General

ENTERED

Los Alamos
NATIONAL LABORATORY
EST. 1943

RECEIVED

JUN 11 2015

NMED
Hazardous Waste Bureau

Associate Director for ESH
Environment, Safety, and Health
P.O. Box 1663, MS K491
Los Alamos, New Mexico 87545
505-667-4218/Fax 505-665-3811

Environmental Management
Los Alamos Field Office, MS A316
3747 West Jemez Road
Los Alamos, New Mexico 87544
(505) 667-4255/FAX (505) 606-2132

Date: JUN 11 2015
Refer To: ADESH-15-084
LAUR: 15-23762
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 Additional Work Plans for the Plugging and Abandonment of Wells for Fiscal Year 2015

Dear Mr. Kieling:

Enclosed please find two hard copies with electronic files of the Additional Work Plans for the Plugging and Abandonment of Wells for Fiscal Year 2015. These work plans summarize the methods Los Alamos National Laboratory (the Laboratory) proposes to use in plugging and abandoning these wells and boreholes in accordance with Section X.D (Well Abandonment) of the Consent Order. This work continues the effort by the Laboratory to plug and abandon unused penetrations on Laboratory property.

Field work will be completed during fiscal year 2015 and a summary report submitted by March 30, 2016.

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,

Dave McInroy, Program Director
Environmental Remediation Program
Los Alamos National Laboratory

Sincerely,

Peter Maggiore
Office of the Manager
Los Alamos Field Office

37133

DM/PM/TB:sm

Enclosures: Two hard copies with electronic files – Additional Work Plans for the Plugging and Abandonment of Wells for Fiscal Year 2015 (EP2015-0088)

Cy: (w/enc.)
Ted Ball, ADEP ER Program, MS M992
Public Reading Room (EPRR)
ADESH Records

Cy: (Letter and CD and/or DVD)
Laurie King, EPA Region 6, Dallas, TX
Gene Turner, DOE-NA-LA, MS A316
Steve Yanicak, NMED-DOE-OB, MS M894
PRS Database

Cy: (w/o enc./date-stamped letter emailed)
lasomailbox@nnsa.doe.gov
Kimberly Davis Lebak, DOE-NA-LA
Peter Maggiore, DOE-NA-LA
Annette Russell, DOE-EM-LA
David Rhodes, DOE-EM-LA
Issac Valdez, LASO-NS-LP
Kenneth Schlindwein, OI-PO
Dave McInroy, ADEP ER Program
Randy Erickson, ADEP
Jocelyn Buckley, ADESH-ENV-CP
Mike Saladen, ADESH-ENV-CP
Tony Grieggs, ADESH-ENV-CP
Alison Dorries, ADESH-ENV-DO
Michael Brandt, ADESH
Amy De Palma, PADOPS
Michael Lansing, PADOPS

LA-UR-15-23762
June 2015
EP2015-0088

Additional Work Plans for the Plugging and Abandonment of Wells for Fiscal Year 2015

Los Alamos
NATIONAL LABORATORY
EST. 1943

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 to support the investigation and cleanup, including corrective action, of contamination at Los Alamos National Laboratory, as required by the Compliance Order on Consent, signed March 1, 2005. The public may copy and use this document without charge, provided that this notice and any statement of authorship are reproduced on all copies.

EP2015-0088

Additional Work Plans for the Plugging and Abandonment of Wells for Fiscal Year 2015

June 2015

Responsible project manager:

Printed Name	Signature	Title	Organization	Date
Ted Ball		Project Manager	Environmental Remediation Program	6/2/15

Responsible LANS representative:

Printed Name	Signature	Title	Organization	Date
Randall Erickson		Acting Associate Director	Environmental Programs	6/2/15

Responsible DOE representative:

Printed Name	Signature	Title	Organization	Date
Peter Maggiore		Assistant Manager	DOE-NA-LA	6/5/15

CONTENTS

1.0 INTRODUCTION 1

2.0 BACKGROUND INFORMATION AND RATIONALE 1
2.1 Air-Injection Boreholes at TA-52 2
2.2 Moisture Access Boreholes at TA-36 2
2.3 Alluvial Wells in Mortandad and Ten Site Canyons 2

3.0 WORK PLANS FOR PLUGGING AND ABANDONMENT 3
3.1 Work Plan to Plug and Abandon Air-Injection Boreholes in TA-52 3
3.2 Work Plan to Plug and Abandon Moisture Access Boreholes in TA-36 4
3.3 Work Plan to Plug and Abandon Alluvial Wells in Mortandad and Ten Site Canyons 5

