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Date: MAY 2 2 2017
Refer To: ADEM-0111
LAUR: 17-23884
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: Work Plans for the Plugging and Abandonment of Wells and Boreholes in Fiscal Year 2017

Dear Mr. Kieling:

Enclosed please find two hard copies with electronic files of the Work Plans for the Plugging and Abandonment of Wells and Boreholes in Fiscal Year 2017. The work plans summarize the methods Los Alamos National Laboratory (the Laboratory) proposes to use in plugging and abandoning these wells. This work continues the Laboratory's effort to plug and abandon unused penetrations on Laboratory property. Field work will be completed during fiscal year 2017 and a summary report submitted by March 30, 2018.

If you have any questions, please contact Ted Ball at (505) 665-3996 (tedball@lanl.gov) or Karen Armijo at (505) 665-7314 (karen.armijo@nnsa.doe.gov).

Sincerely,

Bruce Robinson, Program Director
Environmental Remediation Program
Los Alamos National Laboratory

Sincerely,

Karen Armijo, Program Manager
Permitting and Compliance
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Los Alamos Field Office

BR/PM/TB:sm

Enclosures: Two hard copies with electronic files – Work Plans for the Plugging and Abandonment of Wells and Boreholes in Fiscal Year 2017 (EP2017-0007)

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LA-UR-17-23884
May 2017
EP2017-0007

Work Plans for the Plugging and Abandonment of Wells and Boreholes in Fiscal Year 2017

Los Alamos
NATIONAL LABORATORY
EST. 1943

Prepared by the Environmental Programs Directorate

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EP2017-0007

Work Plans for the Plugging and Abandonment of Wells and Boreholes in Fiscal Year 2017

May 2017

Responsible project manager:

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1.0 INTRODUCTION

This document contains information for the plugging and abandonment of 26 wells in Los Alamos, Pajarito, Sandia, and Mortandad Canyons 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 located on and adjacent to Laboratory property.

The work plans describe plugging and abandonment procedures that comply with Appendix F Section II.D (Well Abandonment) of the June 2016 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 comply with 19.27.4 New Mexico Administrative Code, Rules and Regulations Governing Well Driller Licensing; Construction, Repair and Plugging of Wells. A well plugging plan of operations will be submitted to NMOSE before abandonment activities are undertaken.

This document includes five stand-alone work plans and associated figures, as shown in Table 1.0-1. References for the work plans are provided in section 4.0 of this document.

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Organization of Work Plans

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Work plan to plug and abandon 2 Sandia Canyon alluvial groundwater observation wells Figure 3.3-1–3.3-2, Plugging and abandonment schematics	34–35
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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 2016 has added some practical criteria to maximize cost savings and adhere to allocated budgets. These criteria include grouping wells and boreholes within a given location to minimize mobilization costs and required permitting and combining difficult, and thus 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 field conditions and construction details of each well. Field conditions impacting plugging and abandonment activities include possible obstructions, ease of site access, condition of surface well pad, surface casing, and wellhead security. Construction details, including total borehole depth, current well depth, casing material and diameter, and depth of groundwater (if present), are presented in Table 2.0-1.

The locations of all wells and boreholes to be plugged and abandoned in fiscal year 2017 are shown in Figure 2.0-1. The locations of wells and boreholes to be abandoned are shown in Figures 2.1-1, 2.2-1, and 2.4-1. Background information on the installation of these wells and the rationale for plugging and abandoning each group are provided below.

2.1 Alluvial Groundwater Observation Wells in Los Alamos Canyon

Between 1966 and 1970, a series of 10 shallow alluvial observation wells was drilled on the floor of Los Alamos Canyon as part of a monitoring network (Figure 2.1-1) (Purtymun 1995, 045344). These wells vary from 13 to 40 ft in depth. The wells are constructed of 3-in.–inside diameter (I.D.) schedule 40 polyvinyl chloride (PVC) with 0.25-in. holes drilled in the lower part of the casing for perforations and do not have any gravel pack. These wells are now over 40 yr old and most are no longer used. Because these wells may provide a pathway for contamination to move to the alluvial and perched groundwater, the unused wells should be plugged and abandoned.

2.2 Alluvial Groundwater Test Boreholes and Observation Wells in Pajarito Canyon

Nine alluvial groundwater test boreholes and observation wells were completed through the alluvium into the top of the tuff in Pajarito Canyon in 1985 (Figure 2.2-1) (Devaurs and Purtymun 1985, 007415; Purtymun 1995, 045344). The wells confirmed that perched water in Pajarito Canyon is confined to the alluvium in the stream channel and does not extend to the flank of the canyon. The wells were cased with 4-in.-I.D. PVC pipe with 0.25-in. holes drilled in the lower part of the casing for perforations in each well. The perforated portion of the pipe is wrapped with stainless-steel screen. The PCO wells have gravel packs for their entire length. The PCM test boreholes have 4-in. PVC casing set in the top 7 to 10 ft with the remainder of the borehole open. Because these wells and boreholes may provide a pathway for contamination to move to alluvial and perched groundwater, they should be plugged and abandoned.

2.3 Alluvial Groundwater Observation Well in Sandia Canyon

In 1966, alluvial groundwater observation wells SCO-1 and SCO-2 were drilled in Sandia Canyon. The wells were augered using a 4.5-in. bit and were cased with 20 ft of 2-in.-I.D. PVC pipe, with the lower 10 ft having holes drilled in the lower part of the casing for perforations (Figure 2.1-1) (Purtymun 1995, 045344). Replacement wells for both SCO-1 and SCO-2 were installed in 1989, and the original SCO-1 was plugged and abandoned at that time. However, the original well SCO-2, called SCO-2 (old) in this work plan, had not been plugged and abandoned as was believed. The replacement well for SCO-2, called SCO-2 (new) in this work plan, will be plugged along with SCO-2 (old). Because these wells may provide a pathway for contamination to move to the alluvial and perched groundwater, they should be plugged and abandoned.

2.4 Air-Injection Borehole at TA-35

In 1968, eight boreholes were augered or drilled with an air-rotary drill rig to study the effects of atmospheric pressure change in different zones within the Bandelier Tuff (Figure 2.4-1) (Purtymun 1995, 045344). Originally, the boreholes were drilled near TA-50, but are now sited in TA-35 after the boundary was redrawn. Seven of these boreholes were destroyed during construction on the mesa top in 1980. The remaining borehole is 2-in.-I.D. steel surface casing of unknown length with potentially 43 ft of open borehole. This well is no longer in use and should be abandoned to eliminate any potential contaminant transport pathway.

2.5 Alluvial Groundwater Observation Wells in Mortandad Canyon

From 1960 to 1974, 21 observation wells were installed in Mortandad Canyon. The earlier holes were augered using a 4.5-in.-diameter auger. For casing, 2-in.- and 3-in.-diameter PVC pipe was used. These wells were not gravel-packed. The casing was placed in the hole, and the annulus between the casing and the hole wall was sealed with cuttings from the hole. Later wells were constructed using a 7.25-in.-diameter auger and set with 4-in.-diameter PVC pipe. These wells were gravel-packed. The screen section of the PVC was perforated with 0.25-in. drill bit. The hole was sealed with cement at the surface. Because these wells may provide a pathway for contamination to move to alluvial and perched groundwater, they should be plugged and abandoned.

3.0 WORK PLANS FOR PLUGGING AND ABANDONMENT

3.1 Work Plan to Plug and Abandon Alluvial Groundwater Observation Wells in Los Alamos Canyon

Primary Purpose	The purpose for plugging and abandoning the alluvial groundwater observation wells in Los Alamos Canyon 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 wells in Los Alamos Canyon. Abandonment will be consistent with Appendix F Section II.D, Well Abandonment, of the Consent Order and NMOSE regulations. A plugging plan of operations will be submitted to NMOSE before abandonment.
Construction	Ten wells were installed in the alluvium of Los Alamos Canyon from 1966 to 1970 as part of a study of the aquifer in the area (Purtymun 1995, 045344). The existing wells vary from 13 ft deep at the west end of the study area to 40 ft deep on the east end. All wells terminate at the top of the alluvium/bedrock contact. The wells are constructed of 3-in.-I.D., schedule 40 PVC pipe with a 10-ft perforated length at the bottom of the well. These wells have native material as backfill.
Abandonment Methods	Wells with standing water will be bailed for 3 casing volumes or until dry, then allowed to recharge overnight. Wells with standing water after the recharge period will be sampled using standard alluvial sampling protocol and analyte lists. The Laboratory will attempt to pull the PVC well casing from the borehole while backfilling with cement grout to 2 ft below ground surface (bgs). If this is not feasible, wells deeper than 20 ft will be filled with grout to 20 ft bgs, overdrilled to a depth of 20 ft, and then filled with cement grout to 2 ft bgs. Wells shallower than 20 ft will be overdrilled to total depth as shown in Figures 3.1-1 to 3.1-10 and then backfilled to 2 ft bgs. Schematic diagrams of the well abandonment approaches for each well are shown in Figures 3.1-1 to 3.1-10. LAO-C has already been filled with bentonite, so it needs to be overdrilled to 2 ft bgs for proper surface completion.
Surface Completion	A ready-mix concrete mound with a survey marker will be installed in the borehole from 2 ft bgs and mounded above ground surface to shed water. The marker will be surveyed with a global positioning system (GPS) with an accuracy of ±0.5 ft.
Waste Disposal	A waste characterization strategy form (WCSF) will be prepared to guide in the management of wastes generated during plugging and abandonment activities.
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 Alluvial Groundwater Test Boreholes and Observation Wells in Pajarito Canyon

Primary Purpose	The purpose for plugging and abandoning the alluvial groundwater test boreholes and observation wells in Pajarito Canyon 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 wells in Pajarito Canyon. Abandonment will be consistent with Appendix F Section II.D, Well Abandonment, of the Consent Order and NMOSE regulations. A plugging plan of operations will be submitted to NMOSE before abandonment.
Construction	Four observation wells were installed in Pajarito Canyon in 1985 as part of an investigation of alluvial water in Pajarito Canyon. The wells vary from 9.5 to 18.4 ft deep. All wells terminate at the top of the alluvium/bedrock contact. The wells are constructed of 4-in.-I.D. PVC pipe with perforations in the lower part. The annular space is filled with gravel. At the same time the observation wells were drilled, four moisture monitoring boreholes were also installed on the north flank of the canyon. The borings have 4-in.-diameter PVC surface casings that are 7 to 10 ft long. The remainder of the borings are open holes. Borings vary from 60 to 120 ft in depth. PCM-2 is plugged at the top so its current total depth is not known. The well labeled PCM-2a, close to PCM-2, was located while looking for other wells. It has not been found in any Laboratory literature or well and borehole databases. Therefore, its purpose and the construction are not known, other than it is 18 ft deep and 2 in. in diameter.
Abandonment Methods	Wells with standing water will be bailed for 3 casing volumes or until dry, then allowed to recharge overnight. Wells with standing water after the recharge period will be sampled using standard alluvial sampling protocol and analyte lists. For the PCO or observation wells, the Laboratory will attempt to pull the PVC well casing from the borehole while backfilling with cement grout to 2 ft bgs. If this is not feasible, the wells deeper than 20 ft will be filled with grout to 20 ft bgs, overdrilled to a depth of 20 ft, and then filled with cement grout to 2 ft bgs. Wells shallower than 20 ft will be overdrilled to total depth as shown in Figures 3.2-1 to 3.2-4 and then backfilled to 2 ft bgs. Schematic diagrams of the well abandonment approaches for each well are shown in Figures 3.2-1 to 3.2-4. For the PCM or moisture monitoring boreholes, the Laboratory will fill the boreholes with cement grout to the bottom of the well casing, remove the well casing from the boreholes, and fill the boreholes with cement grout to 2 ft bgs. Schematic diagrams of the well abandonment approaches for each borehole are shown in Figures 3.2-5 to 3.2-9.
Surface Completion	A ready-mix concrete mound with a survey marker will be installed in the borehole from 2 ft bgs and mounded above ground surface to shed water. The marker will be surveyed with a GPS with an accuracy of ±0.5 ft.
Waste Disposal	A WCSF will be prepared to guide in the management of wastes generated during plugging and abandonment activities.
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 Groundwater Well in Sandia Canyon

Primary Purpose	The purpose for plugging and abandoning the alluvial groundwater observation wells in Sandia Canyon 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 wells in Sandia Canyon. Abandonment will be consistent with Appendix F Section II.D, Well Abandonment, of the Consent Order and NMOSE regulations. A plugging plan of operations will be submitted to NMOSE before abandonment.
Construction	Two observation wells were installed in Sandia Canyon in 1966 as part of an investigation of alluvial water in Sandia Canyon. SCO-1 has been plugged and abandoned. SCO-2 (old) is constructed of 2-in.-diameter PVC pipe. The well is 20 ft deep with the bottom 1 ft of the pipe perforated. The well has a 2-ft-thick surface seal with bentonite and a sand pack filling the annular space. Replacement well SCO-2 (new) will also be plugged. It is constructed of 4.5-in.-diameter PVC pipe with an 18.4-ft completion depth.
Abandonment Methods	For the SCO wells, the Laboratory will attempt to pull the PVC well casing from the SCO-2 (new) while backfilling with cement grout to 2 ft bgs. If this is not feasible, SCO-2 (new) will be overdrilled to total depth, and then filled with cement grout to 2 ft bgs. Since SCO-2 (old) is filled with soil, it will be overdrilled to total depth as shown in Figures 3.3-1 to 3.3-2 and then backfilled to 2 ft bgs. Schematic diagrams of the well abandonment approaches for each well are shown in Figures 3.2-1 to 3.2-2.
Surface Completion	A ready-mix concrete mound with a survey marker will be installed in the borehole from 2 ft bgs and mounded above ground surface to shed water. The marker will be surveyed with a GPS with an accuracy of ±0.5 ft.
Waste Disposal	A WCSF will be prepared to guide in the management of wastes generated during plugging and abandonment activities.
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.

