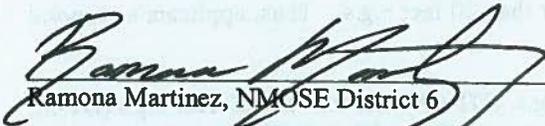
When placing bentonite chips above static water level, the chips shall be hydrated with sufficient potable water to allow the chips to yield. Options include: (A) use tremie for mixture of chips and water (as a carrier), or (B) use of dry-tremie for the chips in short intervals followed or preceded by addition of potable water increment sufficient for yielding of chips.

Potable water shall be added to the well in increments such that the chips are discharged into a column of standing water, if possible. If borehole lithology is too permeable to retain added water prior to chip placement, potable water shall be discharged into the borehole/well following placement of short intervals of chips to provide the bentonite sufficient available water to swell and seal the borehole/casing.

Alternately, a surface pour of the requested bentonite pellets is authorized, provided that the depth of the well be accurately determined prior to plugging, and that the top of the column of chips be sounded and column height / volume of sealant emplaced be recorded at approximate 25' intervals over the course of plugging to gauge appropriate progress of plugging and establish that the chips have not bridged inappropriately up-hole. If bridging occurs using any method of placement, the bridging shall be rectified before continuing with plugging. Sealant manufacturer's recommendations should be followed regarding screening fine particles from the chips and rate of pour to avoid bridging.

5. For DT-5A only, the sequence of plugging includes: 1) tremie bentonite chips inside 8-inch casing to approximately 540 feet b.g.s.; 2) cut 8-inch casing at 520 feet b.g.s. and remove casing; 3) tremie bentonite chips for any annular space to approximately 520-515 feet b.g.s.; and 4) tremie cement from approximately 520 to surface. This sequence protects access to the 8-inch casing and reduces potential losses of cement to lost circulation zones encountered during drilling, which may still be present in the annulus space outside 8-inch casing.
6. The plug may be terminated below grade as necessary to allow approved redevelopment onsite, provided any plug consist of cement or concrete within 10' of ground level, and a minimum 6-inch thickness of reinforced cement grout or concrete completely covers the top of any casing cut off below grade. More stringent local building codes may apply.
7. Should the NMED, or another regulatory agency sharing jurisdiction of the project authorize, or by regulation require a more stringent well plugging procedure than herein acknowledged, the more-stringent procedure should be followed. This, in part, includes provisions regarding pre-authorization to proceed, remediate contaminants, inspect, pull/perforate of casing, or prohibit free discharge of any fluid from the borehole during or related to the plugging process.
8. NMOSE witnessing of the plugging will not be required, but shall be facilitated if a NMOSE observer is onsite. NMOSE witnessing may be requested during normal work hours by calling the District 6 NMOSE Office at 505-827-7848, at least 48-hours in advance. NMOSE inspection will occur dependant on personnel availability.
9. A NMOSE Plugging Record (available at: <http://www.ose.state.nm.us/PDF/WellDrillers/WD-11.pdf>) itemizing actual abandonment process and materials used shall be filed with the State Engineer (NMOSE, PO Box 25102, Santa Fe, NM 87504-5102), within 20 days after completion of well plugging. Please attach a copy of these plugging conditions.

The NMOSE Well Plugging Plan of Operations dated July 2 and July 11, 2014, with annotation, is hereby approved with the aforesaid conditions applied.



Ramona Martinez, NMOSE District 6

Date: 7/12/14



Kevin Myers, NMOSE Hydrology Bureau

Date: 7/17/14



WELL PLUGGING PLAN OF OPERATIONS



NOTE: A Well Plugging Plan of Operations shall be filed with and accepted by the Office of the State Engineer prior to plugging.

I. FILING FEE: There is no filing fee for this form.

II. GENERAL / WELL OWNERSHIP:

Existing Office of the State Engineer POD Number (Well Number) for well to be plugged: DT-5A

Name of well owner: U.S. Department of Energy/Los Alamos National Laboratory

Mailing address: P.O. Box 1663

City: Los Alamos State: New Mexico Zip code: 87545

Phone number: 505-667-3005 E-mail: meverett@lanl.gov

III. WELL DRILLER INFORMATION:

Well Driller contracted to provide plugging services: Boart Longyear

New Mexico Well Driller License No.: 1161 Expiration Date: 10/31/2014

IV. WELL INFORMATION:

Note: A copy of the existing Well Record for the well to be plugged should be attached to this plan.

1) GPS Well Location (BRASS CAP): East: 1625310.0
North: 1754789.4
Well coordinates are New Mexico State Plane Grid Coordinates, Central Zone (North American Datum, 1983[NAD 1983]).

2) Reason(s) for plugging well: Well DT-5A is old and not used for its intended purpose. The borehole represents a conduit to subsurface.

3) Was well used for any type of monitoring program? Yes If yes, please use section VII of this form to detail what hydrogeologic parameters were monitored. If the well was used to monitor contaminated or poor quality water, authorization from the New Mexico Environment Department may be required prior to plugging.

4) Does the well tap brackish, saline, or otherwise poor quality water? No If yes, provide additional detail, including analytical results and/or laboratory report(s): _____

5) Static water level: According to well completion report, 1186 ft bgs.

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OFFICE OF THE STATE ENGINEER
NEW MEXICO
Well Plugging Plans
Form December 2011
Page 1 of 5

feet below land surface / feet above land surface (circle one)

- 6) Depth of the well: 1821 feet
- 7) Inside diameter of innermost casing: 8.0 inches.
- 8) Casing material: Carbon steel
- 9) The well was constructed with:
_____ an open-hole production interval, state the open interval: _____
X a well screen or perforated pipe, state the screened interval(s): 1171.5-1788.5
- 10) What annular interval surrounding the artesian casing of this well is cement-grouted? None
- 11) Was the well built with surface casing? Yes If yes, is the annulus surrounding the surface casing grouted or otherwise sealed? Yes If yes, please describe: A total of 525 ft of 12-in.-diameter steel casing was cemented into the borehole.
- 12) Has all pumping equipment and associated piping been removed from the well? No If not, describe remaining equipment and intentions to remove prior to plugging in Section VII of this form.

V. DESCRIPTION OF PLANNED WELL PLUGGING:

Note: If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie pipe, a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional technical information, such as geophysical logs, that are necessary to adequately describe the proposal.

- 1) Describe the method by which ~~cement~~ grout shall be placed in the well, or describe requested plugging methodology proposed for the well: Hydrated bentonite chips will be placed from total depth (1821 ft bgs) to 540 ft bgs with a tremie pipe. Cement grout will be placed from 540 ft bgs to surface with a tremie pipe.
- 2) Will well head be cut-off below land surface after plugging? Well head will be cut-off near ground surface.

VI. PLUGGING AND SEALING MATERIALS:

Note: The plugging of a well that taps poor quality water may require the use of a specialty cement or specialty sealant

- 1) For plugging intervals that employ cement grout, complete and attach Table A.
- 2) For plugging intervals that will employ approved non-cement based sealant(s), complete and attach Table B.
- 3) Theoretical volume of grout required to plug the well to land surface: Approximately 3123 gallons
- 4) Type of Cement proposed: Portland Type I/II cement
- 5) Proposed cement grout mix: 6 gallons of water per 94 pound sack of Portland cement.
- 6) Will the grout be: _____ batch-mixed and delivered to the site
X mixed on site

7) Grout additives requested, and percent by dry weight relative to cement: None

8) Additional notes and calculations: None

VII. ADDITIONAL INFORMATION: List additional information below, or on separate sheet(s):

Test well DT-5A was drilled to 1821 ft bgs in 1960 with rotary equipment. Water was encountered at 1173 ft bgs. Perched water was not encountered during the drilling of DT-5A. A total of 525 ft of 12-in.-diameter steel casing was cemented into the borehole. Then, 1821 ft of 8-in.-diameter steel casing was hung in the hole. A series of torch-cut slots in the well casing is present below 1172 ft bgs in the Puye and Chamita Formations. There is no backfill in the well annulus. All surface and subsurface appurtenances will be removed from the well before it is abandoned. Bentonite chips will be installed via tremie pipe from the well's total depth (1821 ft bgs) to approximately 540 ft bgs. Then, a pneumatic casing cutter will be installed in the 8-in. casing to 520 ft bgs and the 8-in. casing will be cut off and removed from the borehole. After removing the upper 520 ft of 8-in. casing, a tremie pipe will be installed and the remaining portion of the hole will be grouted to the surface. The 12-in. surface casing will be cut off level with the existing ground surface. See attached figure for pre- and post-abandonment well diagrams.