4.0 REFERENCES 6

Figures

Figure 2.0-1 Locations of wells and boreholes to be abandoned 7
Figure 3.1-1 Plugging and abandonment schematic for boreholes I, NE-1, NW-1, and SE-1 at TA-52 8
Figure 3.1-2 Plugging and abandonment schematic for borehole NE-2 at TA-52 9
Figure 3.2-1 Plugging and abandonment schematic for boreholes POTM-1, POTM-2, and POTM-3 at TA-36 10
Figure 3.3-1 Plugging and abandonment schematic for boreholes MCWB-5, MCWB-6.2a, and TSWB-6 in Mortandad and Ten Site Canyons 11

Table

Table 1.0-1 Organization of Work Plans 1

1.0 INTRODUCTION

Funds and time are available for additional plugging and abandonment work in fiscal year 2015. Therefore, this work plan proposes several additional wells and boreholes to plug and abandon. This plan contains information for the plugging and abandonment of five air-injection boreholes, three wells, and three alluvial wells at Los Alamos National Laboratory (LANL or the Laboratory) and is part of the Laboratory's ongoing efforts to plug and abandon legacy wells and boreholes on and adjacent to Laboratory property.

The work plans describe plugging and abandonment procedures that comply with Section X.D (Well Abandonment) of the Compliance Order on Consent (the Consent Order) as well as the New Mexico Office of the State Engineer (NMOSE) well or borehole abandonment regulations. Additionally, the plugging and abandonment procedures used comply with 19.27.4 New Mexico Administrative Code Rules and Regulations Governing Well Driller Licensing; Construction, Repair and Plugging of Well. The work plans will be submitted to NMOSE before abandonment.

This document includes three stand-alone work plans and associated figures, as shown in Table 1.0-1. References for the work plans are provided at the end of this document.

Table 1.0-1
Organization of Work Plans

Work Plan	Page Number
Work plan to plug and abandon five air injection boreholes in Technical Area 52 (TA-52) Figures 3.1-1 and 3.1-2, Plugging and abandonment schematics	8
Work plan to plug and abandon three wells at Potrillo Canyon Firing Sites in TA-36 Figure 3.2-1, Plugging and abandonment schematic	10
Work plan to plug and abandon three alluvial wells in Mortandad and Ten Site Canyons Figure 3.3-1, Plugging and abandonment schematic	11

2.0 BACKGROUND INFORMATION AND RATIONALE

Prioritization of wells and boreholes to be abandoned is based on criteria that determine their potential for providing a pathway for contaminants to migrate to depth. These criteria include the depth of the well, the location of the penetration (canyon bottom versus mesa top), its condition (the hole is wet or dry), its proximity to known sources of contamination, its age, its construction, and its accessibility to the public. In addition, recent experience from work performed from 2010 to 2014 has added some practical criteria to maximize cost savings and stay within allotted budgets. These criteria include grouping wells and boreholes within a given location to minimize mobilization costs and required permitting and combining difficult, and thus more expensive, wells with less difficult ones. The information available about legacy boreholes can be inaccurate, and unexpected conditions may be encountered. Field reconnaissance will be conducted at the wells and boreholes to verify construction details of each well. These include possible obstructions, ease of site access, condition of surface well pad, surface casing and well head security, verification of total well depth, depth of groundwater (if present), location of any potential obstructions, and other issues that may hamper abandonment.

The locations of wells and boreholes to be abandoned are shown in Figure 2.0-1. The rationale for plugging and abandoning each group of penetrations is provided below.

2.1 Air-Injection Boreholes at TA-52

In 1964 and 1965, five boreholes (I, NW-1, NE-1, NE-2, and SE-1) were drilled at TA-52 to study the possibility of injecting, storing, and later venting low-level, short-lived radioactive gases (Purtymun et al. 1989, 006889; Purtymun 1995, 045344). Four 5-in.-dia. boreholes (I, NW-1, NE-1, and SE-1) were drilled to the 97-ft depth using an auger rig. The boreholes have a 6-in.-diameter steel casing cemented into the top of the tuff. Two plastic tubes were run to the bottom of each borehole, with the lower 10 ft of each tube perforated. The injection zone at the bottom of each borehole was packed with pea-sized gravel from 87 to 97 ft below ground surface (bgs) after the tubes were inserted. The tubes were used to inject air and to measure any buildup of pressure that might occur. The injection zone in each borehole was isolated by a cement plug. The boreholes appear to be filled with cement to the surface with the capped tubes protruding from the stickup.

A 4-in.-diameter borehole was drilled with air-rotary methods to a depth of 297 ft bgs, north of the cluster of four boreholes. NE-2 has two injection zones: one near the bottom from 272 to 291 ft bgs and another at about 160 ft bgs. Both injection zones have a 10-ft-thick interval of pea-sized gravel with a cement plug on top. These injection zones were constructed with only one tube going to each zone. The boreholes appear to be filled with cement to the surface with the capped tubes protruding from the stickup.