3.4 Work Plan to Plug and Abandon Air-Injection Borehole at TA-35

Primary Purpose	The purpose for plugging and abandoning the air-injection borehole, called S-3, at TA-35, formerly at TA-50 before the boundary was redrawn, 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 the borehole in TA-50. Abandonment will be consistent with Appendix F Section II.D, Well Abandonment, of the Consent Order and NMOSE regulations. A plugging plan of operations will be submitted to NMOSE before abandonment.
Construction	Several boreholes were drilled at what was TA-50 in 1968 as part of an investigation into air movement in the Bandelier Tuff, but only one remains. The borehole is 2 in. in diameter with a surface steel casing of unknown length. The remainder of the borehole to 43 ft bgs is potentially open.
Abandonment Methods	The Laboratory will attempt to remove the surface casing from the borehole. If this is not feasible, the well will be filled with grout to 20 ft bgs and then overdrilled to a depth of 20 ft, and the entire borehole will be filled with cement grout to ground surface. The schematic diagram of the well abandonment approach is shown in Figure 3.4-1.
Surface Completion	A ready-mix concrete mound with a survey marker will be installed in the borehole from 2 ft bgs and mounded above ground surface to shed water. The marker will be surveyed with a GPS with an accuracy of ±0.5 ft.
Waste Disposal	A WCSF will be prepared to guide in the management of wastes generated during plugging and abandonment activities.
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.

3.5 Work Plan to Plug and Abandon Alluvial Groundwater Observation Wells in Mortandad Canyon

Primary Purpose	The purpose for plugging and abandoning the alluvial groundwater observation wells in Mortandad Canyon 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 wells in Mortandad Canyon. Abandonment will be consistent with Appendix F Section II.D, Well Abandonment, of the Consent Order and NMOSE regulations. A plugging plan of operations will be submitted to NMOSE before abandonment.
Construction	Four observation wells were installed in Mortandad Canyon from 1961 to 1974 as part of an investigation of alluvial water in Mortandad Canyon. The wells vary from 46 to 107 ft deep. The wells are constructed of 2-, 3-, and 4-in.-diameter PVC pipe with perforations in the lower part. The annular space appears to have been filled with drill cuttings.
Abandonment Methods	Wells with standing water will be bailed for 3 casing volumes or until dry, then allowed to recharge overnight. Wells with standing water after the recharge period will be sampled using standard alluvial sampling protocol and analyte lists. For the MCO wells, the Laboratory will attempt to pull the PVC well casing from the borehole while backfilling with cement grout to 2 ft bgs. If this is not feasible, the wells deeper than 20 ft will be filled with grout to 20 ft bgs, overdrilled to a depth of 20 ft, and then filled with cement grout to 2 ft bgs. Wells shallower than 20 ft will be overdrilled to total depth as shown in Figures 3.5-1 to 3.5-4 and then backfilled to 2 ft bgs. Schematic diagrams of the well abandonment approaches for each well are shown in Figures 3.5-1 to 3.5-4.
Surface Completion	A ready-mix concrete mound with a survey marker will be installed in the borehole from 2 ft bgs and mounded aboveground surface to shed water. The marker will be surveyed with a GPS with an accuracy of ±0.5 ft.
Waste Disposal	A WCSF will be prepared to guide in the management of wastes generated during plugging and abandonment activities.
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 AND MAP DATA SOURCES

4.1 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 New Mexico Environment Department 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.

Devaurs, M., and W.D. Purtymun, 1985. "Hydrologic Characteristics of the Alluvial Aquifers in Mortandad, Cañada del Buey, and Pajarito Canyons," Los Alamos National Laboratory document LA-UR-85-4002, Los Alamos, New Mexico. (Devaurs and Purtymun 1985, 007415)

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)

4.2 Map Data Sources

Plug and Abandon Well Location; Los Alamos National Laboratory; ER-ES; As published from "Stavert Well List", Project 15-0017; 2017.

Paved Road Arcs; Los Alamos National Laboratory, FWO Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 29 November 2010.

WQH Drainage_arc; Los Alamos National Laboratory, ENV Water Quality and Hydrology Group; 1:24,000 Scale Data; 03 June 2003.

Road Centerlines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 15 December 2005; as published 29 November 2010.

Structures; County of Los Alamos, Information Services; as published 29 October 2007.

Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; September 2007; as published 13 August 2010.