Hydrate

** Prior to cement, additional placement of bentonite chips for any open annular space 1821-520 Ken*

VIII. SIGNATURE:

I, Theodore Ball, say that I have carefully read the foregoing Well Plugging Plan of Operations and any attachments, which are a part hereof; that I am familiar with the rules and regulations of the State Engineer pertaining to the plugging of wells and will comply with them, and that each and all of the statements in the Well Plugging Plan of Operations and attachments are true to the best of my knowledge and belief.

Theodore Ball

7/2/14

Signature of Applicant

Date

IX. ACTION OF THE STATE ENGINEER:

*Reviewed by NMOS Hydrology
Ken May 7/17/14*

This Well Plugging Plan of Operations is:

- Approved subject to the attached conditions.
- Not approved for the reasons provided on the attached letter.

Witness my hand and official seal this 18th day of July, 2014

Scott A. Verhines, State Engineer

By: *Ramon May*

TABLE A - For plugging intervals that employ cement grout. Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of grout placement (ft bgl)		Surface	
Bottom of proposed interval of grout placement (ft bgl)		540	
Theoretical volume of grout required per interval (gallons)		3123	
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement		6	
Mixed on-site or batch-mixed and delivered?		On-site	
Grout additive 1 requested			
Additive 1 percent by dry weight relative to cement			
Grout additive 2 requested			
Additive 2 percent by dry weight relative to cement			

TABLE B - For plugging intervals that will employ approved non-cement based sealant(s). Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of sealant placement (ft bgl)	540		
Bottom of proposed sealant of grout placement (ft bgl)	1821		
Theoretical volume of sealant required per interval (gallons)	447 cubic feet		<p><i>volume</i></p> <p><i>Correct for 8-inch casing</i></p> <p><i>If annular space open, add 66% more</i></p> <p><i>ZCM</i></p>
Proposed abandonment sealant (manufacturer and trade name)	Baroid Holeplug 3/8-inch bentonite chips.		

DIAMETER OF BOREHOLE
 12.0 (IN) FROM 0 TO 1821 (FT BGS)
 DEPTH TO WATER (FT BGS) 1186 ft BGS (April, 2008)

ELEVATIONS (FT AMSL)
 WELL CASING TBD
 GROUND SURFACE TBD
 BRASS CAP (MARKER) TBD

GROUND SURFACE (TBD FT BGS)

12-IN DIAMETER
 STEEL CASING
 0 TO 525 (FT BGS)

8-IN DIAMETER
 STEEL CASING
 0 TO 1821 (FT BGS)

Torch Cut Slots
 1171.5 TO 1788.5 (FT BGS)

BOTTOM OF BORING
 1821 (FT BGS)

CONSTRUCTION

NEAT CEMENT
 0 TO 540 (FT BGS)

REMOVE 8-IN
 CASING
 0 TO 520 (FT BGS)

BENTONITE CHIPS
 540 TO 1821 (FT BGS)

PLUG/ABANDONMENT

		DT-5A As-Built Well Construction Technical Area 49 (TA-49) Los Alamos National Laboratory Los Alamos, New Mexico	As-Built DT-5A NOT TO SCALE
Drafted By: TPMC Project Number: 86313	Date: May 16, 2014 File Name: DT-5A_AsBuilt_Diagram		



STATE OF NEW MEXICO
OFFICE OF THE STATE ENGINEER
SANTA FE

Scott A. Verhines, P.E.
State Engineer

CONCHA ORTIZ Y PINO BLDG.
POST OFFICE BOX 25102
130 SOUTH CAPITOL
SANTA FE, NEW MEXICO 87504-5102
(505) 827-6091
FAX: (505) 827-3806

September 18, 2014

U.S Department of Energy/ Los Alamos National Laboratory
C/O Steve White
P.O Box 1663
Los Alamos, NM 87545

Re: Plugging Plan of Operation, LANL Wells DT-9

Greetings:

After a review of the Well Plugging Plan of Operations submitted on September 12, 2014, The Office of the Engineer is returning a favorable approval with specific Plugging Conditions and has accepted the Plugging Plan submitted for filing.

Please return a completed Well Plugging Report that itemizes the actual abandonment process and materials used within 20 days after completion of well plugging. In addition, please include a copy of the approved Plugging Conditions enclosed.

Please address any questions via- telephone to Ramona Martinez at 505.827.6120 or via e-mail at Ramona.Martinez2@state.nm.us.

Sincerely,

A handwritten signature in black ink, appearing to read "Ramona Martinez".

Ramona Martinez
Basin Supervisor

Enclosure
cc: file



DISTRICT 6
SCOTT A. VERHINES, P.E.
NEW MEXICO STATE ENGINEER

Materials submitted by Los Alamos National Laboratory (LANL) request the plugging of one well (DT-9). The well will be sealed to comply with provisions of NMAC 19.27.4 and the New Mexico Environment Department's Hazardous Waste Bureau. Plugging services will be provided by Boart Longyear (WD-1161). Based on logging, well casing bridged at approximately 1308 feet.

LANL Well Name	OSE file No.	X coordinate NM State Plane Central zone NAD 1983 (feet)	Y coordinate NM State Plane Central zone NAD 1983 (feet)	Total depth to be sealed (feet)	Casing diameter (s) (inches)	Depth to water (feet b.g.s.)
DT-9	Unknown	1628993.6	1751492.6	1501 b.g.s.	12 (0-1335 ft. b.g.s.) 8 (1315-1501ft b.g.s.) swage	1017

b.g.s. = below ground surface

Contacted Michael Dale (NMED-HWB, 505-661-2673) on September 10, 2014.

Specific Plugging Conditions of Approval for LANL wells DT-9, Los Alamos, NM, Los Alamos County.

1. Water well drilling and well drilling activities, including well plugging, are regulated under 19.27.4 NMAC, which requires any person engaged in the business of well drilling within New Mexico to obtain a Well Driller License issued by the New Mexico Office of the State Engineer (NMOSE). Therefore, the firm of a New Mexico licensed Well Driller shall perform the well plugging.
2. Approximate theoretical volume of sealant required for abandonment of well intervals ranges from 2.61 gallons per foot for 8-inch ID casing to 5.88 gallons per foot for 12-inch ID casing. Some highly porous volcanic formations may result in uptake of considerably higher volumes than calculated. If surface casings are removed, borehole volume may require more than casing. LANL and its contractor should account for volumes of sealant materials used, especially cement. In the event the theoretical volume is exceeded by 25% or more for cement sealant, use of bentonite chips would be appropriate rather than pumping multiple borehole volumes of cement slurry.
3. For multiple intervals from 1501 feet b.g.s. to surface (DT-9) as specified in Plugging Plan of Operations submitted, LANL requests use of cement as a sealant. Fundamental water demand for Type I/II Portland neat cement grout is 5.2 gallons per 94 lb/sack cement. Use of mix water increment in excess of this amount results in a thinned mix of cement prone to shrinkage that may disrupt effective sealing and hydraulic separation. AWWA Well Standards allow use of a maximum of 6.0 gallons water per 94 lb/sack cement if necessary for pumpability of neat cement grout. NMAC 19.27.4.30.C.1 specifies placement of sealant by use of a tremie pipe for depths greater than 20 feet b.g.s.. Thus, applicant's proposal of 6 gallons of water per 94-lbs sack of cement is acceptable.
4. If any intervals require use of bentonite chips in lieu of cement, applicant will use of bentonite chips (3/8-inch Hole Plug) as a sealant. NMAC 19.27.4.30.C.1 specifies placement of sealant by use of a tremie pipe. When a tremie is used, it shall extend to near total depth of the well at the initiation of the plugging. The tremie shall be incrementally removed to retain the tremie bottom a limited distance above the top of the rising column of bentonite chips throughout the plugging process.

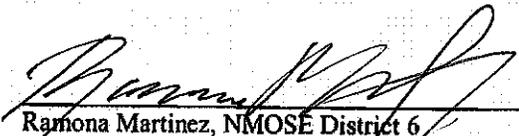
When placing bentonite chips above static water level, the chips shall be hydrated with sufficient potable water to allow the chips to yield. Options include: (A) use tremie for mixture of chips and water (as a carrier), or (B) use of dry-tremie for the chips in short intervals followed or preceded by addition of potable water increment sufficient for yielding of chips.