2.2 Moisture Access Boreholes at TA-36

Three shallow moisture-access boreholes were drilled in Potrillo Canyon at TA-36 in 1989 to investigate the infiltration of surface water into the alluvium (Becker 1991, 015317). The moisture-access boreholes were installed as part of a study to determine whether there was recharge to the alluvium and underlying tuff and transport of depleted uranium from the intermittent stream in Potrillo Canyon. The wells were installed to study the chemistry and radiochemistry of infiltrating water at different depths. The boreholes are believed to be 4-in.-diameter with aluminum tube liners.

2.3 Alluvial Wells in Mortandad and Ten Site Canyons

Alluvial groundwater monitoring wells were installed in Los Alamos and Ten Site Canyons in 1994 as part of a water balance study conducted by researchers at the Laboratory. Of those, three alluvial groundwater monitoring wells (MCWB-S, MCWB-6.2a, and TSWB-6) are no longer in use and should be plugged and abandoned. Depths of these wells vary from 33 to 46 ft. These wells are thought to be of 2-in.–inside diameter (I.D.) polyvinyl chloride (PVC) construction.

3.0 WORK PLANS FOR PLUGGING AND ABANDONMENT

3.1 Work Plan to Plug and Abandon Air-Injection Boreholes in TA-52

Primary Purpose	The purpose for plugging and abandoning the air-injection boreholes in TA-52 is to prevent the migration of surface water and contaminants in the borehole to depth. This work plan summarizes the plugging and abandonment methods the Laboratory proposes for five boreholes at TA-52. Abandonment will be consistent with Section X.D (Well Abandonment) of the Consent Order and NMOSE regulations. A plugging plan of operations will be submitted to NMOSE before abandonment.
Construction	Five boreholes were drilled at TA-52 in 1964 and 1965 to study the possibility of injecting, storing, and later venting low-level short-lived radioactive gases in the Bandelier Tuff (Kunkler 1969, 011669). Four of the boreholes were advanced to a depth of 97 ft bgs using auger-drilling methods. The fifth borehole was drilled to 297 ft bgs using air-rotary methods. For the four 97-ft-deep boreholes, two plastic tubes were run to the bottom of each hole, with the lower 10 ft of each tube perforated. The bottom 10 ft of each borehole was filled with pea-sized gravel after the tubes were installed. The 297-ft-deep borehole has two injection zones: one near the bottom from 272 to 291 ft bgs and another at about 160 ft bgs. Both injection zones have a 10-ft-thick interval of pea-sized gravel with a cement plug on top. These injection zones were constructed with only one tube going to each zone. A cement plug was placed on top of the pea gravel in each borehole. The boreholes appear to have been filled with cement to the surface.
Abandonment Methods	Because of the small diameter, the casing cannot be perforated. The plastic tubes and pea-gravel zones in each well will be pressure-grouted from total depth to ground surface. The cement-filled steel pipe stickups at each well will be cut off belowgrade. Figure 3.1-1 shows the plugging and abandonment schematic for boreholes I, NW-1, NE-1, and SE-1, and Figure 3.1-2 shows the schematic for borehole NE-2.
Surface Completion	A neat-cement mound with a brass marker will be installed over the borehole at ground surface. The marker will be surveyed in accordance with Section IX.B.2.f of the Consent Order, which states pertinent structures may be horizontally located with a global positioning system with an accuracy of ±0.5 ft.
Waste Disposal	A waste characterization strategy form (WCSF) will be prepared to guide disposal of any wastes generated during abandonment.
Summary Report	A report will be prepared detailing the abandonment methods and the quantities of backfill materials used. A location map and abandonment schematic will also be included in the report.