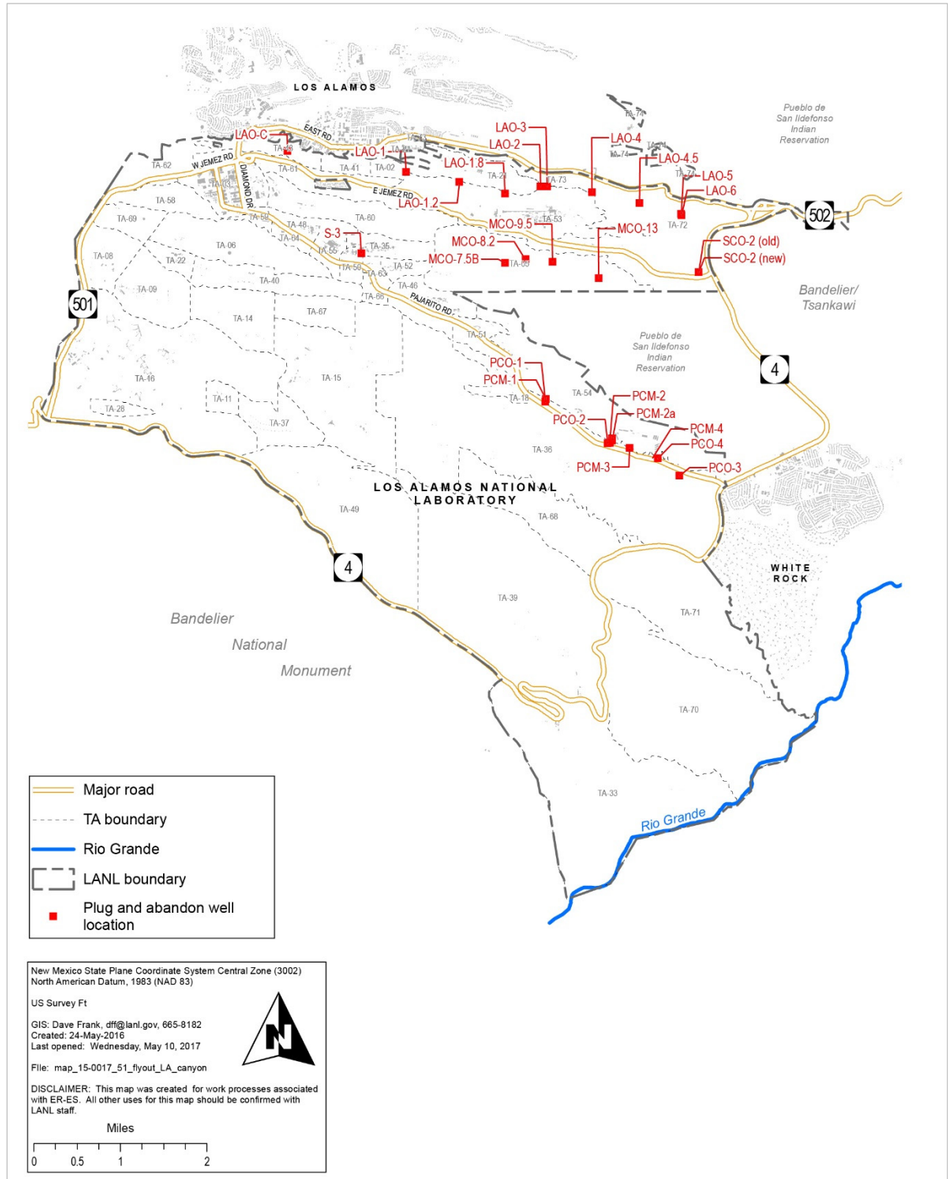


Figure 2.0-1 Locations of all wells to be plugged in fiscal year 2017

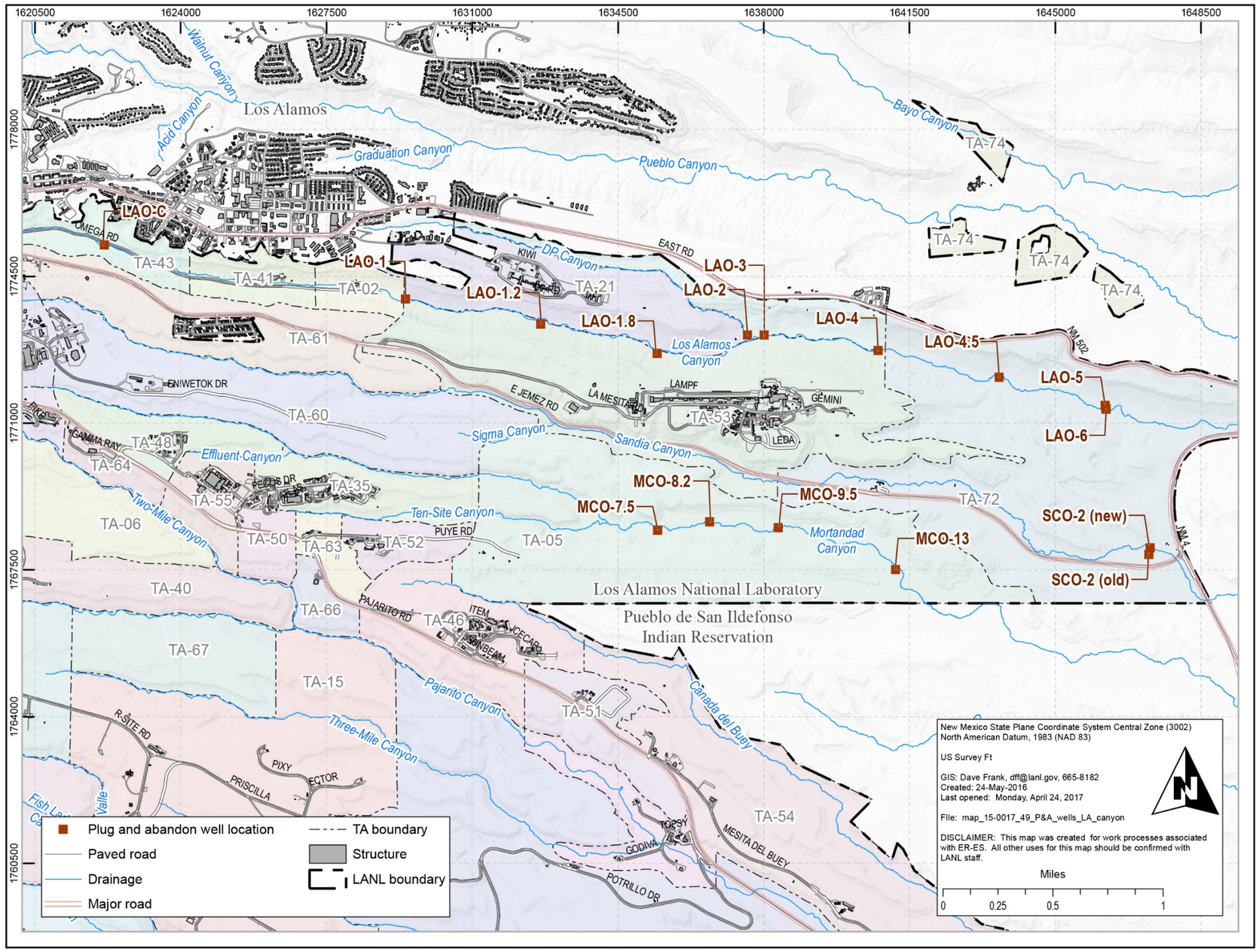


Figure 2.1-1 Alluvial wells in Los Alamos, Mortandad, and Sandia Canyons

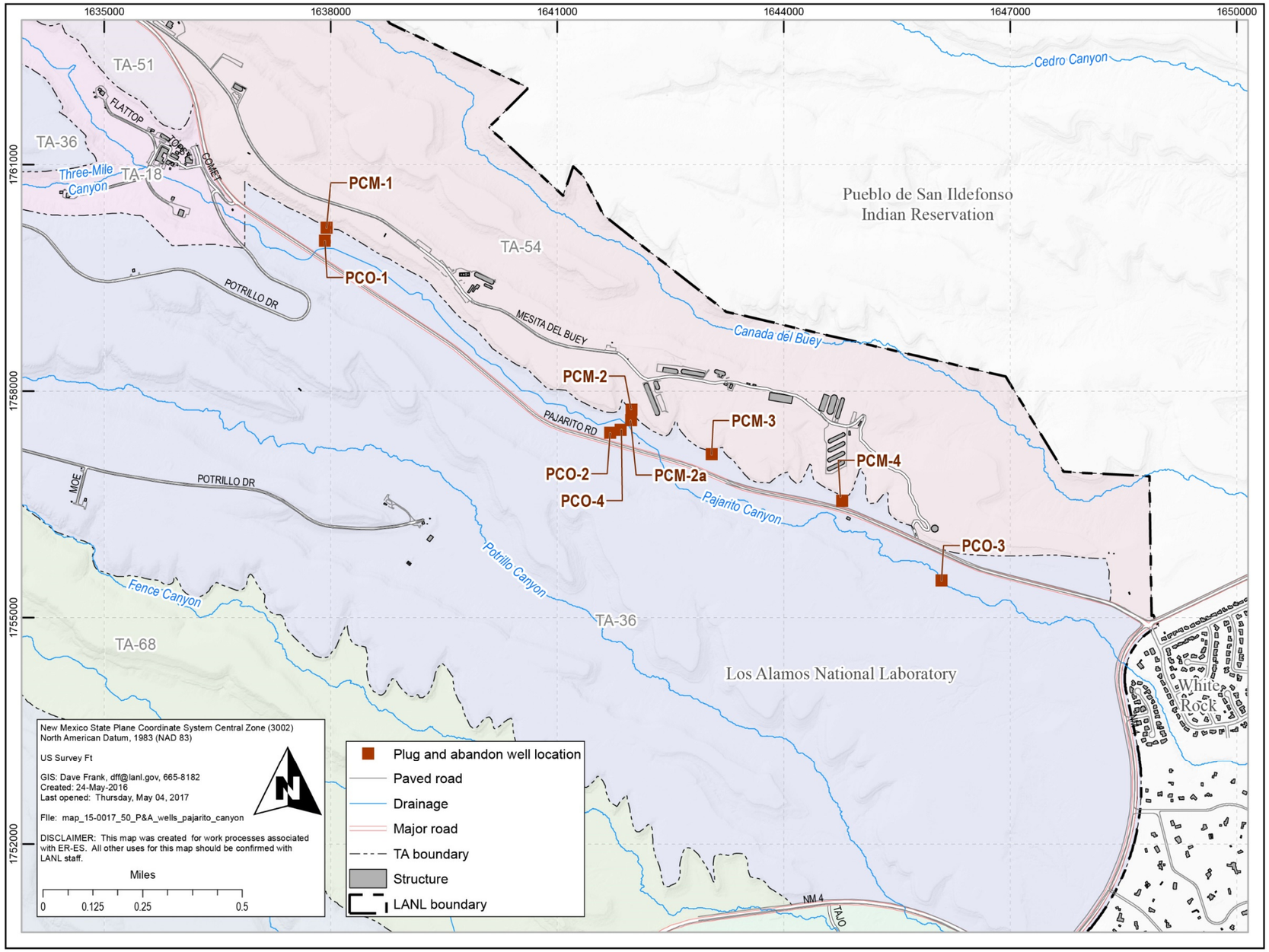


Figure 2.2-1 Wells in Pajarito Canyon

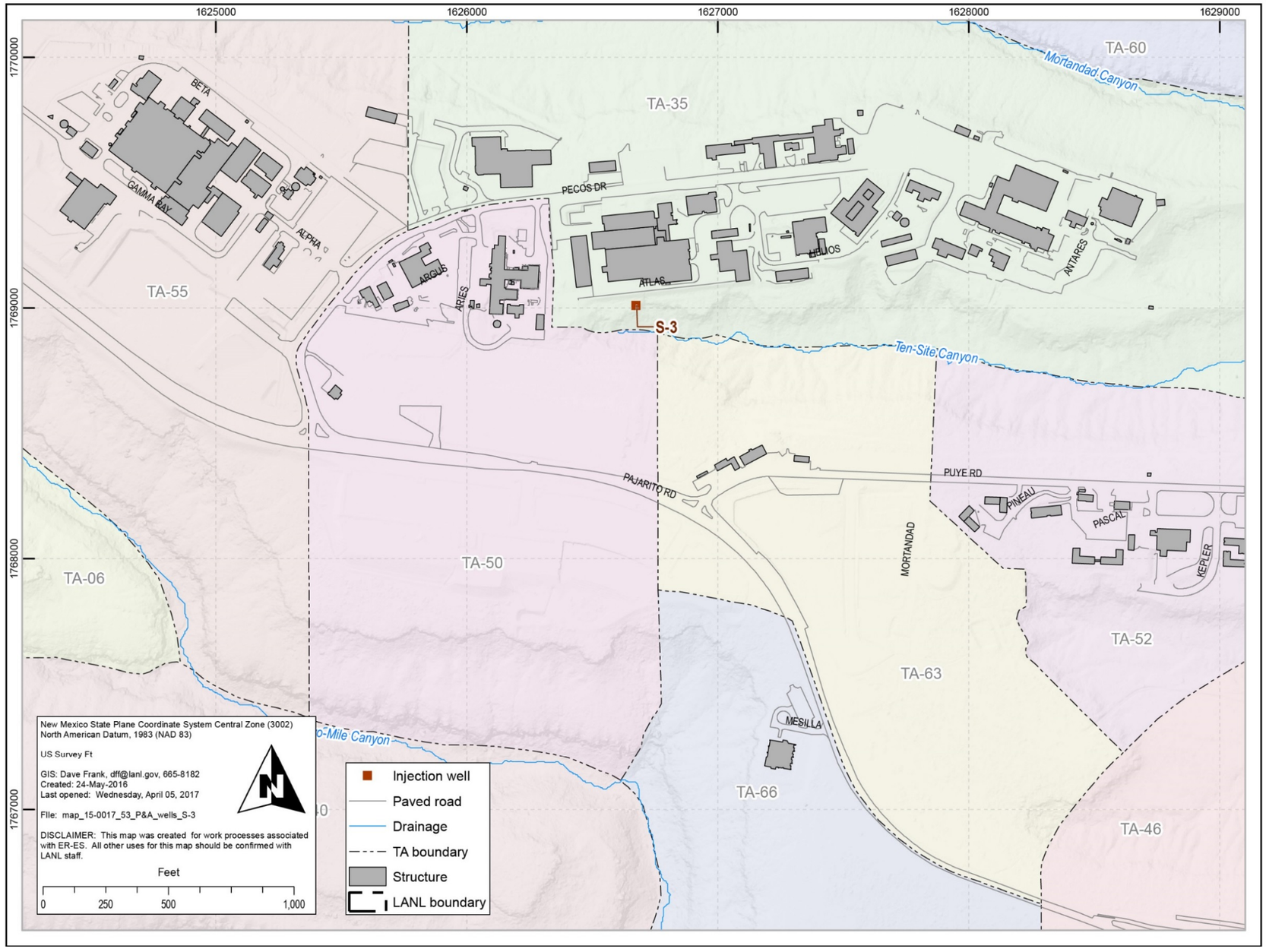