Potable water shall be added to the well in increments such that the chips are discharged into a column of standing water, if possible. If borehole lithology is too permeable to retain added water prior to chip placement, potable water shall be discharged into the borehole/well following placement of short intervals of chips to provide the bentonite sufficient available water to swell and seal the borehole/casing.

Alternately, a surface pour of the requested bentonite pellets is authorized, provided that the depth of the well be accurately determined prior to plugging, and that the top of the column of chips be sounded and column height / volume of sealant emplaced be recorded at approximate 25' intervals over the course of plugging to gauge appropriate progress of plugging and establish that the chips have not bridged inappropriately up-hole. If bridging occurs using any method of placement, the bridging shall be rectified before continuing with plugging. Sealant manufacturer's recommendations should be followed regarding screening fine particles from the chips and rate of pour to avoid bridging.

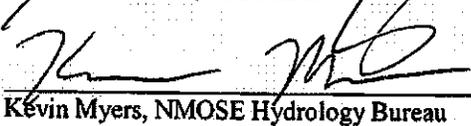
5. For DT-9, the sequence of plugging includes: 1) tremie set at approximately 1300 feet for cement placement inside 8-inch casing total depth to approximately 1315 feet b.g.s. (depending on severity of bridging); 2) tremie cement inside 12-inch casing to approximately 300 feet b.g.s. 3) cut 12-inch casing at approximately 280 feet b.g.s. and remove casing; and 3) tremie cement for any borehole and annular space from approximately 300 feet b.g.s. to surface. This sequence protects access to the 12-inch casing. If any significant cement losses to the formation for some porous intervals, bentonite chips may be used as described in the condition above.
6. The plug may be terminated below grade as necessary to allow approved redevelopment onsite, provided any plug consist of cement or concrete within 10' of ground level, and a minimum 6-inch thickness of reinforced cement grout or concrete completely covers the top of any casing cut off below grade. More stringent local building codes may apply.
7. Should the NMED, or another regulatory agency sharing jurisdiction of the project authorize, or by regulation require a more stringent well plugging procedure than herein acknowledged, the more-stringent procedure should be followed. This, in part, includes provisions regarding pre-authorization to proceed, remediate contaminants, inspect, pull/perforate of casing, or prohibit free discharge of any fluid from the borehole during or related to the plugging process.
8. NMOSE witnessing of the plugging will not be required, but shall be facilitated if a NMOSE observer is onsite. NMOSE witnessing may be requested during normal work hours by calling the District 6 NMOSE Office at 505-827-7848, at least 48-hours in advance. NMOSE inspection will occur dependant on personnel availability.
9. A NMOSE Plugging Record (available at: <http://www.ose.state.nm.us/PDF/WellDrillers/WD-11.pdf>) itemizing actual abandonment process and materials used shall be filed with the State Engineer (NMOSE, PO Box 25102, Santa Fe, NM 87504-5102), within 20 days after completion of well plugging. Please attach a copy of these plugging conditions.

The NMOSE Well Plugging Plan of Operations dated September 10, 2014, with annotation, is hereby approved with the aforesaid conditions applied.



Ramona Martinez, NMOSE District 6

Date: 9/10/2014

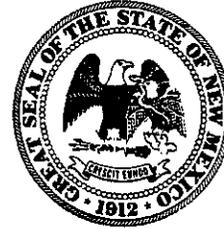


Kevin Myers, NMOSE Hydrology Bureau

Date: 9/10/14



WELL PLUGGING PLAN OF OPERATIONS



NOTE: A Well Plugging Plan of Operations shall be filed with and accepted by the Office of the State Engineer prior to plugging.

I. FILING FEE: There is no filing fee for this form.

II. GENERAL / WELL OWNERSHIP:

Existing Office of the State Engineer POD Number (Well Number) for well to be plugged: DT-9
Name of well owner: U.S. Department of Energy/Los Alamos National Laboratory
Mailing address: P.O. Box 1663
City: Los Alamos State: New Mexico Zip code: 87545
Phone number: 505-667-3005 E-mail: meverett@lanl.gov

III. WELL DRILLER INFORMATION:

Well Driller contracted to provide plugging services: Boart Longyear
New Mexico Well Driller License No.: 1161 Expiration Date: 10/31/2014

IV. WELL INFORMATION:

Note: A copy of the existing Well Record for the well to be plugged should be attached to this plan.

- 1) GPS Well Location (BRASS CAP): East: 1628993.6
North: 1751492.6
Well coordinates are New Mexico State Plane Grid Coordinates, Central Zone (North American Datum, 1983[NAD 1983]).
- 2) Reason(s) for plugging well: Well DT-9 is old and not used for its intended purpose. The borehole represents a conduit to subsurface.
- 3) Was well used for any type of monitoring program? Yes If yes, please use section VII of this form to detail what hydrogeologic parameters were monitored. If the well was used to monitor contaminated or poor quality water, authorization from the New Mexico Environment Department may be required prior to plugging.
- 4) Does the well tap brackish, saline, or otherwise poor quality water? No If yes, provide additional detail, including analytical results and/or laboratory report(s): _____
- 5) Static water level: 1017 ft bgs

2014 SEP 12 AM 11:26

Well Plugging Plan
Version 1.0
December 2011
OFFICE OF THE STATE ENGINEER
NEW MEXICO

feet below land surface / feet above land surface (circle one)

- 6) Depth of the well: 1501 feet
- 7) Inside diameter of innermost casing: 8.0 inches.
- 8) Casing material: Carbon steel
- 9) The well was constructed with:
_____ an open-hole production interval, state the open interval: _____
X a well screen or perforated pipe, state the screened interval(s): 1040-1501
- 10) What annular interval surrounding the artesian casing of this well is cement-grouted? None
- 11) Was the well built with surface casing? Yes If yes, is the annulus surrounding the surface casing grouted or otherwise sealed? No If yes, please describe: _____
- 12) Has all pumping equipment and associated piping been removed from the well? Yes If not, describe remaining equipment and intentions to remove prior to plugging in Section VII of this form.

V. DESCRIPTION OF PLANNED WELL PLUGGING:

Note: If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie pipe, a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional technical information, such as geophysical logs, that are necessary to adequately describe the proposal.

- 1) Describe the method by which cement grout shall be placed in the well, or describe requested plugging methodology proposed for the well: On September 9, 2014, a LANL video log of the well recorded a bridged section of material at 1308 ft bgs. A tremie pipe will be installed to approximately 1300 ft bgs and cement grout will be placed to surface with a tremie pipe.
- 2) Will well head be cut-off below land surface after plugging? Well head will be cut-off near ground surface.

VI. PLUGGING AND SEALING MATERIALS:

Note: The plugging of a well that taps poor quality water may require the use of a specialty cement or specialty sealant

- 1) For plugging intervals that employ cement grout, complete and attach Table A.
- 2) For plugging intervals that will employ approved non-cement based sealant(s), complete and attach Table B.
- 3) Theoretical volume of grout required to plug the well to land surface: Approximately 8312 gallons
- 4) Type of Cement proposed: Portland Type I/II cement
- 5) Proposed cement grout mix: 6 gallons of water per 94 pound sack of Portland cement.
- 6) Will the grout be: _____ batch-mixed and delivered to the site
X mixed on site

TABLE A - For plugging intervals that employ cement grout. Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of grout placement (ft bgl)			Surface
Bottom of proposed interval of grout placement (ft bgl)			1501
Theoretical volume of grout required per interval (gallons)			8312
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement			6
Mixed on-site or batch-mixed and delivered?			On-site
Grout additive 1 requested			
Additive 1 percent by dry weight relative to cement			
Grout additive 2 requested			
Additive 2 percent by dry weight relative to cement			

TABLE B - For plugging intervals that will employ approved non-cement based sealant(s). Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of sealant placement (ft bgl)			
Bottom of proposed sealant of grout placement (ft bgl)			
Theoretical volume of sealant required per interval (gallons)			
Proposed abandonment sealant (manufacturer and trade name)			

7) Grout additives requested, and percent by dry weight relative to cement: None

8) Additional notes and calculations: None

VII. ADDITIONAL INFORMATION: List additional information below, or on separate sheet(s):

*possibly 819-11335
per email
X*

Test well DT-9 was drilled to 1501 ft bgs in 1960 with rotary equipment. Water was encountered at 1003 ft bgs. The well is constructed with 1335 ft of 12-in.-diameter steel casing with torch-cut slots from 1040 to 1335 ft. Approximately 186 ft of 8-in.-diameter steel casing with torch cut slots (183 ft) was swaged into the 12-in. casing at 1315 ft. There is presumed to be no backfill in the well annulus. All surface and subsurface appurtenances will be removed from the well before it is abandoned. A tremie pipe will be installed and the well casing will be grouted to approximately 300 ft bgs. Then, a pneumatic casing cutter will be installed in the 12-in. casing to 280 ft bgs and the 12-in. casing will be cut off and removed as the remainder of the borehole is grouted to the surface. The 12-in. surface casing will be cut off level with the existing ground surface.