3.2 Work Plan to Plug and Abandon Moisture Access Boreholes in TA-36

Primary Purpose	The purpose for plugging and abandoning these boreholes is to prevent the migration of surface water and contaminants in the borehole to depth. This work plan summarizes the plugging and abandonment methods the Laboratory proposes for three boreholes at TA-36. Abandonment will be consistent with Section X.D (Well Abandonment) of the Consent Order and NMOSE regulations. A plugging plan of operations will be submitted to NMOSE before abandonment.
Construction	Boreholes POTM-1, POTM-2, and POTM-3 were drilled in Potrillo Canyon at TA-36 in 1989 to investigate the infiltration of surface water into the alluvium. The moisture-access boreholes were installed as part of a study to determine whether recharge to the alluvium and underlying tuff was occurring and transporting depleted uranium from the intermittent stream in Potrillo Canyon. The wells were installed to study the chemistry and radiochemistry of infiltrating water at different depths. POTO-1 is 50 ft deep, POTO-2 is 54 ft deep, and POTO-3 is 52 ft deep. The boreholes are cased with aluminum tubing.
Abandonment Methods	All surface appurtenances will be removed from the boreholes before abandonment. The boreholes will be pressure-grouted from total depth to ground surface. All holes will then be overdrilled to 20 ft bgs. The overdrilled volume will be filled with neat cement slurry to the ground surface. Figure 3.2-1 shows the plugging and abandonment schematic for boreholes POTM-1, POTM-2, and POTM-3.
Surface Completion	A neat-cement mound with a brass marker will be installed over the borehole at ground surface. The marker will be surveyed in accordance with Section IX.B.2.f of the Consent Order, which states pertinent structures may be horizontally located with a global positioning system with an accuracy of ±0.5 ft.
Waste Disposal	A WCSF will be prepared to guide disposal of any wastes generated during abandonment.
Summary Report	A report will be prepared detailing the abandonment methods and the quantities of backfill materials used. A location map and abandonment schematic will also be included in the report.

3.3 Work Plan to Plug and Abandon Alluvial Wells in Mortandad and Ten Site Canyons

Primary Purpose	The purpose for plugging and abandoning these wells is to prevent the migration of surface water and contaminants in the wells to depth. This work plan summarizes the plugging and abandonment methods the Laboratory proposes for the alluvial wells in Los Alamos Canyon. Abandonment will be consistent with Section X.D (Well Abandonment) of the Consent Order and NMOSE regulations. A plugging plan of operations will be submitted to NMOSE before abandonment.
Construction	Alluvial wells MCWB-S, MCWB-6.2a, and TSWB-6 were installed for water balance studies in Mortandad and Ten Site Canyons. They are believed to be of 2-in.-diameter PVC pipe construction.
Abandonment Methods	All surface appurtenances will be removed from the boreholes before abandonment. The boreholes will be pressure-grouted from total depth to ground surface. All holes will then be overdrilled to 20 ft bgs. The overdrilled volume will be filled with neat cement slurry to the ground surface. Figure 3.3-1 shows the plugging and abandonment schematic for wells MCWB-S, MCWB-6.2a, and TSWB-6.
Surface Completion	A neat-cement mound with a brass marker will be installed over the borehole at ground surface. The marker will be surveyed in accordance with Section IX.B.2.f of the Consent Order, which states pertinent structures may be horizontally located with a global positioning system with an accuracy of ±0.5 ft.
Waste Disposal	A WCSF will be prepared to guide disposal of any wastes generated during abandonment.
Summary Report	A report will be prepared detailing the abandonment methods and the quantities of backfill materials used. A location map and abandonment schematic will also be included in the report.

4.0 REFERENCES

The following list includes all documents cited in this plan. 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.

Becker, N.M., 1991. "Influence of Hydraulic and Geomorphologic Components of a Semi-Arid Watershed on Depleted Uranium Transport," PhD dissertation, Civil and Environmental Engineering, University of Wisconsin, Madison, Wisconsin. (Becker 1991, 015317)

Kunkler, J.L., 1969. "Measurement of Atmospheric Pressure and Subsurface-Gas Pressure in the Unsaturated Zone of the Bandelier Tuff, Los Alamos, New Mexico," U.S. Geological Survey Professional Paper 650-D, U.S. Department of the Interior Geological Survey, pp. 283–287. (Kunkler 1969, 011669)

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)

Purtymun, W.D., E.A. Enyart, and S.G. McLin, August 1989. "Hydrologic Characteristics of the Bandelier Tuff as Determined Through an Injection Well System," Los Alamos National Laboratory report LA-11511-MS, Los Alamos, New Mexico. (Purtymun et al. 1989, 006889)