Figure 2.4-1 Location of air-injection well S-3 in TA-35

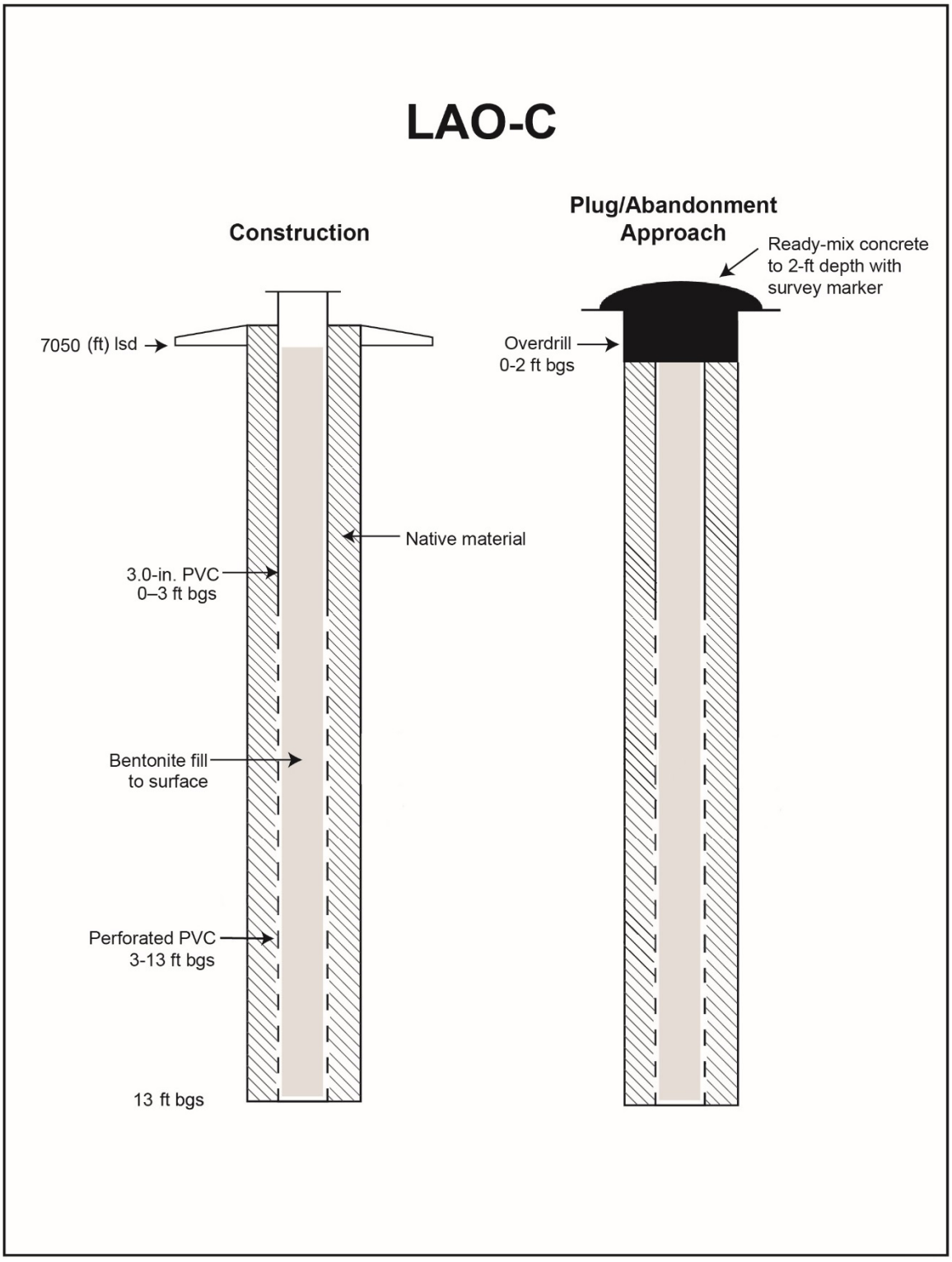


Figure 3.1-1 LAO-C abandonment schematic

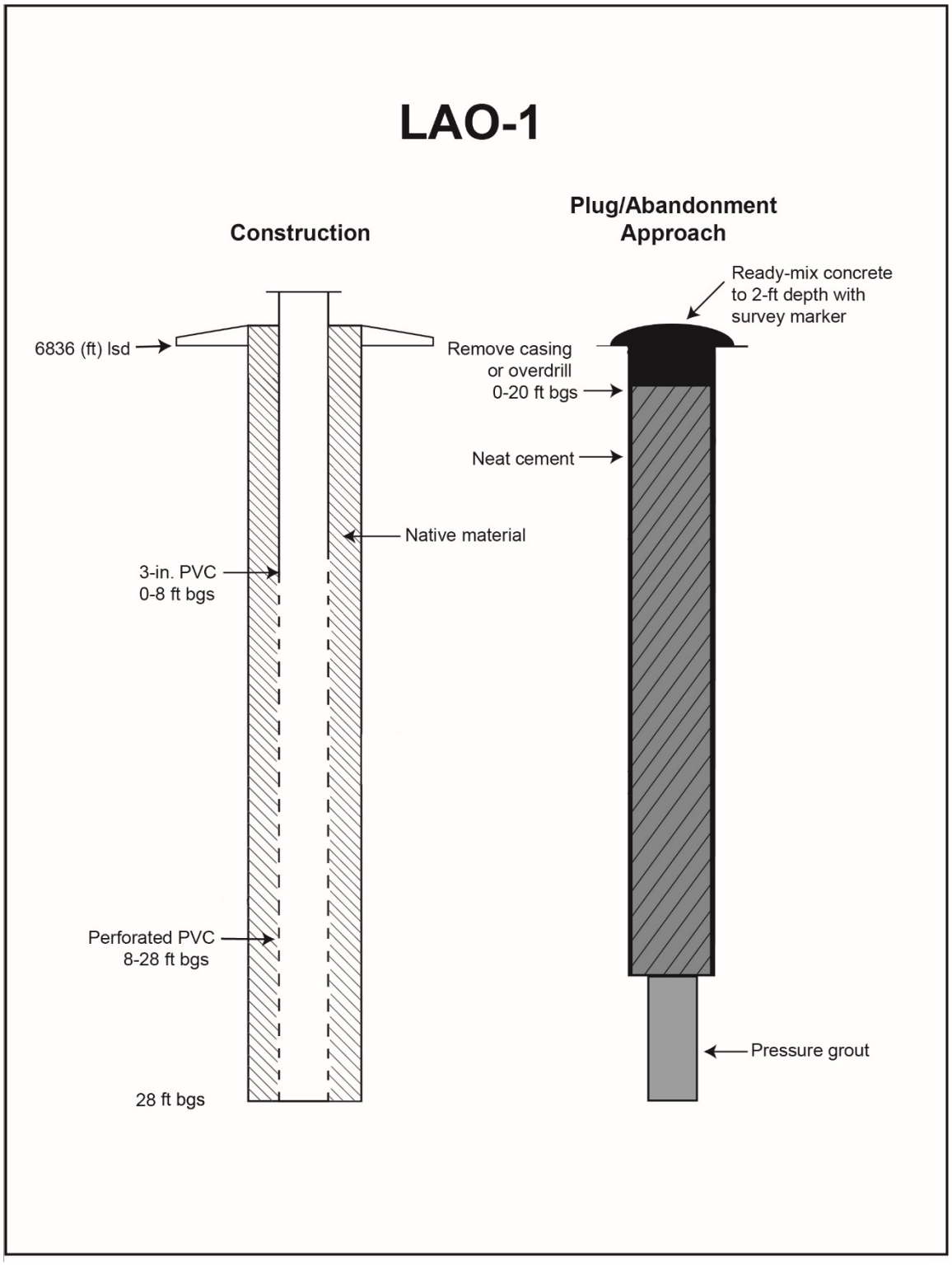


Figure 3.1-2 LAO-1 abandonment schematic

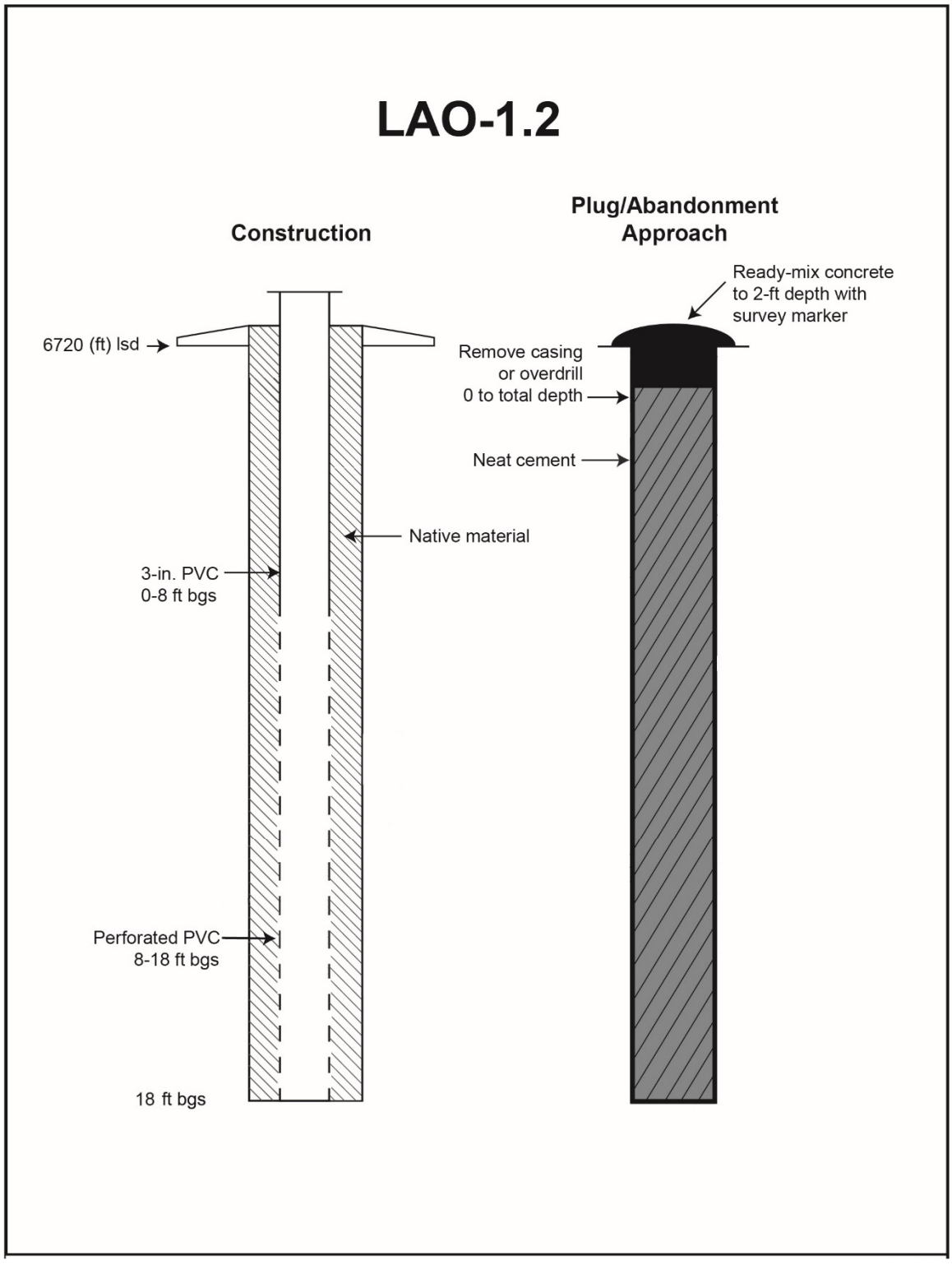


Figure 3.1-3 LAO-1.2 abandonment schematic

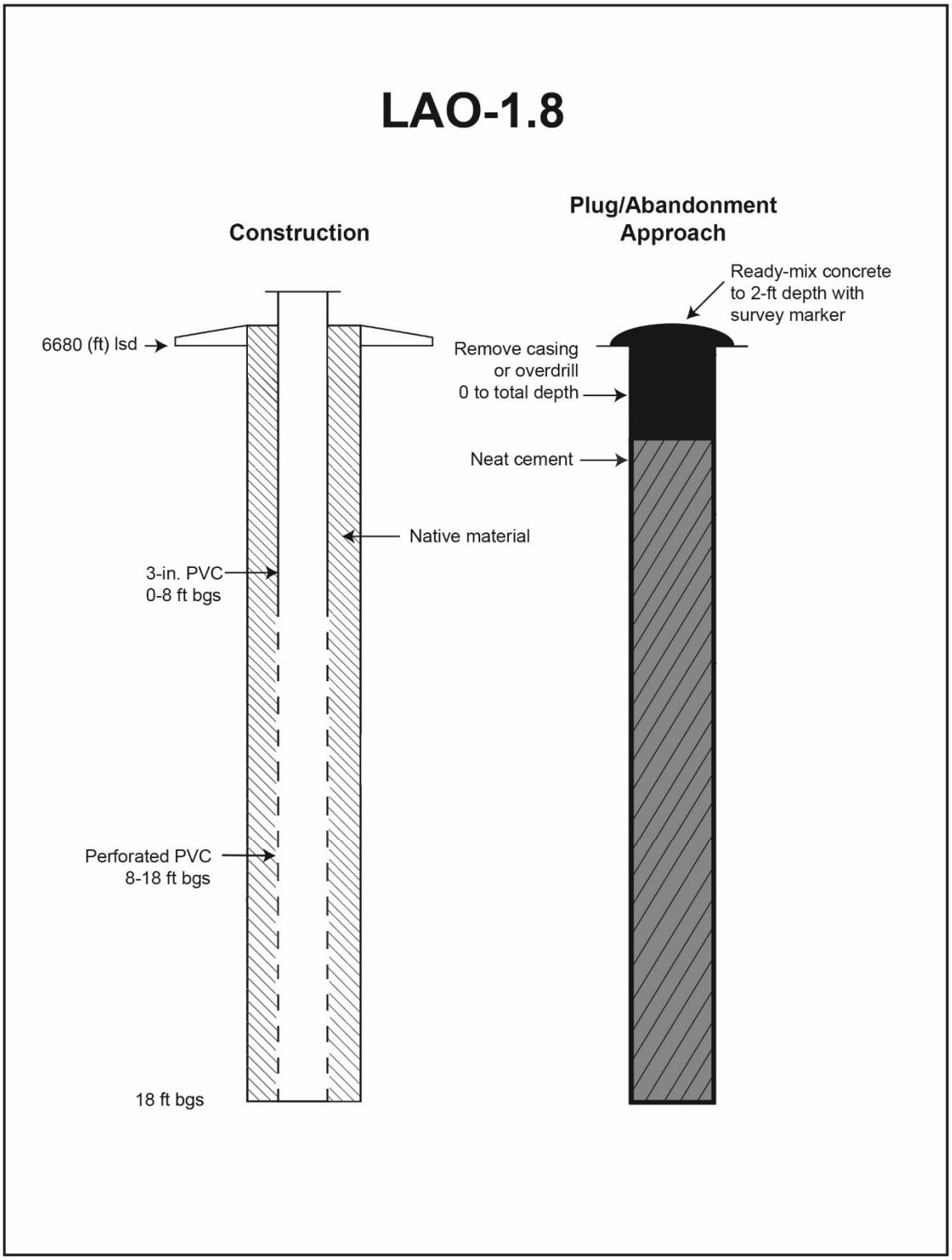


Figure 3.1-4 LAO-1.8 abandonment schematic