VIII. SIGNATURE:

I, _____, say that I have carefully read the foregoing Well Plugging Plan of Operations and any attachments, which are a part hereof; that I am familiar with the rules and regulations of the State Engineer pertaining to the plugging of wells and will comply with them, and that each and all of the statements in the Well Plugging Plan of Operations and attachments are true to the best of my knowledge and belief.

Walter Muratt

9-11-14

Signature of Applicant

Date

IX. ACTION OF THE STATE ENGINEER:

*Received by Tom M
9/17/14 NMOSE Hydrology*

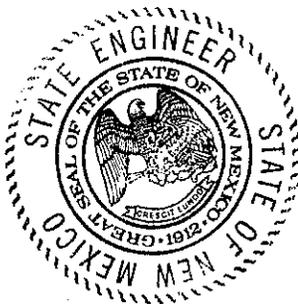
This Well Plugging Plan of Operations is:

- Approved subject to the attached conditions.
- Not approved for the reasons provided on the attached letter.

Witness my hand and official seal this 12 day of September, 2014

Scott A. Verhines, State Engineer

By: *[Signature]*





STATE OF NEW MEXICO
OFFICE OF THE STATE ENGINEER
SANTA FE

Scott A. Verhines, P.E.
State Engineer

CONCHA ORTIZ Y PINO BLDG.
POST OFFICE BOX 25102
130 SOUTH CAPITOL
SANTA FE, NEW MEXICO 87504-5102
(505) 827-6091
FAX: (505) 827-3806

July 3, 2014

U.S Department of Energy/ Los Alamos National Laboratory
C/O Steve White
P.O Box 1663
Los Alamos, NM 87545

Re: Plugging Plan of Operation, LANL Wells LAWS-01, LAWS-02, LAWS-03, Los Alamos, NM.

Greetings:

After a review of the Well Plugging Plan of Operations submitted on July 3, 2014, The Office of the Engineer is returning a favorable approval with specific Plugging Conditions and has accepted the Plugging Plan submitted for filing.

Please return a completed Well Plugging Report that itemizes the actual abandonment process and materials used within 20 days after completion of well plugging. In addition, please include a copy of the approved Plugging Conditions enclosed.

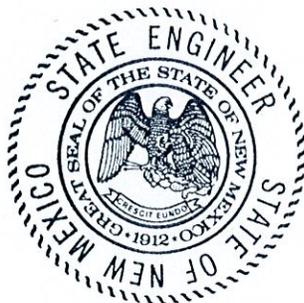
Please address any questions via- telephone to Ramona Martinez at 505.827.6120 or via e-mail at Ramona.Martinez2@state.nm.us.

Sincerely,

A handwritten signature in blue ink, appearing to read "Ramona Martinez".

Ramona Martinez
Upper Pecos Basin Supervisor

Enclosure
CC: File





DISTRICT 6
SCOTT A. VERHINES, P.E.
NEW MEXICO STATE ENGINEER

Materials submitted by Los Alamos National Laboratory (LANL) request the plugging of three wells (LAWS-01, LAWS-02 and LAWS-03). As summarized in the table below, one vertical well (LAWS-01) has total depth of 281.5 feet, and two angled wells with a length of 157 and 137 feet. Vertical well has 4-inch ID diameter PVC casing and angle wells have 6-inch ID scalloped PVC casing. Completion report shows shall water zone(s) at approximately 80, 135, and 264 feet b.g.s.. Shallow water has been reported at 174 feet below ground surface at LAWS-01. The wells will be sealed to comply with provisions of NMAC 19.27.4 and the New Mexico Environment Department's Hazardous Waste Bureau. Plugging services will be provided by Boart Longyear (WD-1161).

LANL Well Name	OSE file No.	X coordinate NM State Plane Central zone NAD 1983 (feet)	Y coordinate NM State Plane Central zone NAD 1983 (feet)	Total depth to be sealed (feet)	Casing diameter (s) (inches)	Depth to water (feet b.g.s.)
LAWS-01 (LA-10135)	unknown	1649524.5	1770854.0	278 b.g.s.	10.75 4	174
LAWS-02 (LA-10136)	unknown	1649536.9	1770848.3	156 (length) 106 b.g.s.	10.75 6	Dry above 80
LAWS-03 (LA-10137)	unknown	1649542.9	1770848.8	136 (length) 76 b.g.s.	10.75 6	Dry above 80

b.g.s. = below ground surface

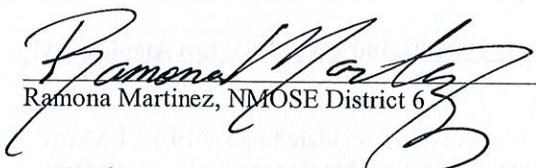
Contacted Michael Dale (NMED-HWB, 505-661-2673) on July 3, 2014.

Specific Plugging Conditions of Approval for LANL wells LAWS-01, LAWS-02 and LAWS-03, Los Alamos, NM, Los Alamos County.

1. Water well drilling and well drilling activities, including well plugging, are regulated under 19.27.4 NMAC, which requires any person engaged in the business of well drilling within New Mexico to obtain a Well Driller License issued by the New Mexico Office of the State Engineer (NMOSE). Therefore, the firm of a New Mexico licensed Well Driller shall perform the well plugging.
2. Approximate theoretical volume of sealant required for abandonment of well intervals ranges from 0.65 gallons per foot for 4-inch ID casing to 1.47 gallons per foot for 6-inch ID casing. Some highly porous volcanic formations may result in uptake of considerably higher volumes than calculated. If surface casings are removed, borehole volume may require more than casing. Angled boreholes may be 8-inch to 10-inch diameter, which may require additional volume of cement (1 to 2.5 gallons per foot additional sealant) for any open annular spaces. LANL and its contractor should account for volumes of sealant materials used, especially cement. In the event the theoretical volume is exceeded by 25% or more for cement sealant, use of bentonite chips would be appropriate rather than pumping multiple borehole volumes of cement slurry.

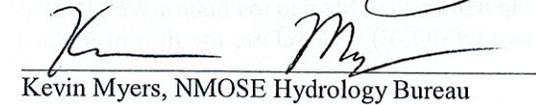
3. For multiple intervals (278 to 136 feet, length of borehole) as specified in Plugging Plan of Operations submitted, LANL requests use of cement as a sealant. Fundamental water demand for Type I/II Portland neat cement grout is 5.2 gallons per 94 lb/sack cement. Use of mix water increment in excess of this amount results in a thinned mix of cement prone to shrinkage that may disrupt effective sealing and hydraulic separation. AWWA Well Standards allow use of a maximum of 6.0 gallons water per 94 lb/sack cement if necessary for pumpability of neat cement grout. NMAC 19.27.4.30.C.1 specifies placement of sealant by use of a tremie pipe for depths greater than 20 feet b.g.s.. Thus, applicant's proposal of 6 gallons of water per 94-lbs sack of cement is acceptable.
4. The plug may be terminated below grade as necessary to allow approved redevelopment onsite, provided any plug consist of cement or concrete within 10' of ground level, and a minimum 6-inch thickness of reinforced cement grout or concrete completely covers the top of any casing cut off below grade. More stringent local building codes may apply.
5. Should the NMED, or another regulatory agency sharing jurisdiction of the project authorize, or by regulation require a more stringent well plugging procedure than herein acknowledged, the more-stringent procedure should be followed. This, in part, includes provisions regarding pre-authorization to proceed, contaminant remediation, inspection, pulling/perforating of casing, or prohibition of free discharge of any fluid from the borehole during or related to the plugging process.
6. NMOSE witnessing of the plugging will not be required, but shall be facilitated if a NMOSE observer is onsite. NMOSE witnessing may be requested during normal work hours by calling the District 6 NMOSE Office at 505-827-7848, at least 48-hours in advance. NMOSE inspection will occur dependant on personnel availability.
7. A NMOSE Plugging Record (available at: <http://www.ose.state.nm.us/PDF/WellDrillers/WD-11.pdf>) itemizing actual abandonment process and materials used shall be filed with the State Engineer (NMOSE, PO Box 25102, Santa Fe, NM 87504-5102), within 20 days after completion of well plugging. Please attach a copy of these plugging conditions.