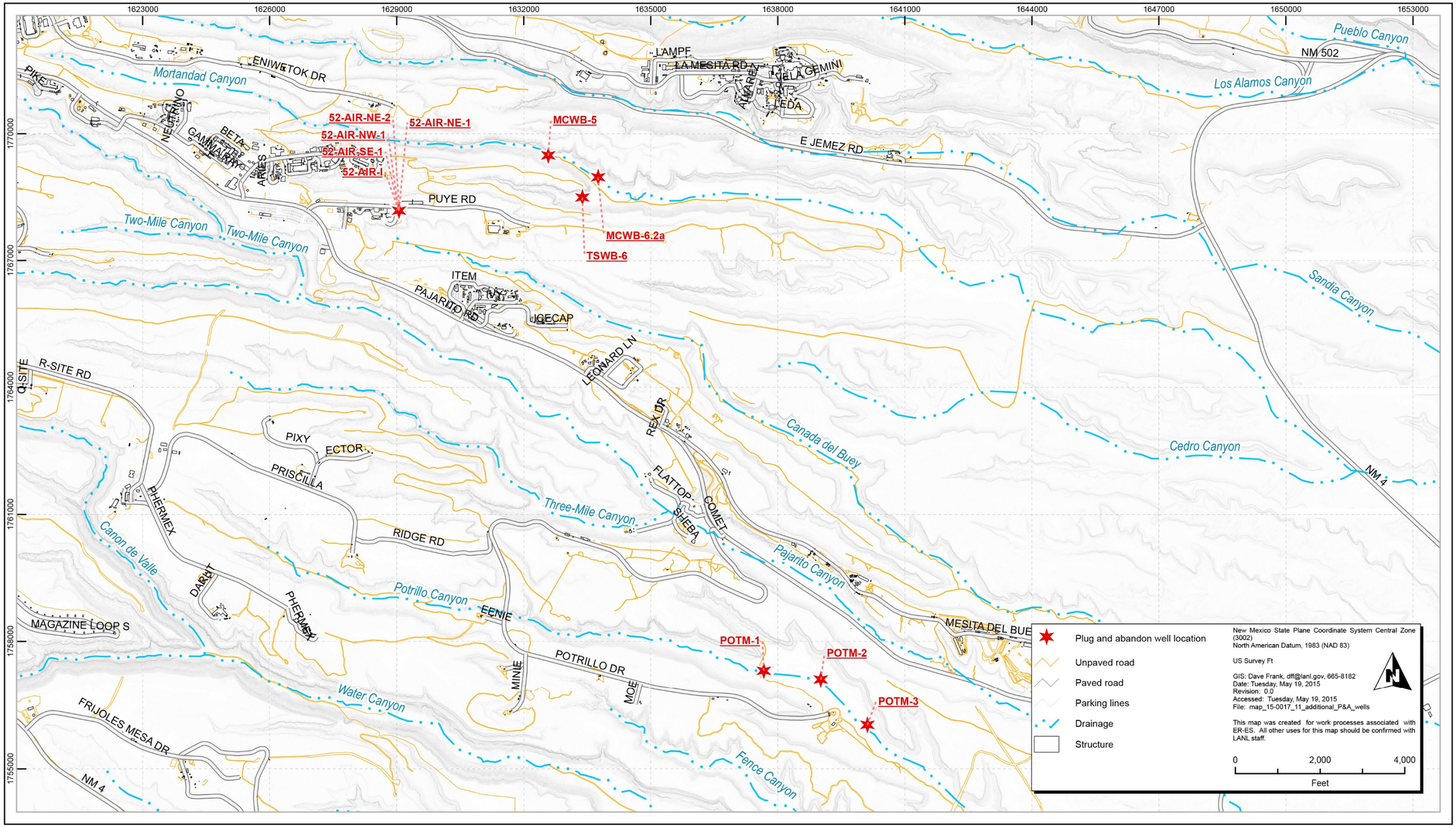

Figure 2.0-1 Locations of wells and boreholes to be abandoned