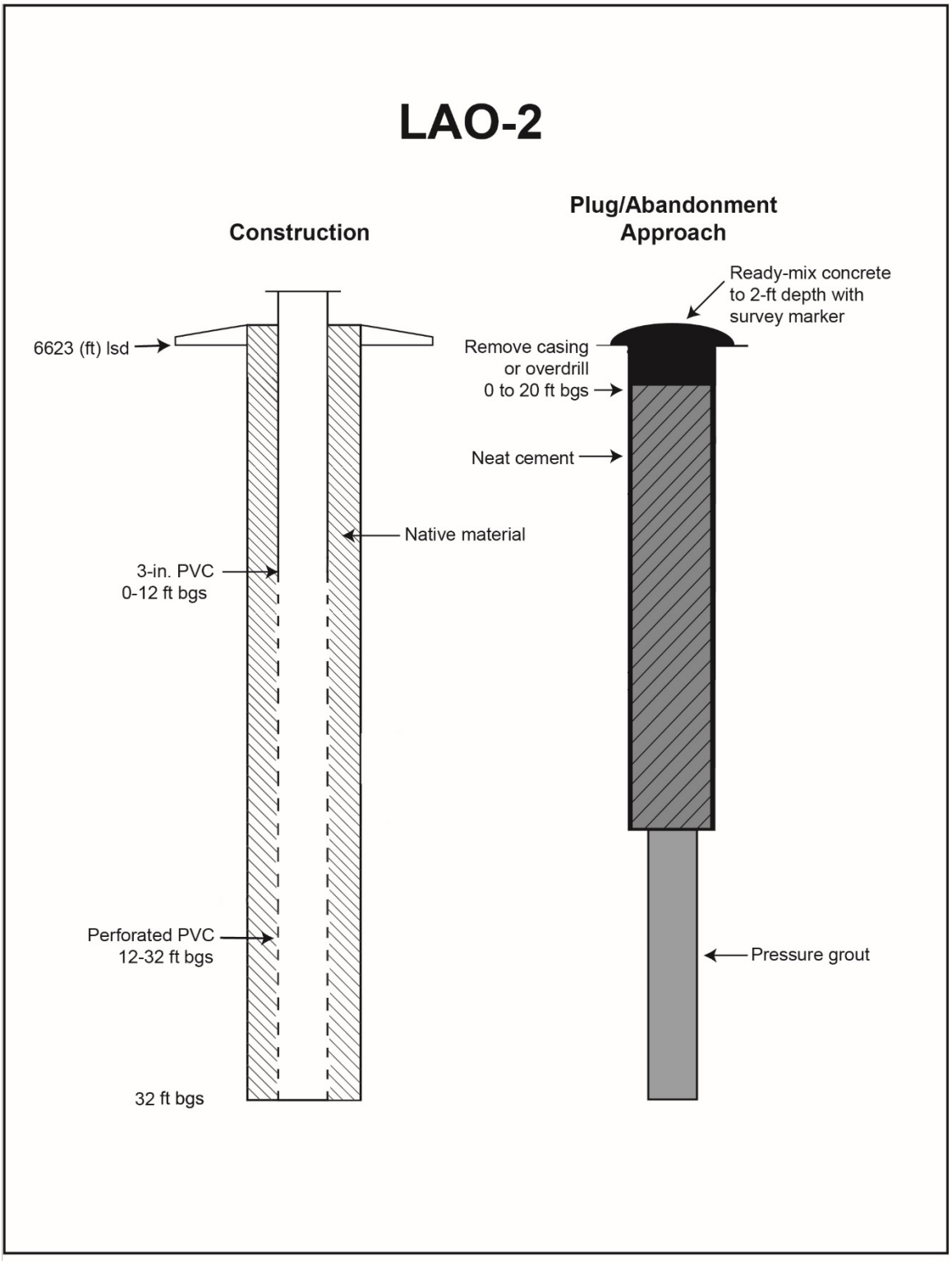


Figure 3.1-5 LAO-2 abandonment schematic

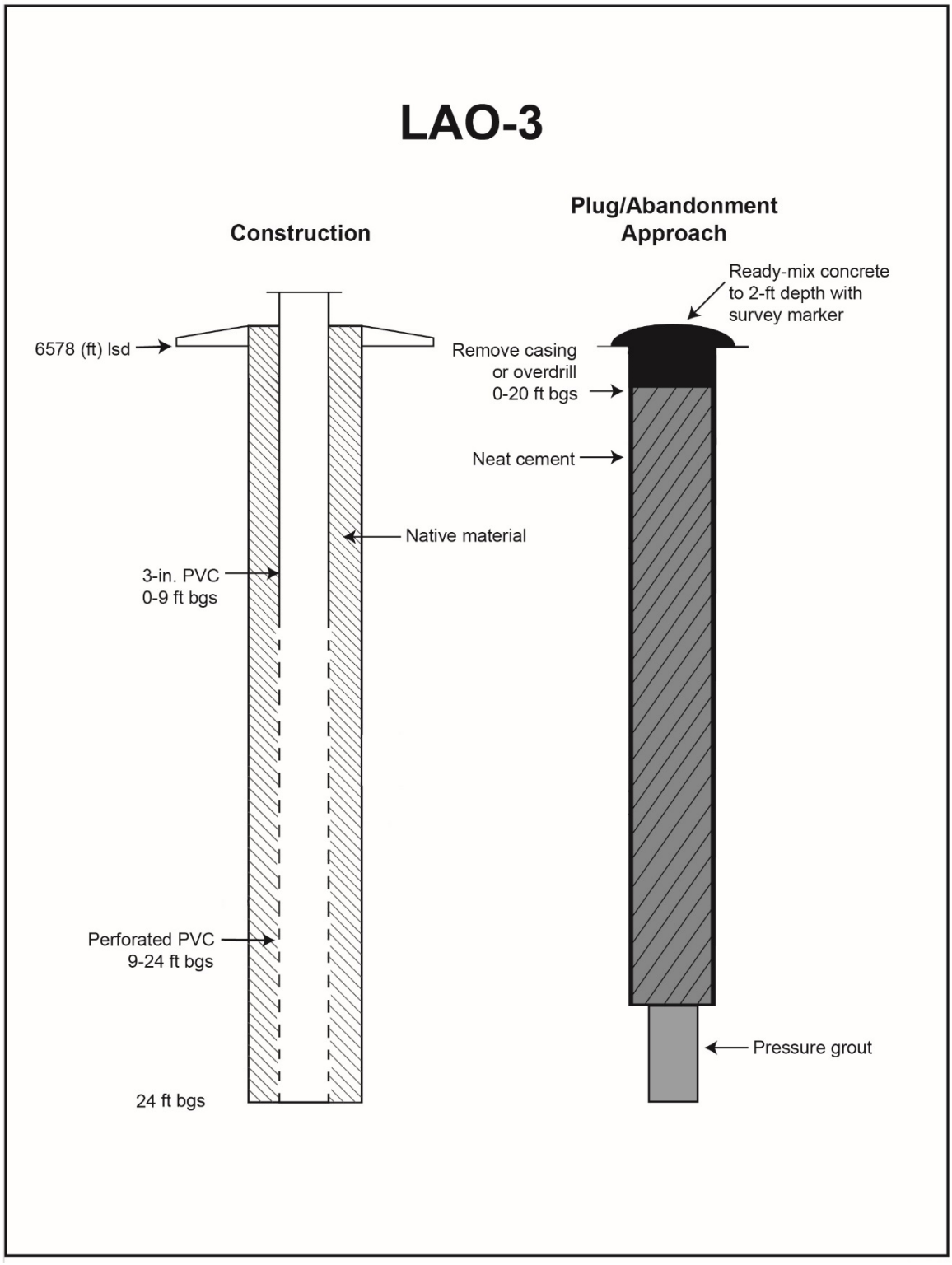


Figure 3.1-6 LAO-3 abandonment schematic

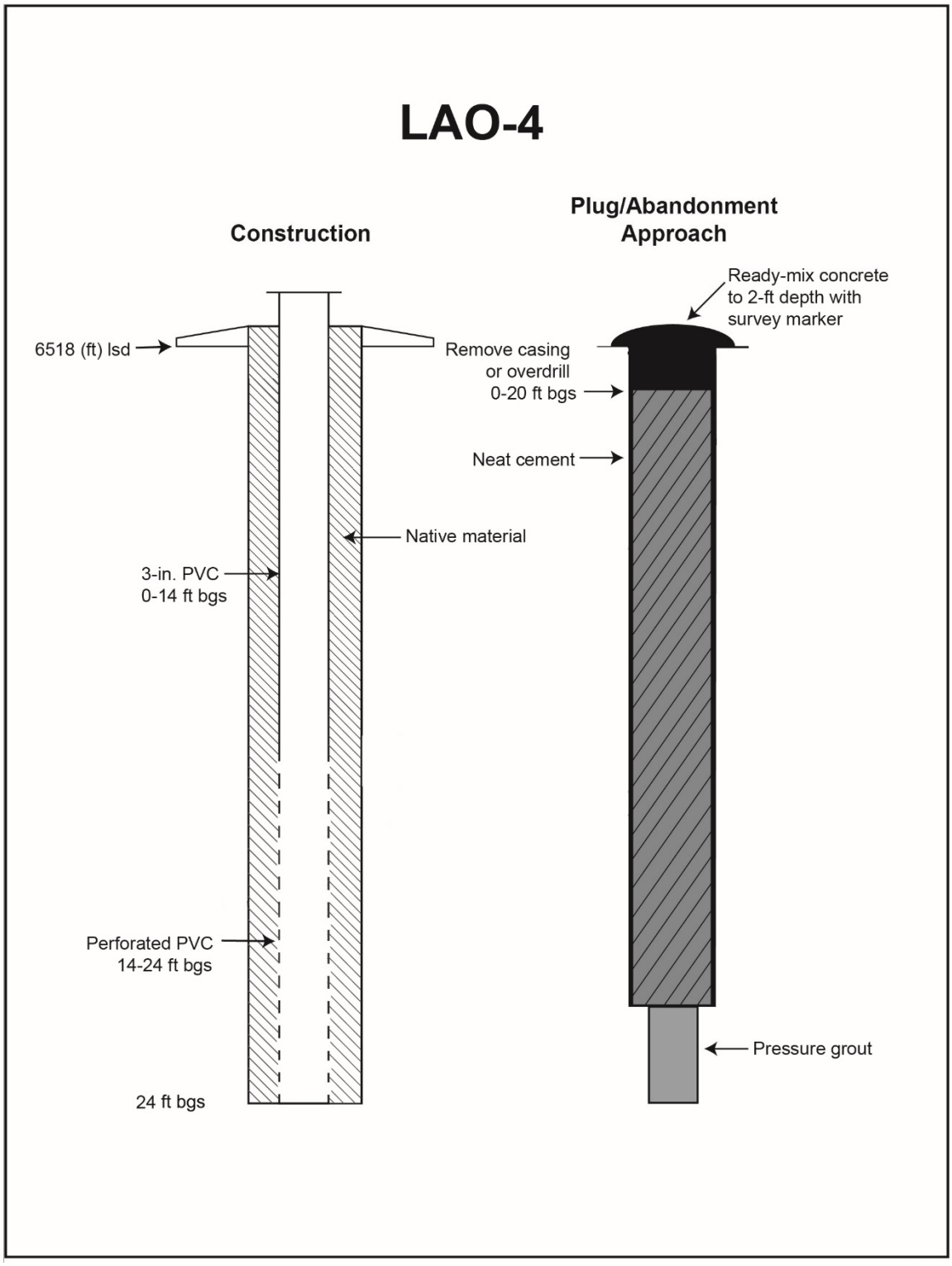


Figure 3.1-7 LAO-4 abandonment schematic

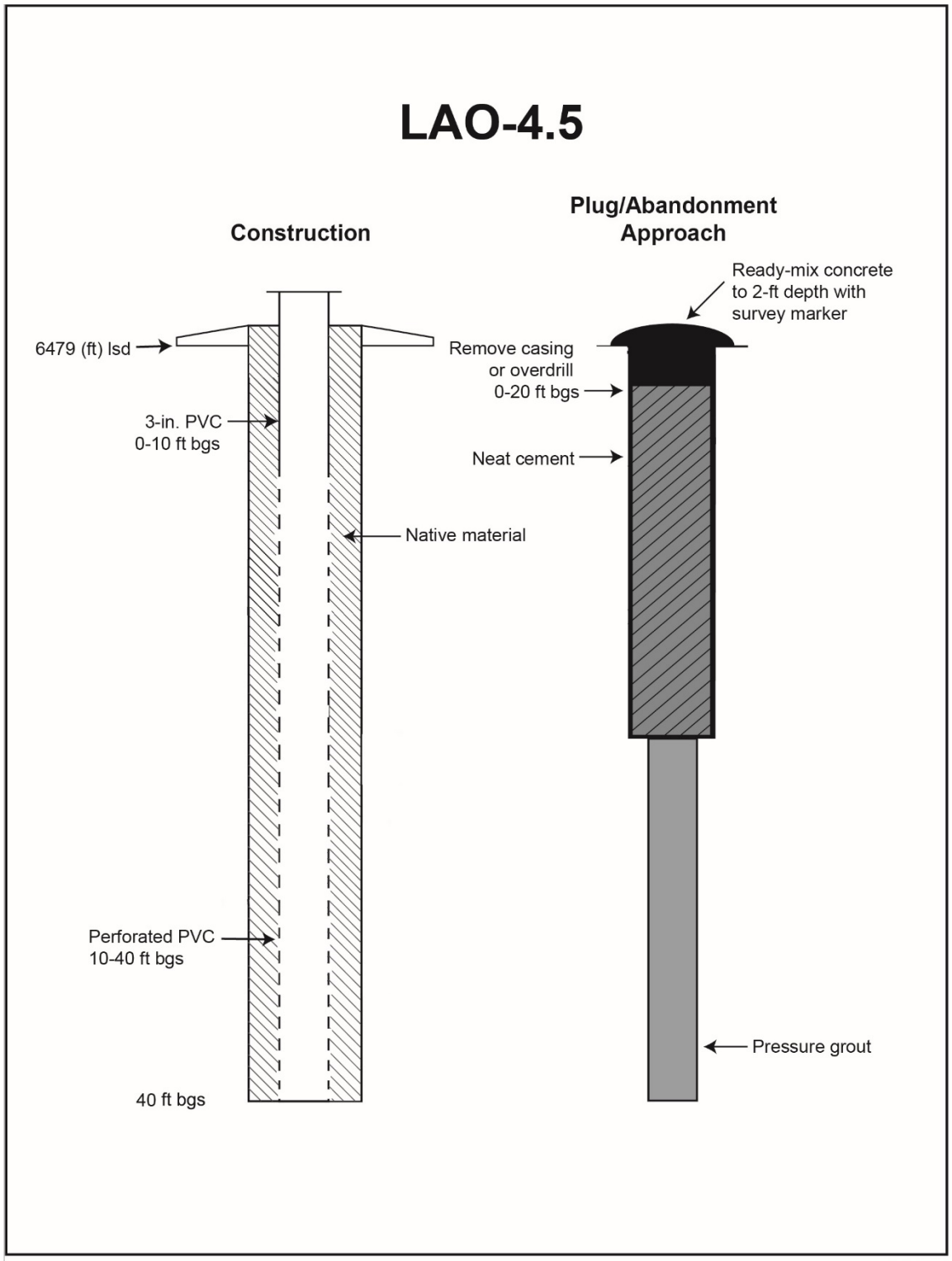


Figure 3.1-8 LAO-4.5 abandonment schematic