The NMOSE Well Plugging Plan of Operations dated July 3, 2014, without annotation, is hereby approved with the aforesaid conditions applied.



Ramona Martinez, NMOSE District 6

Date: 7/3/14



Kevin Myers, NMOSE Hydrology Bureau

Date: 7/3/14





WELL PLUGGING PLAN OF OPERATIONS



NOTE: A Well Plugging Plan of Operations shall be filed with and accepted by the Office of the State Engineer prior to plugging.

I. FILING FEE: There is no filing fee for this form.

II. GENERAL / WELL OWNERSHIP:

Existing Office of the State Engineer POD Number (Well Number) for well to be plugged: LAWS-01
Name of well owner: U.S. Department of Energy/Los Alamos National Laboratory
Mailing address: P.O. Box 1663
City: Los Alamos State: New Mexico Zip code: 87545
Phone number: 505-667-3005 E-mail: meverett@lanl.gov

III. WELL DRILLER INFORMATION:

Well Driller contracted to provide plugging services: Boart Longyear
New Mexico Well Driller License No.: 1161 Expiration Date: 10/31/2014

IV. WELL INFORMATION:

Note: A copy of the existing Well Record for the well to be plugged should be attached to this plan.

- 1) GPS Well Location (BRASS CAP): East: 1649524.5
North: 1770854.0
Well coordinates are New Mexico State Plane Grid Coordinates, Central Zone (North American Datum, 1983/NAD 1983).
- 2) Reason(s) for plugging well: Well LAWS-01 is old and not used for its intended purpose. The borehole represents a conduit to subsurface.
- 3) Was well used for any type of monitoring program? Yes If yes, please use section VII of this form to detail what hydrogeologic parameters were monitored. If the well was used to monitor contaminated or poor quality water, authorization from the New Mexico Environment Department may be required prior to plugging.
- 4) Does the well tap brackish, saline, or otherwise poor quality water? No If yes, provide additional detail, including analytical results and/or laboratory report(s): _____
- 5) Static water level: According to well completion report, 174 ft bgs.

36 JUL 3- 2014

feet below land surface / feet above land surface (circle one)

- 6) Depth of the well: 278 feet
- 7) Inside diameter of innermost casing: 4.0 inches.
- 8) Casing material: Polyvinyl Chloride
- 9) The well was constructed with:
_____ an open-hole production interval, state the open interval: _____
X a well screen or perforated pipe, state the screened interval(s): 83-93, 158-168, 188-198, 263-273
- 10) What annular interval surrounding the artesian casing of this well is cement-grouted? None
- 11) Was the well built with surface casing? Yes If yes, is the annulus surrounding the surface casing grouted or otherwise sealed? Not according to well completion report If yes, please describe: _____
- 12) Has all pumping equipment and associated piping been removed from the well? No If not, describe remaining equipment and intentions to remove prior to plugging in Section VII of this form.

V. DESCRIPTION OF PLANNED WELL PLUGGING:

Note: If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie pipe, a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional technical information, such as geophysical logs, that are necessary to adequately describe the proposal.

- 1) Describe the method by which cement grout shall be placed in the well, or describe requested plugging methodology proposed for the well: Cement grout will be placed from bottom to top with a tremie pipe.
- 2) Will well head be cut-off below land surface after plugging? Well head will be cut-off near ground surface.

VI. PLUGGING AND SEALING MATERIALS:

Note: The plugging of a well that taps poor quality water may require the use of a specialty cement or specialty sealant

- 1) For plugging intervals that employ cement grout, complete and attach Table A.
- 2) For plugging intervals that will employ approved non-cement based sealant(s), complete and attach Table B.
- 3) Theoretical volume of grout required to plug the well to land surface: Approximately 181 gallons
- 4) Type of Cement proposed: Portland Type I/II cement
- 5) Proposed cement grout mix: 6 gallons of water per 94 pound sack of Portland cement.
- 6) Will the grout be: _____ batch-mixed and delivered to the site
X mixed on site

7) Grout additives requested, and percent by dry weight relative to cement: None

8) Additional notes and calculations: None

VII. ADDITIONAL INFORMATION: List additional information below, or on separate sheet(s):

Well LAWS-01 is a vertical hole drilled in 2001 to a depth of 281 ft and completed as a four screen well in the Cerros Del Rio Basalt to monitor the saturated zones at the Los Alamos Canyon weir site. The well is 4.5-in. O.D. schedule 80 PVC with four 0.01-in. slotted PVC screens. A FLUTE™ water monitoring system was deployed with transducers and sampling ports. Monitoring is no longer being performed at this well. All surface and subsurface appurtenances, including the FLUTE™ system, will be removed from the well before abandonment. The well will be grouted from 278 ft bgs to the surface.

VIII. SIGNATURE:

I, Theodore Bell, say that I have carefully read the foregoing Well Plugging Plan of Operations and any attachments, which are a part hereof; that I am familiar with the rules and regulations of the State Engineer pertaining to the plugging of wells and will comply with them, and that each and all of the statements in the Well Plugging Plan of Operations and attachments are true to the best of my knowledge and belief.

Theodore Bell

Signature of Applicant

7/2/14

Date

IX. ACTION OF THE STATE ENGINEER:

*Reviewed by MNOSE Hydrology
Z-M 7/3/14*

This Well Plugging Plan of Operations is:

- Approved subject to the attached conditions.
 Not approved for the reasons provided on the attached letter.

Witness my hand and official seal this 3rd day of July, 2014

Scott A. Verhines, State Engineer

By: [Signature]

TABLE A - For plugging intervals that employ cement grout. Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of grout placement (ft bgl)			Surface
Bottom of proposed interval of grout placement (ft bgl)			278
Theoretical volume of grout required per interval (gallons)			181
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement			6
Mixed on-site or batch-mixed and delivered?			On-site
Grout additive 1 requested			
Additive 1 percent by dry weight relative to cement			
Grout additive 2 requested			
Additive 2 percent by dry weight relative to cement			

TABLE B - For plugging intervals that will employ approved non-cement based sealant(s). Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of sealant placement (ft bgl)			
Bottom of proposed sealant or grout placement (ft bgl)			
Theoretical volume of sealant required per interval (gallons)			
Proposed abandonment sealant (manufacturer and trade name)			



STATE OF NEW MEXICO
OFFICE OF THE STATE ENGINEER
SANTA FE

Scott A. Verhines, P.E.
State Engineer

CONCHA ORTIZ Y PINO BLDG.
POST OFFICE BOX 25102
130 SOUTH CAPITOL
SANTA FE, NEW MEXICO 87504-5102
(505) 827-6091
FAX: (505) 827-3806

July 3, 2014

U.S Department of Energy/ Los Alamos National Laboratory
C/O Steve White
P.O Box 1663
Los Alamos, NM 87545

Re: Plugging Plan of Operation, LANL Wells LAWS-01, LAWS-02, LAWS-03, Los Alamos, NM.

Greetings:

After a review of the Well Plugging Plan of Operations submitted on July 3, 2014, The Office of the Engineer is returning a favorable approval with specific Plugging Conditions and has accepted the Plugging Plan submitted for filing.

Please return a completed Well Plugging Report that itemizes the actual abandonment process and materials used within 20 days after completion of well plugging. In addition, please include a copy of the approved Plugging Conditions enclosed.

Please address any questions via- telephone to Ramona Martinez at 505.827.6120 or via e-mail at Ramona.Martinez2@state.nm.us.