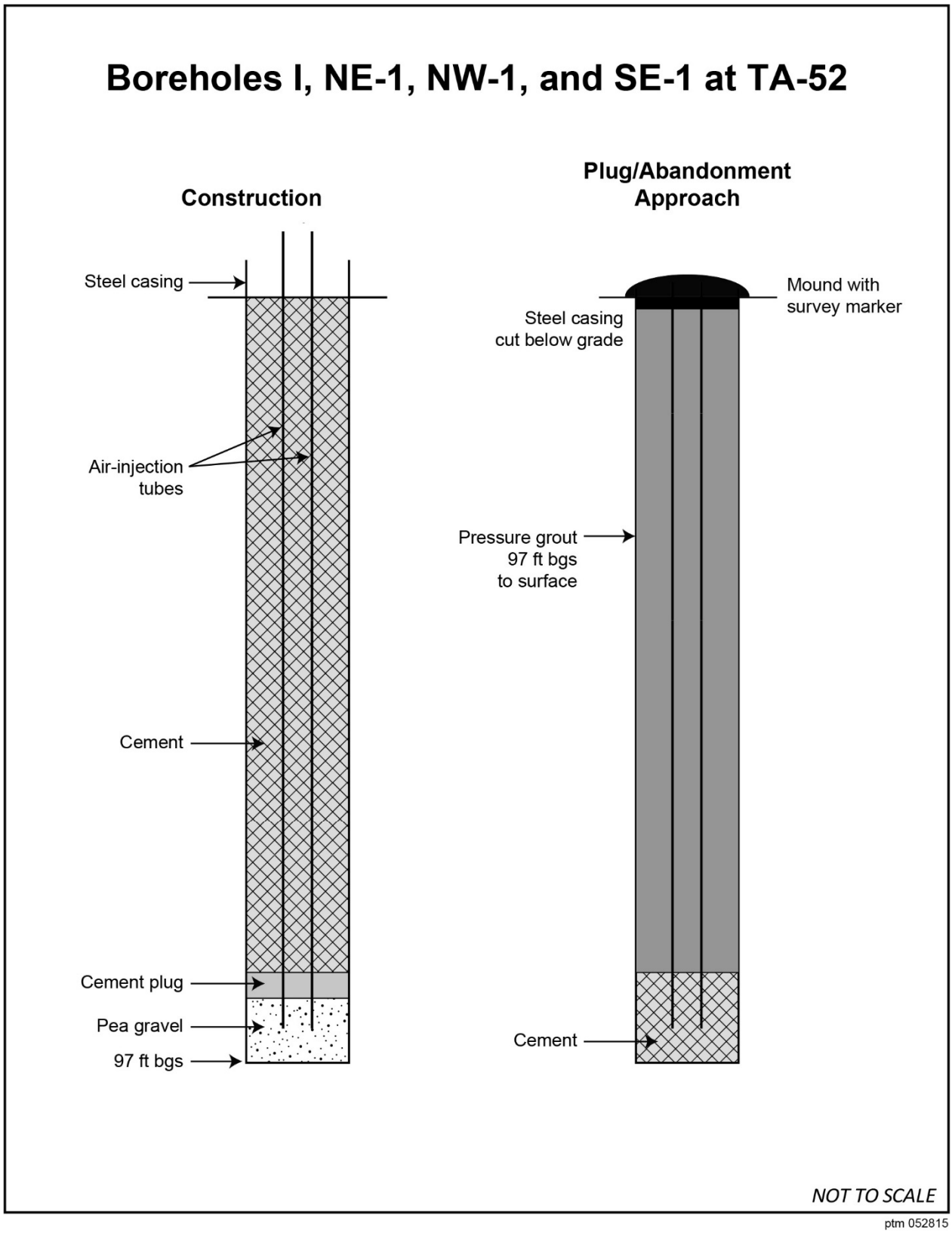

Figure 3.1-1 Plugging and abandonment schematic for boreholes I, NE-1, NW-1, and SE-1 at TA-52