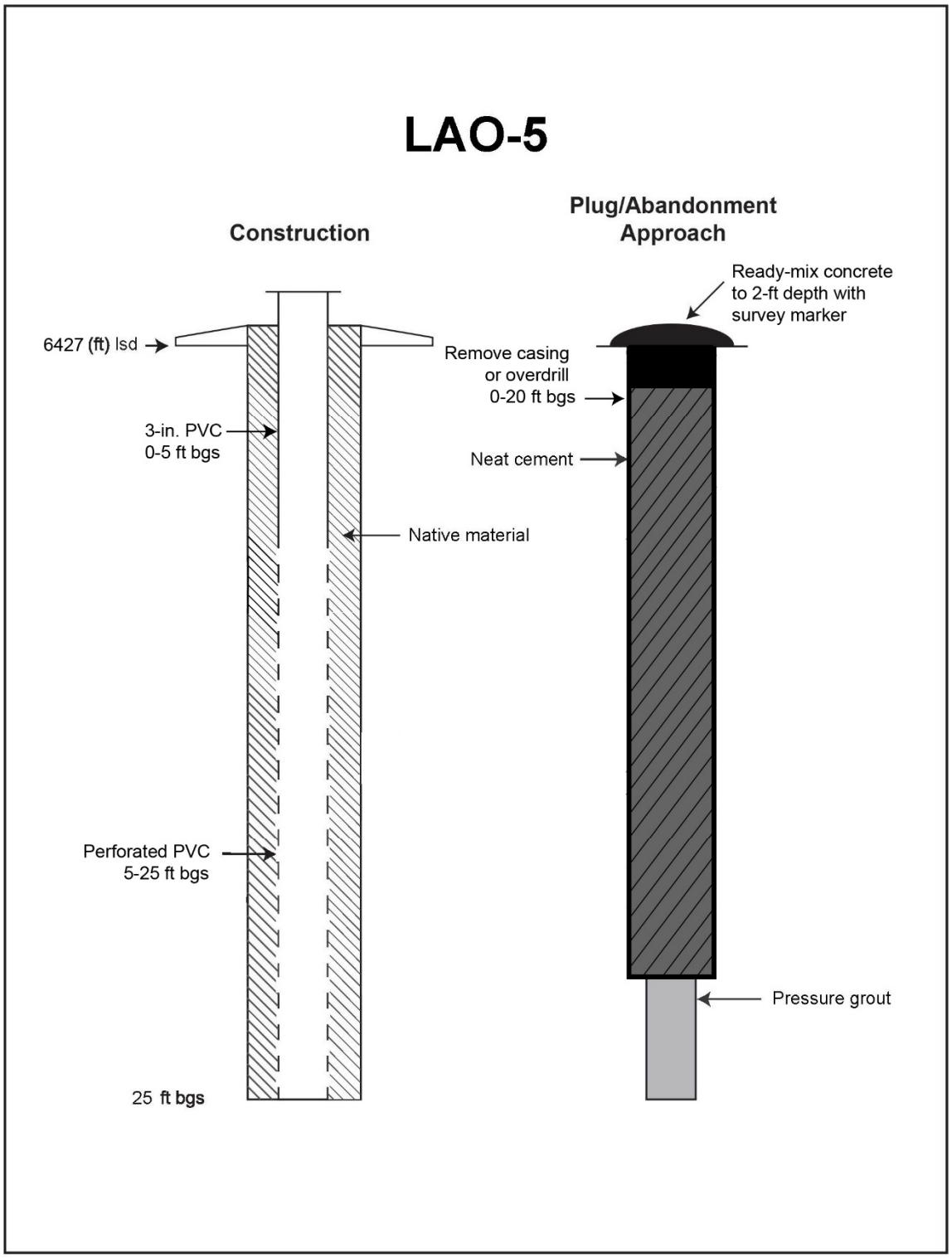


Figure 3.1-9 LAO-5 abandonment schematic

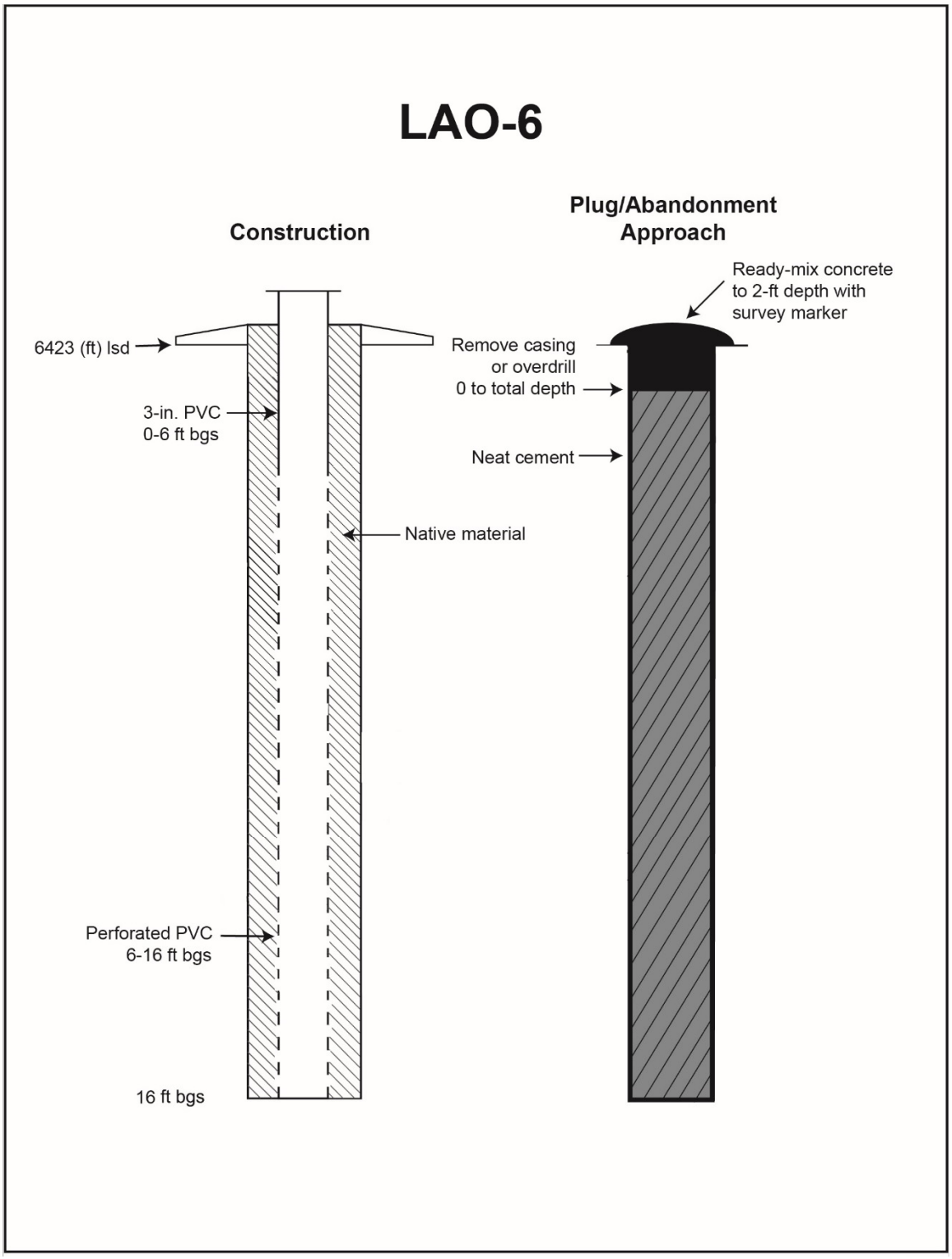


Figure 3.1-10 LAO-6 abandonment schematic

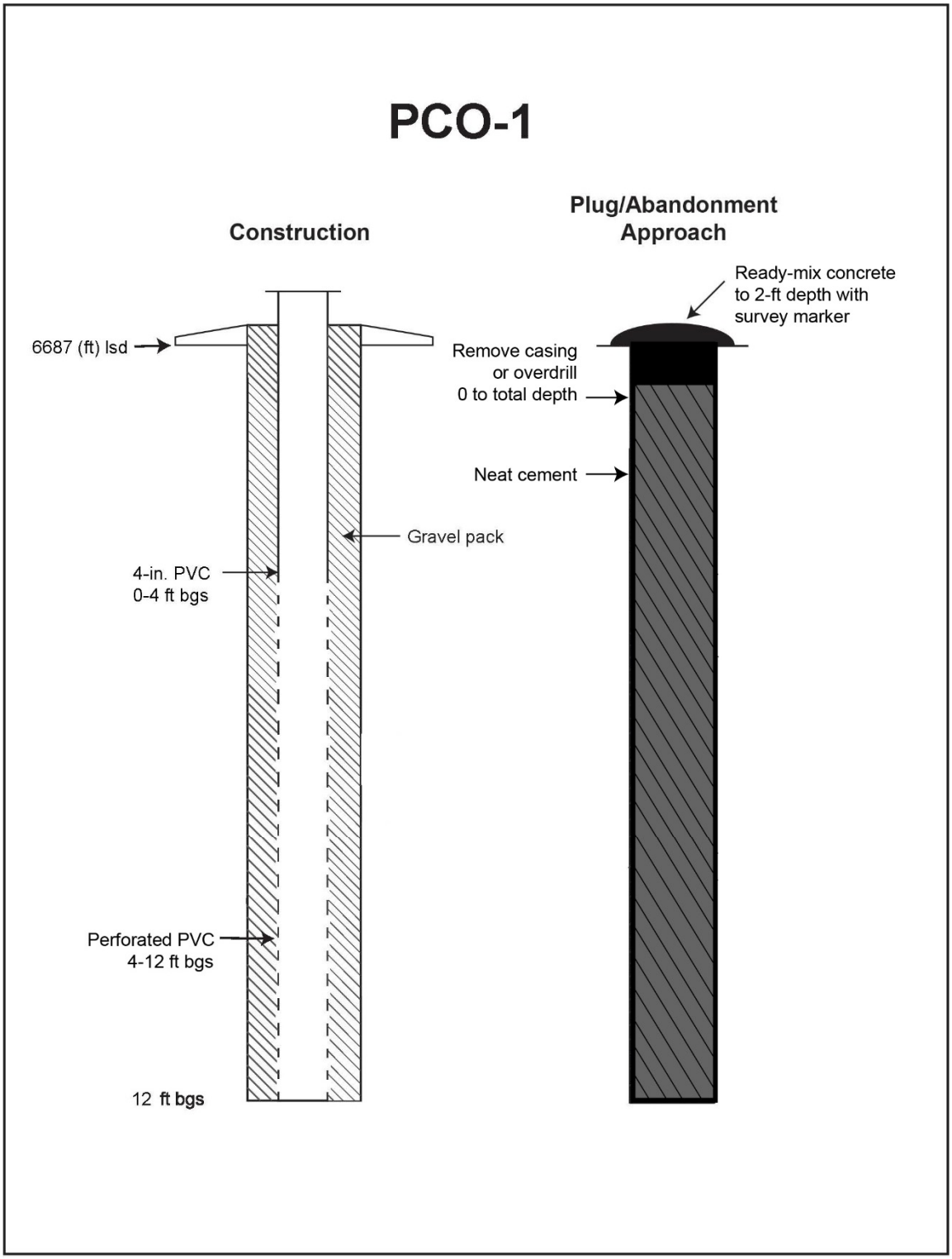


Figure 3.2-1 PCO-1 abandonment schematic

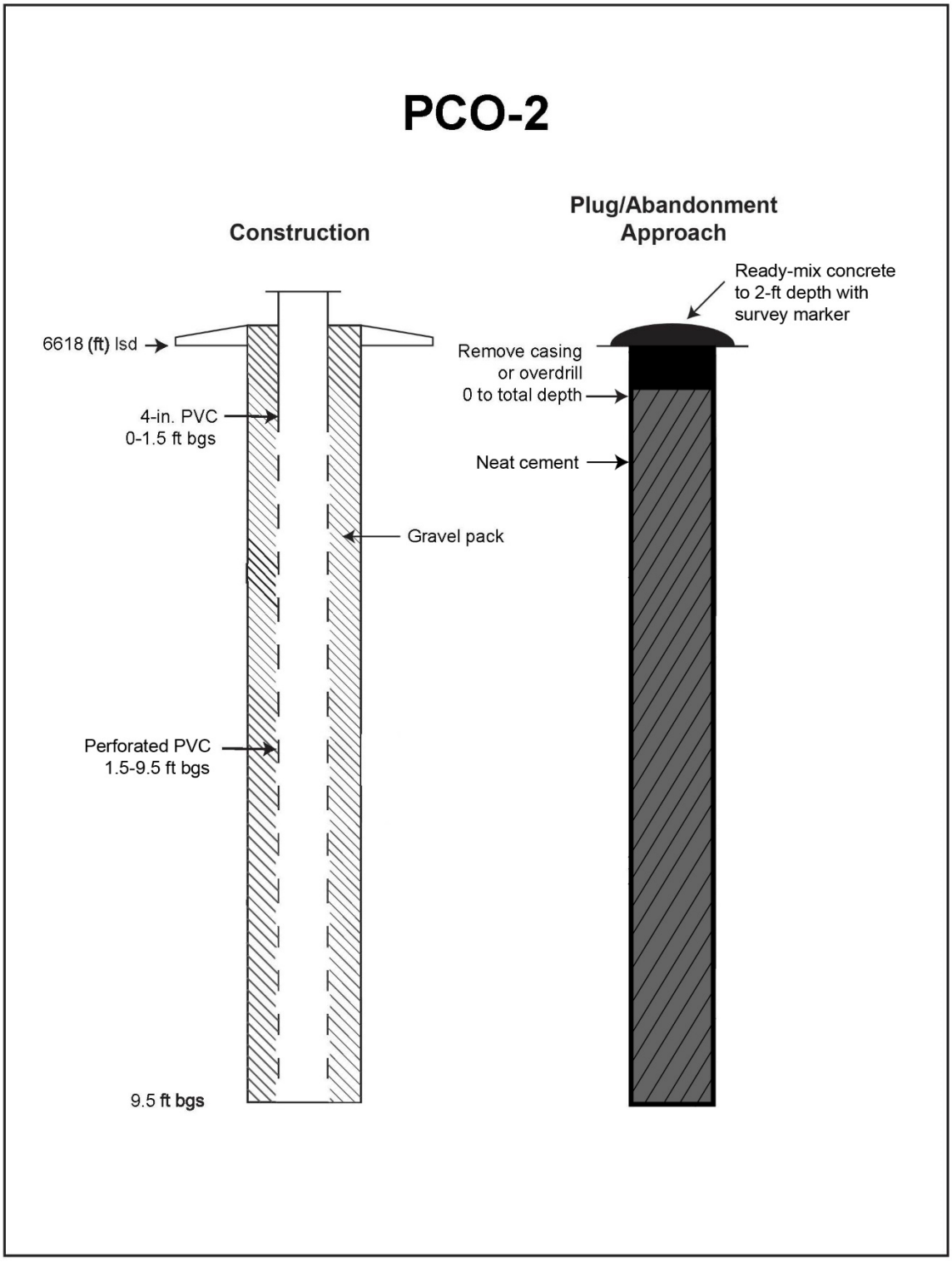


Figure 3.2-2 PCO-2 abandonment schematic

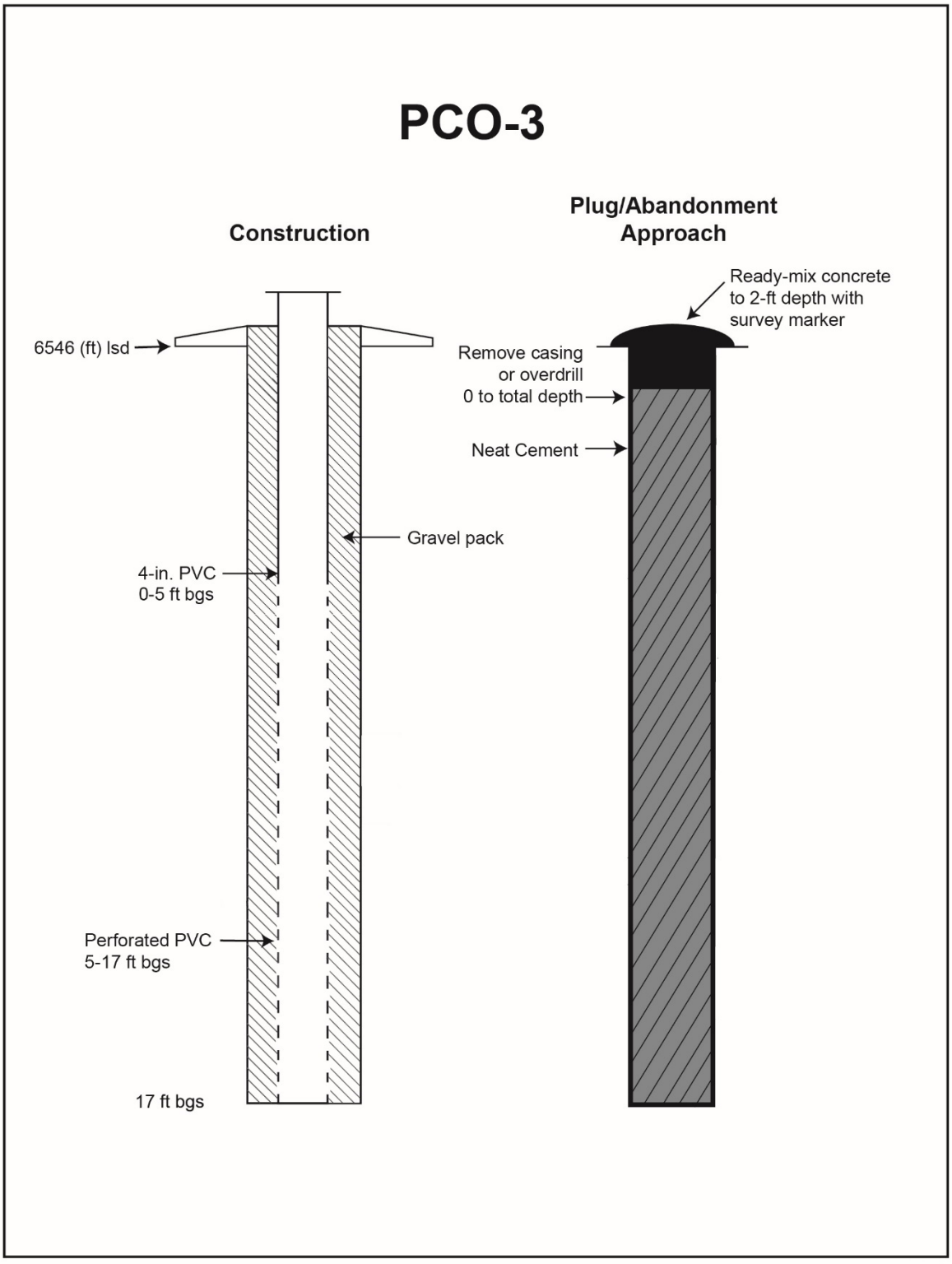