Sincerely,


Ramona Martinez
Upper Pecos Basin Supervisor

Enclosure
CC: File





DISTRICT 6
SCOTT A. VERHINES, P.E.
NEW MEXICO STATE ENGINEER

Materials submitted by Los Alamos National Laboratory (LANL) request the plugging of three wells (LAWS-01, LAWS-02 and LAWS-03). As summarized in the table below, one vertical well (LAWS-01) has total depth of 281.5 feet, and two angled wells with a length of 157 and 137 feet. Vertical well has 4-inch ID diameter PVC casing and angle wells have 6-inch ID scalloped PVC casing. Completion report shows shall water zone(s) at approximately 80, 135, and 264 feet b.g.s.. Shallow water has been reported at 174 feet below ground surface at LAWS-01. The wells will be sealed to comply with provisions of NMAC 19.27.4 and the New Mexico Environment Department's Hazardous Waste Bureau. Plugging services will be provided by Boart Longyear (WD-1161).

LANL Well Name	OSE file No.	X coordinate NM State Plane Central zone NAD 1983 (feet)	Y coordinate NM State Plane Central zone NAD 1983 (feet)	Total depth to be sealed (feet)	Casing diameter (s) (inches)	Depth to water (feet b.g.s.)
LAWS-01 (LA-10135)	unknown	1649524.5	1770854.0	278 b.g.s.	10.75 4	174
LAWS-02 (LA-10136)	unknown	1649536.9	1770848.3	156 (length) 106 b.g.s.	10.75 6	Dry above 80
LAWS-03 (LA-10137)	unknown	1649542.9	1770848.8	136 (length) 76 b.g.s.	10.75 6	Dry above 80

b.g.s. = below ground surface

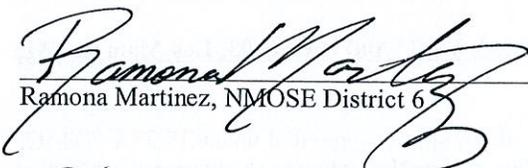
Contacted Michael Dale (NMED-HWB, 505-661-2673) on July 3, 2014.

Specific Plugging Conditions of Approval for LANL wells LAWS-01, LAWS-02 and LAWS-03, Los Alamos, NM, Los Alamos County.

1. Water well drilling and well drilling activities, including well plugging, are regulated under 19.27.4 NMAC, which requires any person engaged in the business of well drilling within New Mexico to obtain a Well Driller License issued by the New Mexico Office of the State Engineer (NMOSE). Therefore, the firm of a New Mexico licensed Well Driller shall perform the well plugging.
2. Approximate theoretical volume of sealant required for abandonment of well intervals ranges from 0.65 gallons per foot for 4-inch ID casing to 1.47 gallons per foot for 6-inch ID casing. Some highly porous volcanic formations may result in uptake of considerably higher volumes than calculated. If surface casings are removed, borehole volume may require more than casing. Angled boreholes may be 8-inch to 10-inch diameter, which may require additional volume of cement (1 to 2.5 gallons per foot additional sealant) for any open annular spaces. LANL and its contractor should account for volumes of sealant materials used, especially cement. In the event the theoretical volume is exceeded by 25% or more for cement sealant, use of bentonite chips would be appropriate rather than pumping multiple borehole volumes of cement slurry.

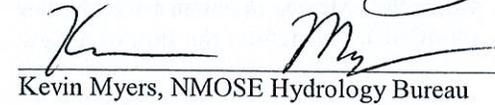
3. For multiple intervals (278 to 136 feet, length of borehole) as specified in Plugging Plan of Operations submitted, LANL requests use of cement as a sealant. Fundamental water demand for Type I/II Portland neat cement grout is 5.2 gallons per 94 lb/sack cement. Use of mix water increment in excess of this amount results in a thinned mix of cement prone to shrinkage that may disrupt effective sealing and hydraulic separation. AWWA Well Standards allow use of a maximum of 6.0 gallons water per 94 lb/sack cement if necessary for pumpability of neat cement grout. NMAC 19.27.4.30.C.1 specifies placement of sealant by use of a tremie pipe for depths greater than 20 feet b.g.s.. Thus, applicant's proposal of 6 gallons of water per 94-lbs sack of cement is acceptable.
4. The plug may be terminated below grade as necessary to allow approved redevelopment onsite, provided any plug consist of cement or concrete within 10' of ground level, and a minimum 6-inch thickness of reinforced cement grout or concrete completely covers the top of any casing cut off below grade. More stringent local building codes may apply.
5. Should the NMED, or another regulatory agency sharing jurisdiction of the project authorize, or by regulation require a more stringent well plugging procedure than herein acknowledged, the more-stringent procedure should be followed. This, in part, includes provisions regarding pre-authorization to proceed, contaminant remediation, inspection, pulling/perforating of casing, or prohibition of free discharge of any fluid from the borehole during or related to the plugging process.
6. NMOSE witnessing of the plugging will not be required, but shall be facilitated if a NMOSE observer is onsite. NMOSE witnessing may be requested during normal work hours by calling the District 6 NMOSE Office at 505-827-7848, at least 48-hours in advance. NMOSE inspection will occur dependant on personnel availability.
7. A NMOSE Plugging Record (available at: <http://www.ose.state.nm.us/PDF/WellDrillers/WD-11.pdf>) itemizing actual abandonment process and materials used shall be filed with the State Engineer (NMOSE, PO Box 25102, Santa Fe, NM 87504-5102), within 20 days after completion of well plugging. Please attach a copy of these plugging conditions.

The NMOSE Well Plugging Plan of Operations dated July 3, 2014, without annotation, is hereby approved with the aforesaid conditions applied.



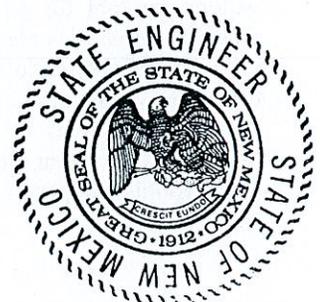
Ramona Martinez, NMOSE District 6

Date: 7/3/14



Kevin Myers, NMOSE Hydrology Bureau

Date: 7/3/14





WELL PLUGGING PLAN OF OPERATIONS



NOTE: A Well Plugging Plan of Operations shall be filed with and accepted by the Office of the State Engineer prior to plugging.

I. FILING FEE: There is no filing fee for this form.

II. GENERAL / WELL OWNERSHIP:

Existing Office of the State Engineer POD Number (Well Number) for well to be plugged: LAWS-02

Name of well owner: U.S. Department of Energy/Los Alamos National Laboratory

Mailing address: P.O. Box 1663

City: Los Alamos State: New Mexico Zip code: 87545

Phone number: 505-667-3005 E-mail: meverett@lanl.gov

III. WELL DRILLER INFORMATION:

Well Driller contracted to provide plugging services: Boart Longyear

New Mexico Well Driller License No.: 1161 Expiration Date: 10/31/2014

IV. WELL INFORMATION:

Note: A copy of the existing Well Record for the well to be plugged should be attached to this plan.

- 1) GPS Well Location (BRASS CAP): East: 1649536.9
North: 1770848.3
Well coordinates are New Mexico State Plane Grid Coordinates, Central Zone (North American Datum, 1983[NAD 1983]).
- 2) Reason(s) for plugging well: Well LAWS-02 is old and not used for its intended purpose. The borehole represents a conduit to subsurface.
- 3) Was well used for any type of monitoring program? Yes If yes, please use section VII of this form to detail what hydrogeologic parameters were monitored. If the well was used to monitor contaminated or poor quality water, authorization from the New Mexico Environment Department may be required prior to plugging.
- 4) Does the well tap brackish, saline, or otherwise poor quality water? No If yes, provide additional detail, including analytical results and/or laboratory report(s): _____
- 5) Static water level: Dry, according to well completion report.

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Well Plugging Plan
Version: December, 2011
Page 1 of 5
OFFICE OF THE STATE ENGINEER
NEW MEXICO

feet below land surface / feet above land surface (circle one)

- 6) Depth of the well: 156 feet (length), 106 feet (depth bgs).
- 7) Inside diameter of innermost casing: 6.0 inches.
- 8) Casing material: Scalloped polyvinyl chloride
- 9) The well was constructed with:
_____ an open-hole production interval, state the open interval: _____
X a well screen or perforated pipe, state the screened interval(s): Near ground surface to T.D.
- 10) What annular interval surrounding the artesian casing of this well is cement-grouted? None
- 11) Was the well built with surface casing? Yes If yes, is the annulus surrounding the surface casing grouted or otherwise sealed? Not according to well completion report If yes, please describe: _____
- 12) Has all pumping equipment and associated piping been removed from the well? No If not, describe remaining equipment and intentions to remove prior to plugging in Section VII of this form.