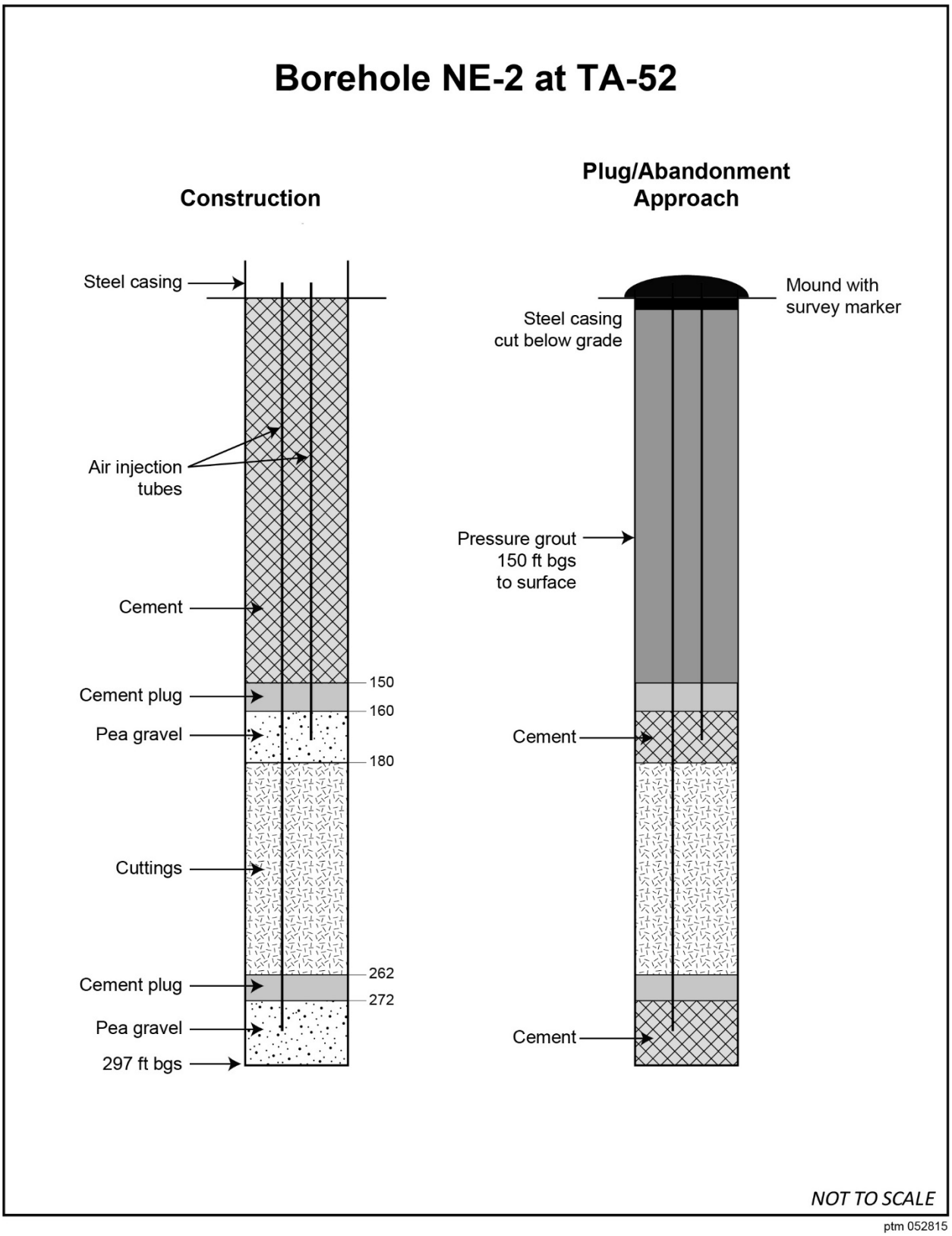

Figure 3.1-2 Plugging and abandonment schematic for borehole NE-2 at TA-52

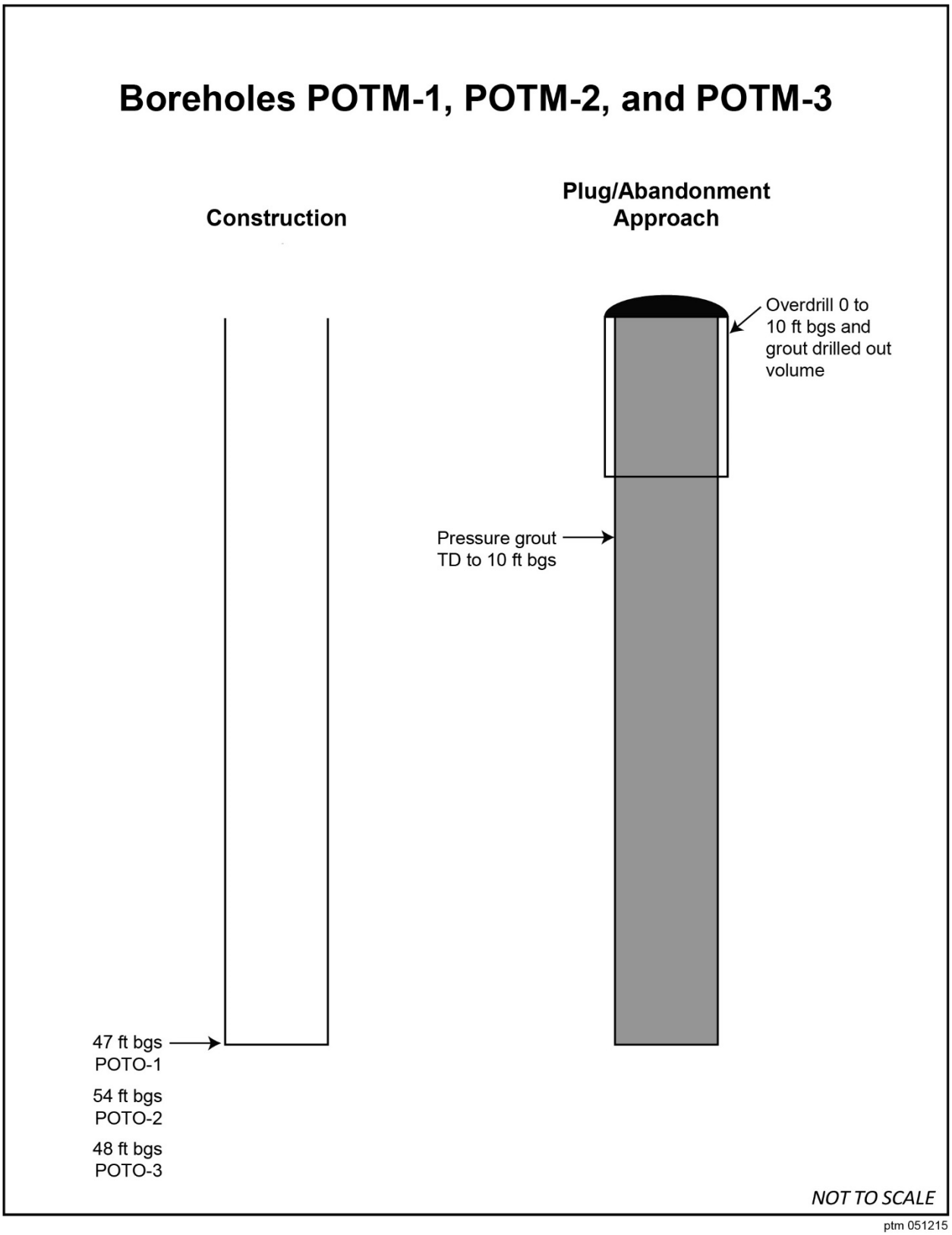

Figure 3.2-1 Plugging and abandonment schematic for boreholes POTM-1, POTM-2, and POTM-3 at TA-36