Figure 3.2-3 PCO-3 abandonment schematic

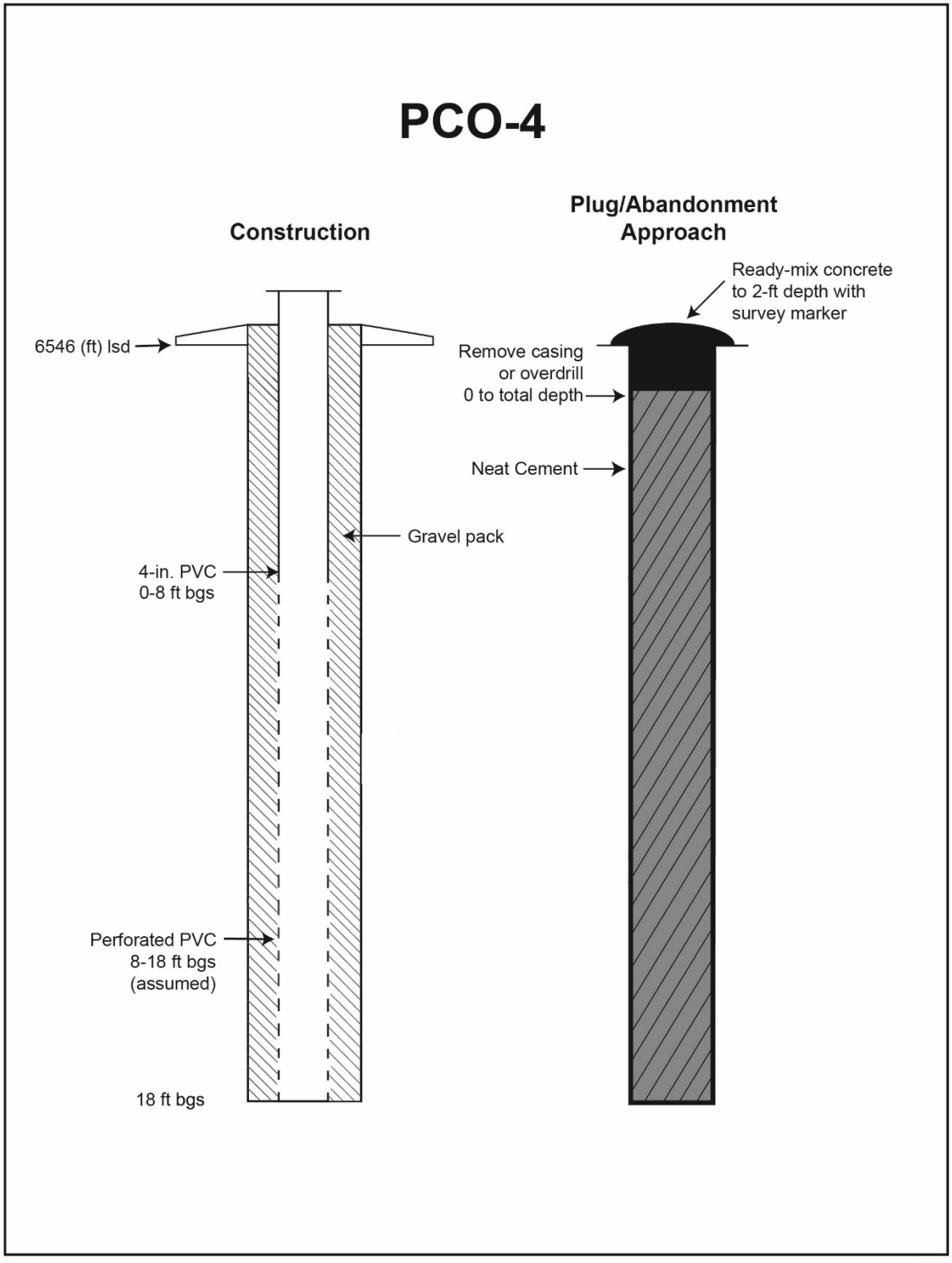


Figure 3.2-4 PCO-4 abandonment schematic

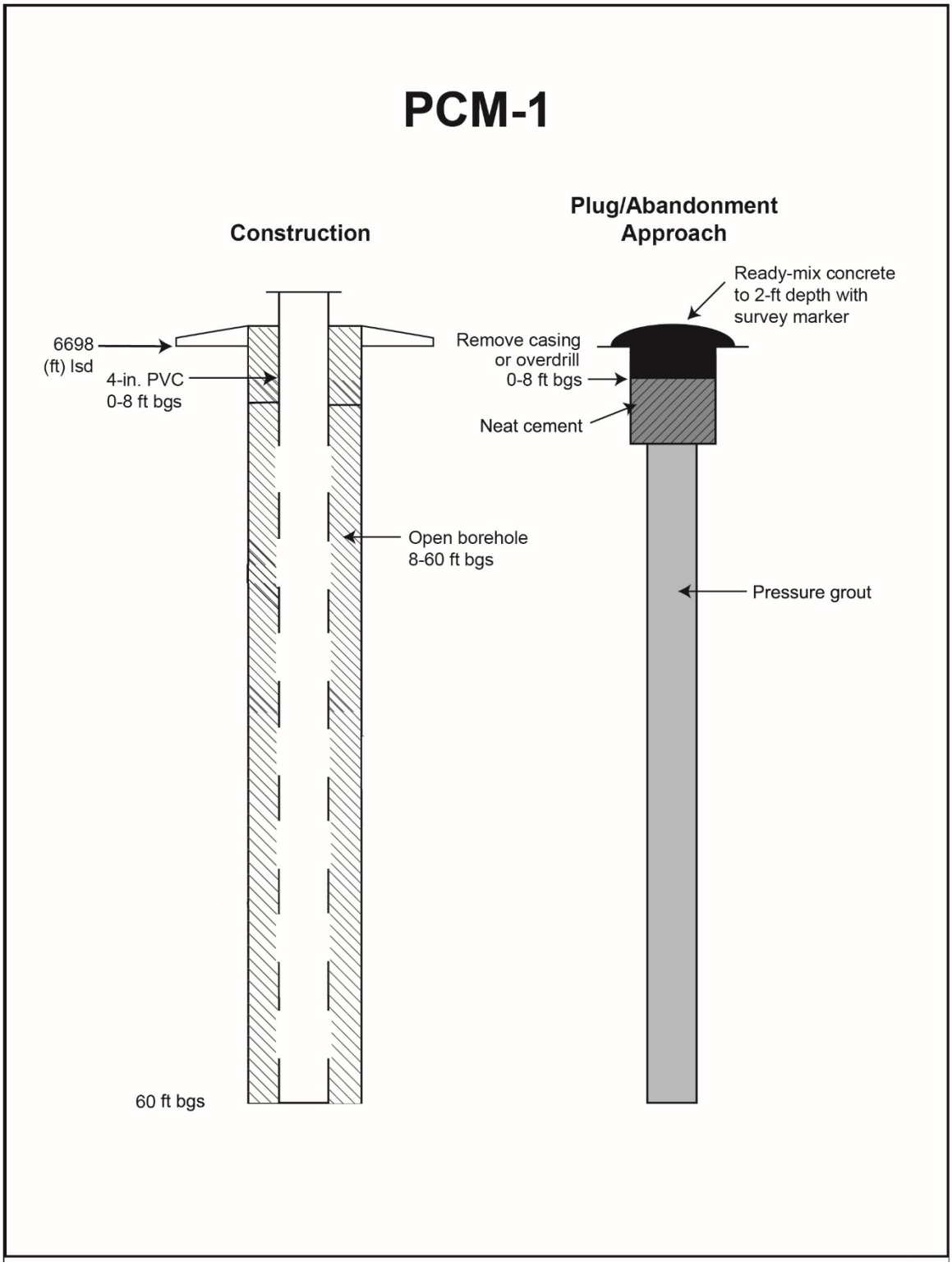


Figure 3.2-5 PCM-1 abandonment schematic

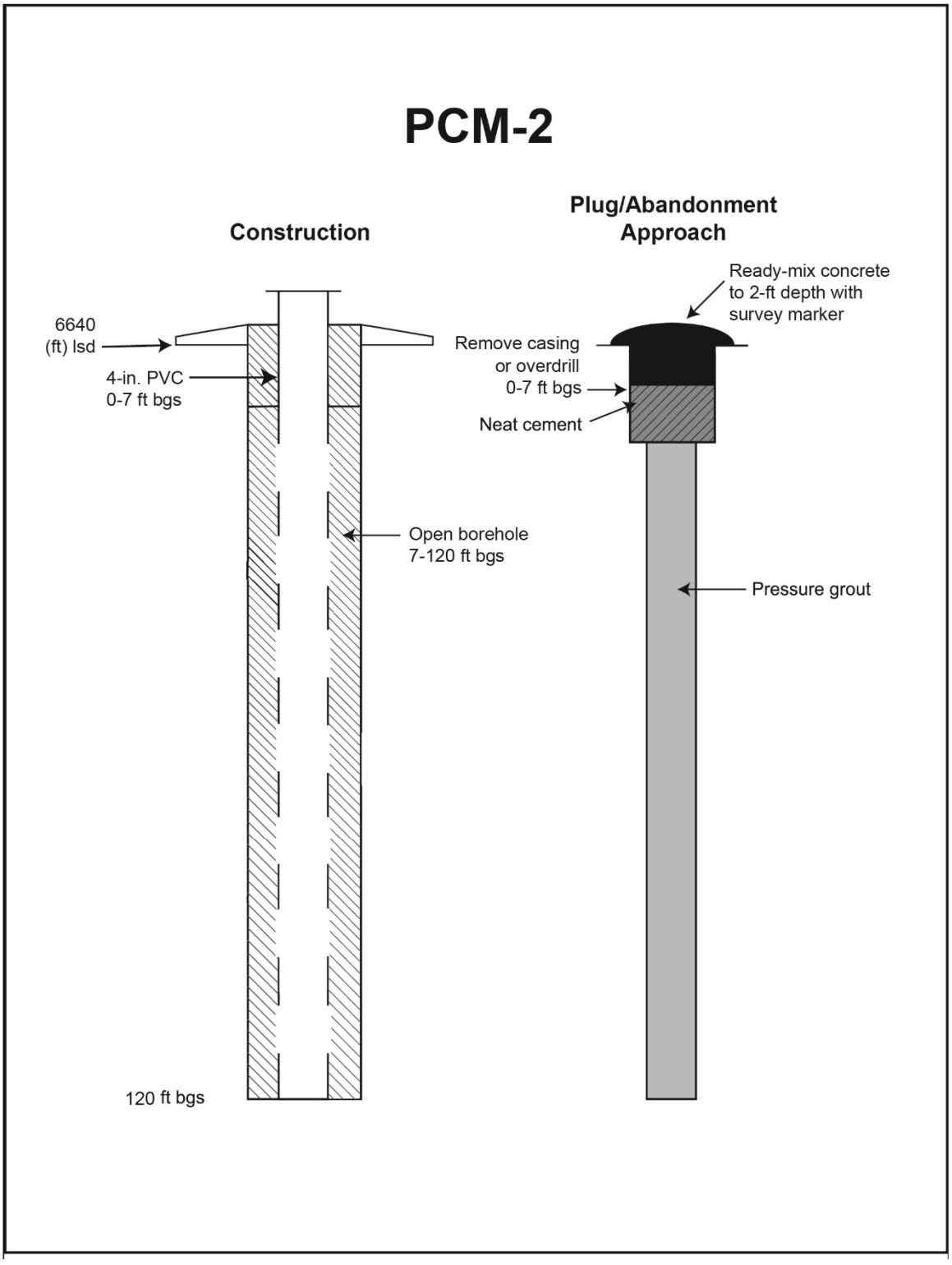


Figure 3.2-6 PCM-2 abandonment schematic

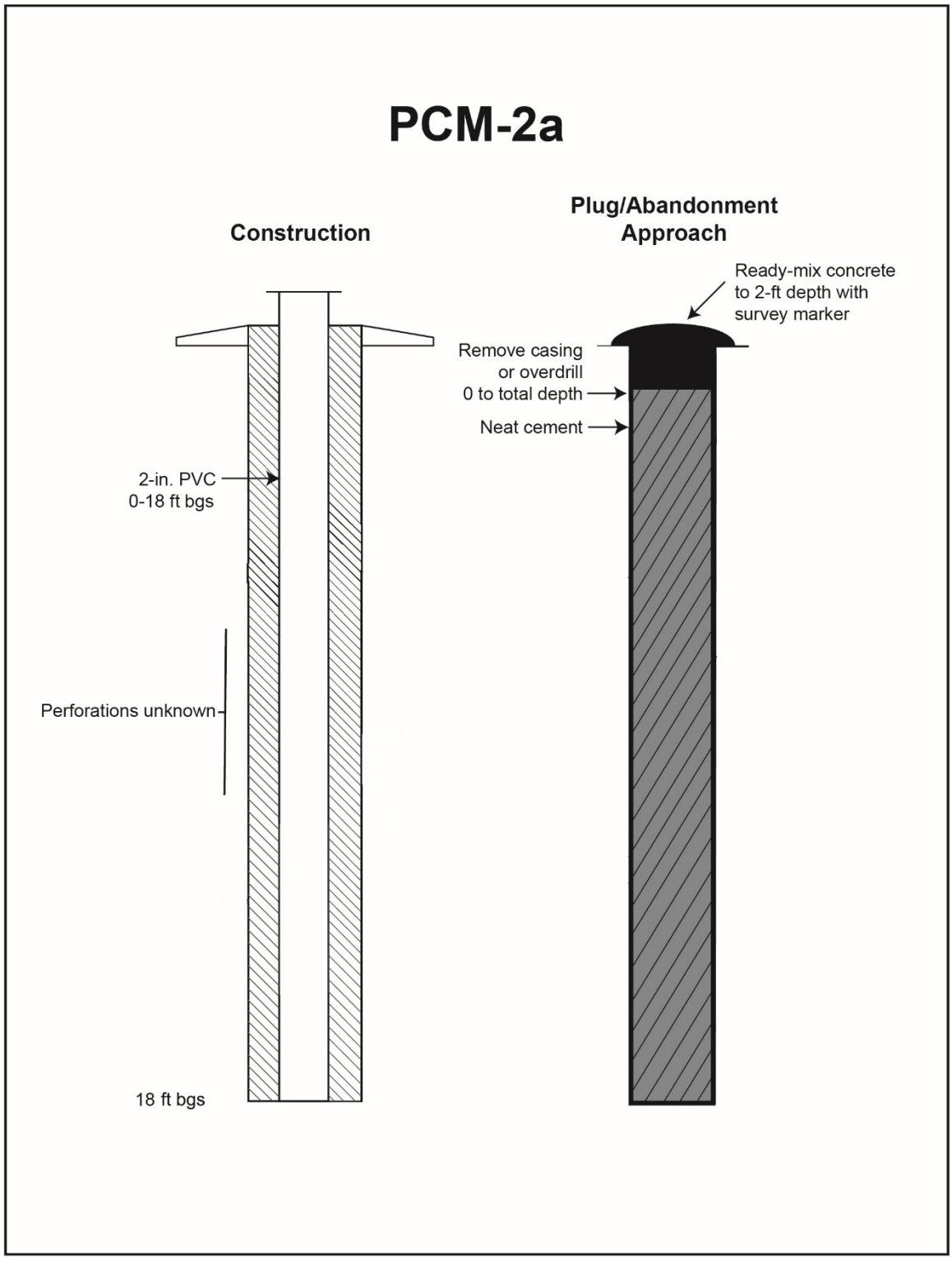


Figure 3.2-7 PCM-2a abandonment schematic