V. DESCRIPTION OF PLANNED WELL PLUGGING:

Note: If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie pipe, a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional technical information, such as geophysical logs, that are necessary to adequately describe the proposal.

- 1) Describe the method by which cement grout shall be placed in the well, or describe requested plugging methodology proposed for the well: Cement grout will be placed from bottom to top with a tremie pipe.
- 2) Will well head be cut-off below land surface after plugging? Well head will be cut-off near ground surface.

VI. PLUGGING AND SEALING MATERIALS:

Note: The plugging of a well that taps poor quality water may require the use of a specialty cement or specialty sealant

- 1) For plugging intervals that employ cement grout, complete and attach Table A.
- 2) For plugging intervals that will employ approved non-cement based sealant(s), complete and attach Table B.
- 3) Theoretical volume of grout required to plug the well to land surface: Approximately 230 gallons
- 4) Type of Cement proposed: Portland Type I/II cement
- 5) Proposed cement grout mix: 6 gallons of water per 94 pound sack of Portland cement.
- 6) Will the grout be: _____ batch-mixed and delivered to the site
X mixed on site

7) Grout additives requested, and percent by dry weight relative to cement: None

8) Additional notes and calculations: None

VII. ADDITIONAL INFORMATION: List additional information below, or on separate sheet(s):

Well LAWS-02 is a angle hole drilled in 2001 to a length of 156 ft and completed as a vadose zone moisture monitoring well in the Cerros Del Rio Basalt to monitor the vadose zone below the Los Alamos Canyon weir site. The well is 6-in. I.D. schedule 80 PVC with scallops cut into the PVC. A FLUTE™ monitoring system was deployed with transducers and sampling ports. Monitoring is no longer being performed at this well. All surface and subsurface appurtenances, including the FLUTE™ system, will be removed from the well before abandonment. The well will be grouted from 156 ft (total length) to the surface.

VIII. SIGNATURE:

I, Theodore Ball, say that I have carefully read the foregoing Well Plugging Plan of Operations and any attachments, which are a part hereof; that I am familiar with the rules and regulations of the State Engineer pertaining to the plugging of wells and will comply with them, and that each and all of the statements in the Well Plugging Plan of Operations and attachments are true to the best of my knowledge and belief.

Theodore Ball

Signature of Applicant

7/2/14

Date

IX. ACTION OF THE STATE ENGINEER:

This Well Plugging Plan of Operations is:

- Approved subject to the attached conditions.
- Not approved for the reasons provided on the attached letter.

*NMOSSE Hydrology 7/3/14
Reviewed by Kim CM*

Witness my hand and official seal this 3rd day of July, 2014

Scott A. Verhines, State Engineer

By: Bonnie Young

TABLE A - For plugging intervals that employ cement grout. Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of grout placement (ft bgl)			Surface
Bottom of proposed interval of grout placement (ft bgl)			156 (length)
Theoretical volume of grout required per interval (gallons)			230
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement			6
Mixed on-site or batch-mixed and delivered?			On-site
Grout additive 1 requested			
Additive 1 percent by dry weight relative to cement			
Grout additive 2 requested			
Additive 2 percent by dry weight relative to cement			

TABLE B - For plugging intervals that will employ approved non-cement based sealant(s). Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of sealant placement (ft bgl)			
Bottom of proposed sealant or grout placement (ft bgl)			
Theoretical volume of sealant required per interval (gallons)			
Proposed abandonment sealant (manufacturer and trade name)			



STATE OF NEW MEXICO
OFFICE OF THE STATE ENGINEER
SANTA FE

Scott A. Verhines, P.E.
State Engineer

CONCHA ORTIZ Y PINO BLDG.
POST OFFICE BOX 25102
130 SOUTH CAPITOL
SANTA FE, NEW MEXICO 87504-5102
(505) 827-6091
FAX: (505) 827-3806

July 3, 2014

U.S Department of Energy/ Los Alamos National Laboratory
C/O Steve White
P.O Box 1663
Los Alamos, NM 87545

Re: Plugging Plan of Operation, LANL Wells LAWS-01, LAWS-02, LAWS-03, Los Alamos, NM.

Greetings:

After a review of the Well Plugging Plan of Operations submitted on July 3, 2014, The Office of the Engineer is returning a favorable approval with specific Plugging Conditions and has accepted the Plugging Plan submitted for filing.

Please return a completed Well Plugging Report that itemizes the actual abandonment process and materials used within 20 days after completion of well plugging. In addition, please include a copy of the approved Plugging Conditions enclosed.

Please address any questions via- telephone to Ramona Martinez at 505.827.6120 or via e-mail at Ramona.Martinez2@state.nm.us.

Sincerely,


Ramona Martinez
Upper Pecos Basin Supervisor

Enclosure
CC: File





DISTRICT 6
SCOTT A. VERHINES, P.E.
NEW MEXICO STATE ENGINEER

Materials submitted by Los Alamos National Laboratory (LANL) request the plugging of three wells (LAWS-01, LAWS-02 and LAWS-03). As summarized in the table below, one vertical well (LAWS-01) has total depth of 281.5 feet, and two angled wells with a length of 157 and 137 feet. Vertical well has 4-inch ID diameter PVC casing and angle wells have 6-inch ID scalloped PVC casing. Completion report shows shall water zone(s) at approximately 80, 135, and 264 feet b.g.s.. Shallow water has been reported at 174 feet below ground surface at LAWS-01. The wells will be sealed to comply with provisions of NMAC 19.27.4 and the New Mexico Environment Department's Hazardous Waste Bureau. Plugging services will be provided by Boart Longyear (WD-1161).

LANL Well Name	OSE file No.	X coordinate NM State Plane Central zone NAD 1983 (feet)	Y coordinate NM State Plane Central zone NAD 1983 (feet)	Total depth to be sealed (feet)	Casing diameter (s) (inches)	Depth to water (feet b.g.s.)
LAWS-01 (LA-10135)	unknown	1649524.5	1770854.0	278 b.g.s.	10.75 4	174
LAWS-02 (LA-10136)	unknown	1649536.9	1770848.3	156 (length) 106 b.g.s.	10.75 6	Dry above 80
LAWS-03 (LA-10137)	unknown	1649542.9	1770848.8	136 (length) 76 b.g.s.	10.75 6	Dry above 80

b.g.s. = below ground surface

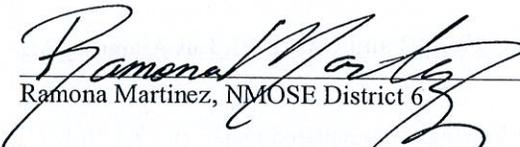
Contacted Michael Dale (NMED-HWB, 505-661-2673) on July 3, 2014.

**Specific Plugging Conditions of Approval for LANL wells LAWS-01, LAWS-02 and LAWS-03, Los Alamos, NM,
Los Alamos County.**

1. Water well drilling and well drilling activities, including well plugging, are regulated under 19.27.4 NMAC, which requires any person engaged in the business of well drilling within New Mexico to obtain a Well Driller License issued by the New Mexico Office of the State Engineer (NMOSE). Therefore, the firm of a New Mexico licensed Well Driller shall perform the well plugging.
2. Approximate theoretical volume of sealant required for abandonment of well intervals ranges from 0.65 gallons per foot for 4-inch ID casing to 1.47 gallons per foot for 6-inch ID casing. Some highly porous volcanic formations may result in uptake of considerably higher volumes than calculated. If surface casings are removed, borehole volume may require more than casing. Angled boreholes may be 8-inch to 10-inch diameter, which may require additional volume of cement (1 to 2.5 gallons per foot additional sealant) for any open annular spaces. LANL and its contractor should account for volumes of sealant materials used, especially cement. In the event the theoretical volume is exceeded by 25% or more for cement sealant, use of bentonite chips would be appropriate rather than pumping multiple borehole volumes of cement slurry.