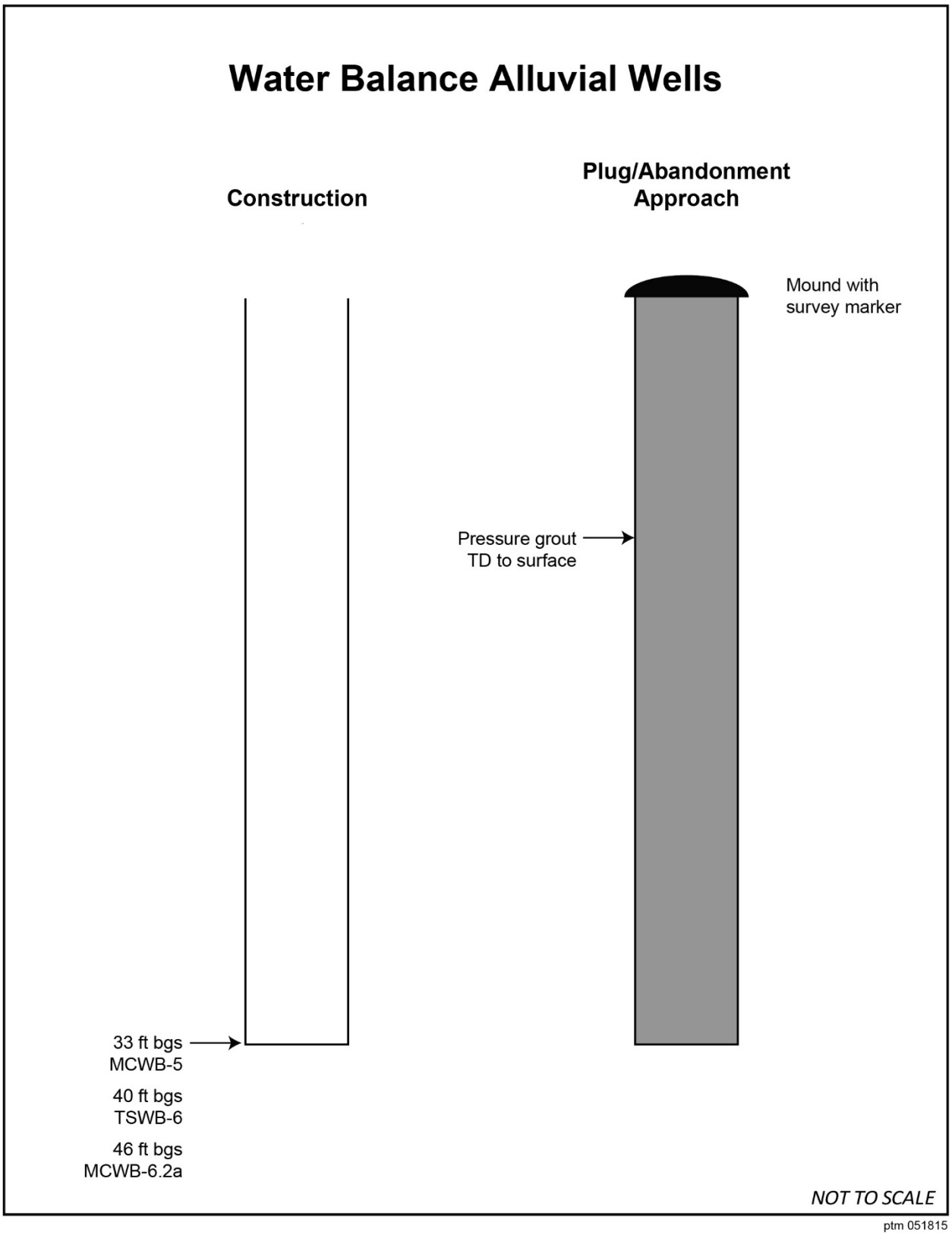

Figure 3.3-1 Plugging and abandonment schematic for boreholes MCWB-5, MCWB-6.2a, and TSWB-6 in Mortandad and Ten Site Canyons