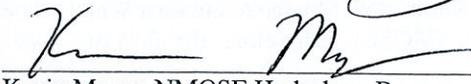
3. For multiple intervals (278 to 136 feet, length of borehole) as specified in Plugging Plan of Operations submitted, LANL requests use of cement as a sealant. Fundamental water demand for Type I/II Portland neat cement grout is 5.2 gallons per 94 lb/sack cement. Use of mix water increment in excess of this amount results in a thinned mix of cement prone to shrinkage that may disrupt effective sealing and hydraulic separation. AWWA Well Standards allow use of a maximum of 6.0 gallons water per 94 lb/sack cement if necessary for pumpability of neat cement grout. NMAC 19.27.4.30.C.1 specifies placement of sealant by use of a tremie pipe for depths greater than 20 feet b.g.s.. Thus, applicant's proposal of 6 gallons of water per 94-lbs sack of cement is acceptable.
4. The plug may be terminated below grade as necessary to allow approved redevelopment onsite, provided any plug consist of cement or concrete within 10' of ground level, and a minimum 6-inch thickness of reinforced cement grout or concrete completely covers the top of any casing cut off below grade. More stringent local building codes may apply.
5. Should the NMED, or another regulatory agency sharing jurisdiction of the project authorize, or by regulation require a more stringent well plugging procedure than herein acknowledged, the more-stringent procedure should be followed. This, in part, includes provisions regarding pre-authorization to proceed, contaminant remediation, inspection, pulling/perforating of casing, or prohibition of free discharge of any fluid from the borehole during or related to the plugging process.
6. NMOSE witnessing of the plugging will not be required, but shall be facilitated if a NMOSE observer is onsite. NMOSE witnessing may be requested during normal work hours by calling the District 6 NMOSE Office at 505-827-7848, at least 48-hours in advance. NMOSE inspection will occur dependant on personnel availability.
7. A NMOSE Plugging Record (available at: <http://www.ose.state.nm.us/PDF/WellDrillers/WD-11.pdf>) itemizing actual abandonment process and materials used shall be filed with the State Engineer (NMOSE, PO Box 25102, Santa Fe, NM 87504-5102), within 20 days after completion of well plugging. Please attach a copy of these plugging conditions.

The NMOSE Well Plugging Plan of Operations dated July 3, 2014, without annotation, is hereby approved with the aforesaid conditions applied.



Ramona Martinez, NMOSE District 6

Date: 7/3/14



Kevin Myers, NMOSE Hydrology Bureau

Date: 7/3/14





WELL PLUGGING PLAN OF OPERATIONS



NOTE: A Well Plugging Plan of Operations shall be filed with and accepted by the Office of the State Engineer prior to plugging.

I. FILING FEE: There is no filing fee for this form.

II. GENERAL / WELL OWNERSHIP:

Existing Office of the State Engineer POD Number (Well Number) for well to be plugged: LAWS-03

Name of well owner: U.S. Department of Energy/Los Alamos National Laboratory

Mailing address: P.O. Box 1663

City: Los Alamos State: New Mexico Zip code: 87545

Phone number: 505-667-3005 E-mail: meverett@lanl.gov

III. WELL DRILLER INFORMATION:

Well Driller contracted to provide plugging services: Boart Longyear

New Mexico Well Driller License No.: 1161 Expiration Date: 10/31/2014

IV. WELL INFORMATION:

Note: A copy of the existing Well Record for the well to be plugged should be attached to this plan.

- 1) GPS Well Location (BRASS CAP): East: 1649542.9
North: 1770848.8
Well coordinates are New Mexico State Plane Grid Coordinates, Central Zone (North American Datum, 1983[NAD 1983]).
- 2) Reason(s) for plugging well: Well LAWS-03 is old and not used for its intended purpose. The borehole represents a conduit to subsurface.
- 3) Was well used for any type of monitoring program? Yes If yes, please use section VII of this form to detail what hydrogeologic parameters were monitored. If the well was used to monitor contaminated or poor quality water, authorization from the New Mexico Environment Department may be required prior to plugging.
- 4) Does the well tap brackish, saline, or otherwise poor quality water? No If yes, provide additional detail, including analytical results and/or laboratory report(s): _____
- 5) Static water level: Dry, according to well completion report.

2014 JUL 3 - 11 AM

feet below land surface / feet above land surface (circle one)

- 6) Depth of the well: 136 feet (length), 76 feet (depth bgs).
- 7) Inside diameter of innermost casing: 6.0 inches.
- 8) Casing material: Perforated polyvinyl chloride
- 9) The well was constructed with:
_____ an open-hole production interval, state the open interval: _____
X a well screen or perforated pipe, state the screened interval(s): Near ground surface to T.D.
- 10) What annular interval surrounding the artesian casing of this well is cement-grouted? None
- 11) Was the well built with surface casing? Yes If yes, is the annulus surrounding the surface casing grouted or otherwise sealed? Not according to well completion report If yes, please describe: _____
- 12) Has all pumping equipment and associated piping been removed from the well? No If not, describe remaining equipment and intentions to remove prior to plugging in Section VII of this form.

V. DESCRIPTION OF PLANNED WELL PLUGGING:

Note: If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie pipe, a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional technical information, such as geophysical logs, that are necessary to adequately describe the proposal.

- 1) Describe the method by which cement grout shall be placed in the well, or describe requested plugging methodology proposed for the well: Cement grout will be placed from bottom to top with a tremie pipe.
- 2) Will well head be cut-off below land surface after plugging? Well head will be cut-off near ground surface.

VI. PLUGGING AND SEALING MATERIALS:

Note: The plugging of a well that taps poor quality water may require the use of a specialty cement or specialty sealant

- 1) For plugging intervals that employ cement grout, complete and attach Table A.
- 2) For plugging intervals that will employ approved non-cement based sealant(s), complete and attach Table B.
- 3) Theoretical volume of grout required to plug the well to land surface: Approximately 200 gallons
- 4) Type of Cement proposed: Portland Type I/II cement
- 5) Proposed cement grout mix: 6 gallons of water per 94 pound sack of Portland cement.
- 6) Will the grout be: _____ batch-mixed and delivered to the site
X mixed on site

7) Grout additives requested, and percent by dry weight relative to cement: None

8) Additional notes and calculations: None

VII. ADDITIONAL INFORMATION: List additional information below, or on separate sheet(s):

Well LAWS-03 is a angle hole drilled in 2001 to a length of 136 ft and completed as a vadose zone moisture monitoring well in the Cerros Del Rio Basalt to monitor the vadose zone below the Los Alamos Canyon weir site. The well is 6-in. I.D. perforated schedule 40 PVC pipe. A FLUTE™ monitoring system was deployed with transducers and sampling ports. Monitoring is no longer being performed at this well. All surface and subsurface appurtenances, including the FLUTE™ system, will be removed from the well before abandonment. The well will be grouted from 136 ft (total length) to the surface.

VIII. SIGNATURE:

I, Theodore Ball, say that I have carefully read the foregoing Well Plugging Plan of Operations and any attachments, which are a part hereof; that I am familiar with the rules and regulations of the State Engineer pertaining to the plugging of wells and will comply with them, and that each and all of the statements in the Well Plugging Plan of Operations and attachments are true to the best of my knowledge and belief.

Theodore J Ball

7/2/14

Signature of Applicant

Date

IX. ACTION OF THE STATE ENGINEER:

*Review by Dan Mose
Mose Hydrology 7/3/14*

This Well Plugging Plan of Operations is:

- Approved subject to the attached conditions.
- Not approved for the reasons provided on the attached letter.

Witness my hand and official seal this 3rd day of July, 2014

Scott A. Verhines, State Engineer

By: [Signature]

TABLE A - For plugging intervals that employ cement grout. Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of grout placement (ft bgl)			Surface
Bottom of proposed interval of grout placement (ft bgl)			136 (length)
Theoretical volume of grout required per interval (gallons)			200
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement			6
Mixed on-site or batch-mixed and delivered?			On-site
Grout additive 1 requested			
Additive 1 percent by dry weight relative to cement			
Grout additive 2 requested			
Additive 2 percent by dry weight relative to cement			

TABLE B - For plugging intervals that will employ approved non-cement based sealant(s). Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of sealant placement (ft bgl)			
Bottom of proposed sealant or grout placement (ft bgl)			
Theoretical volume of sealant required per interval (gallons)			
Proposed abandonment sealant (manufacturer and trade name)			