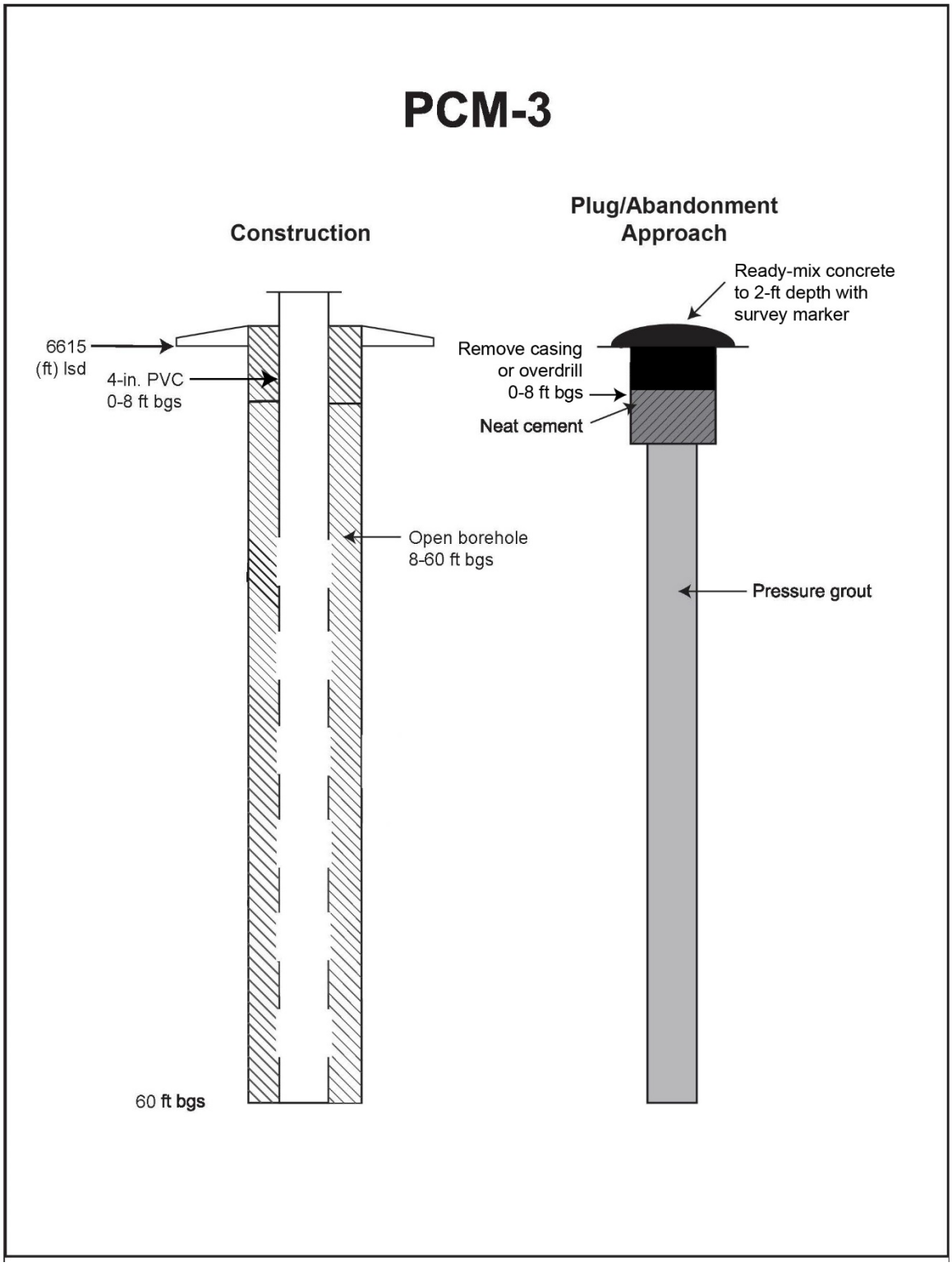


Figure 3.2-8 PCM-3 abandonment schematic

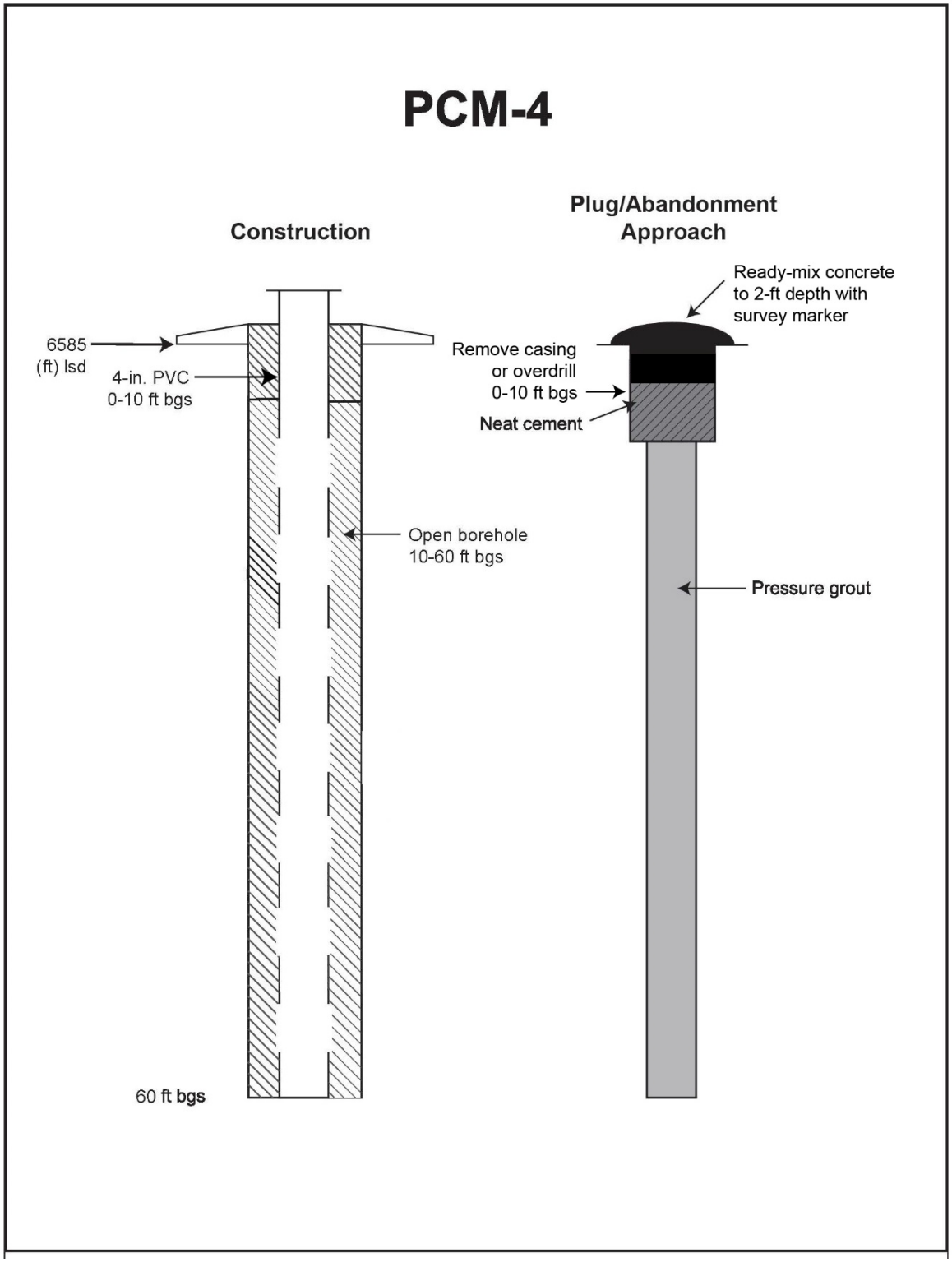


Figure 3.2-9 PCM-4 abandonment schematic

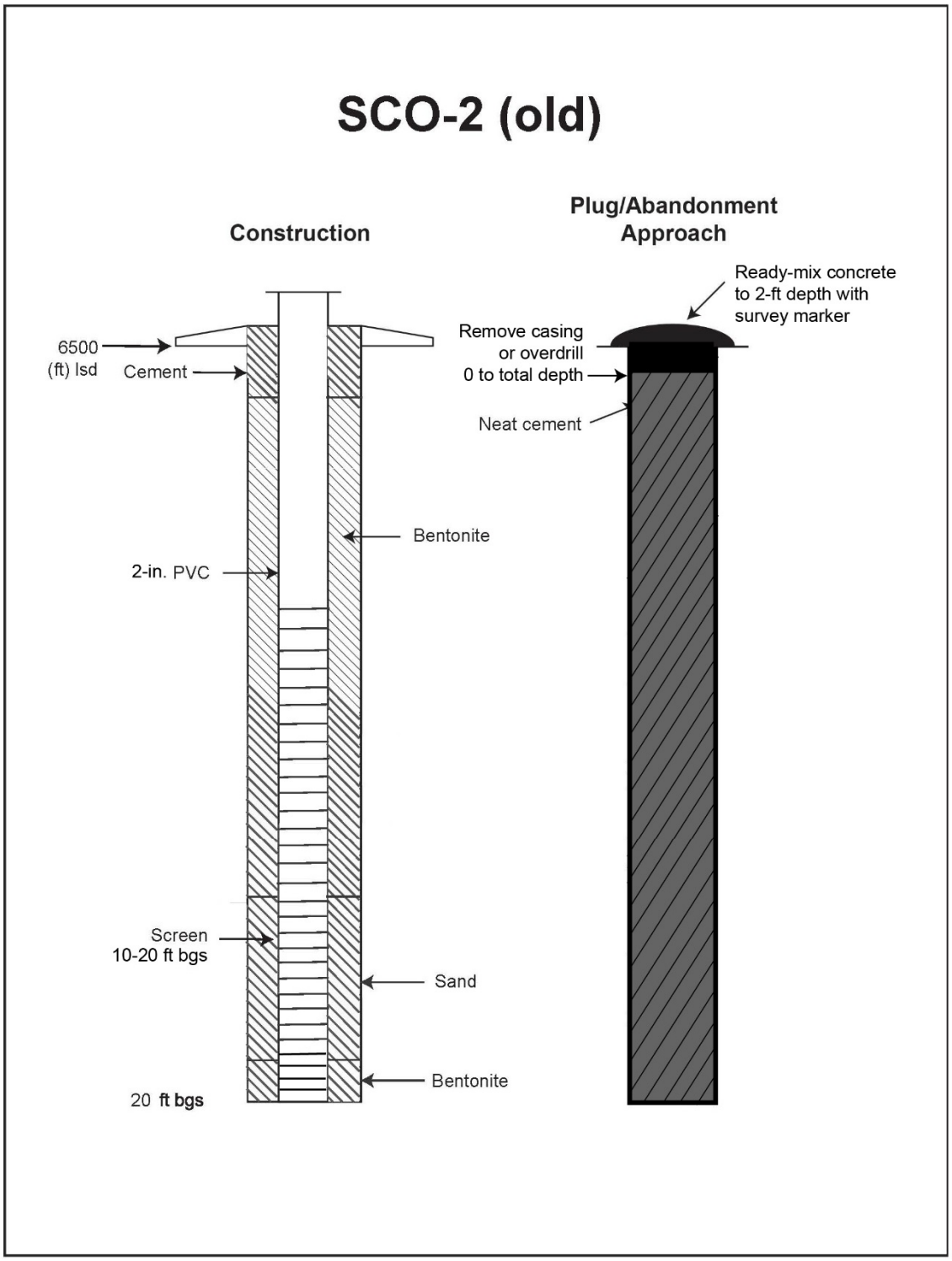


Figure 3.3-1 SCO-2 (old) abandonment schematic

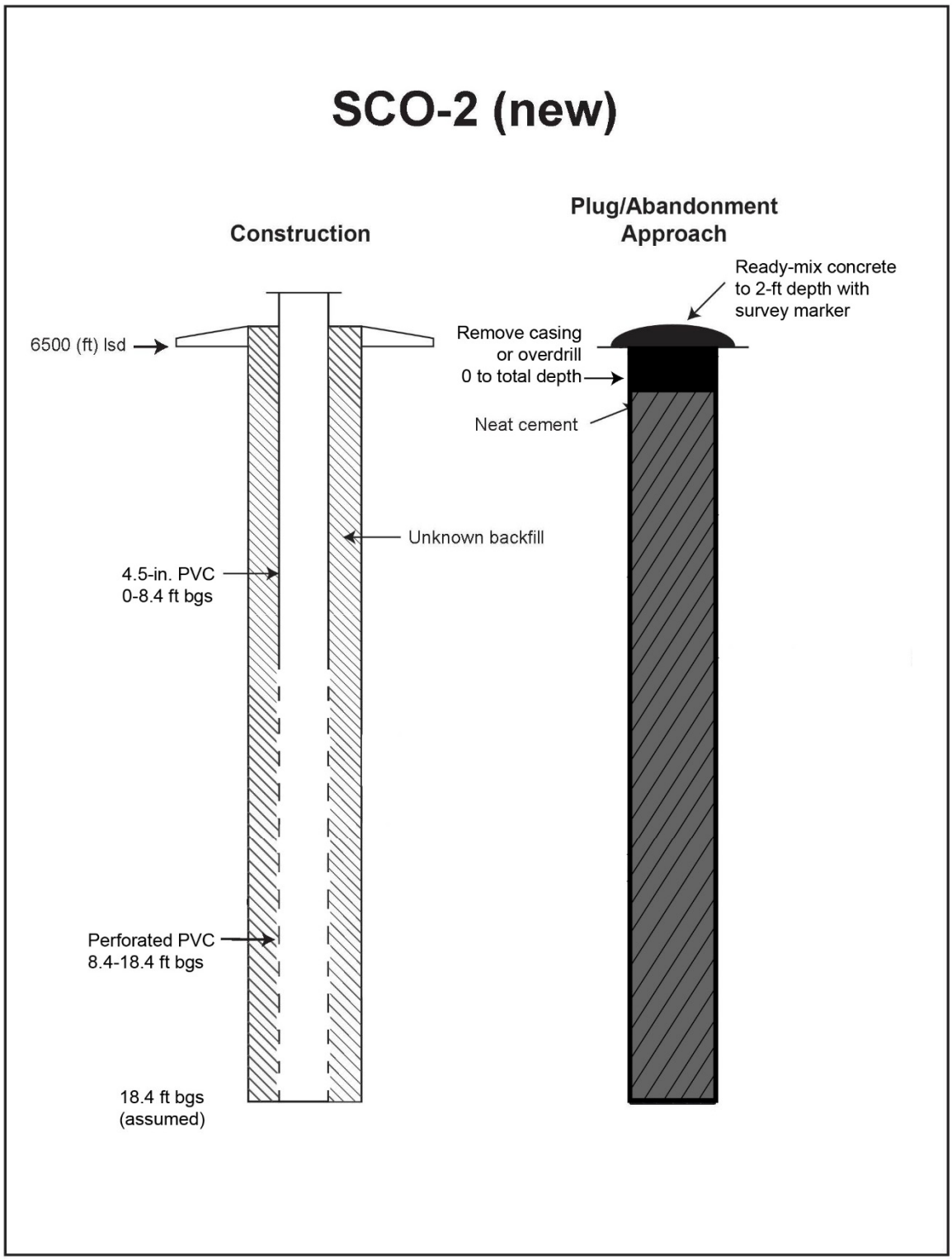


Figure 3.3-2 SCO-2 (new) abandonment schematic

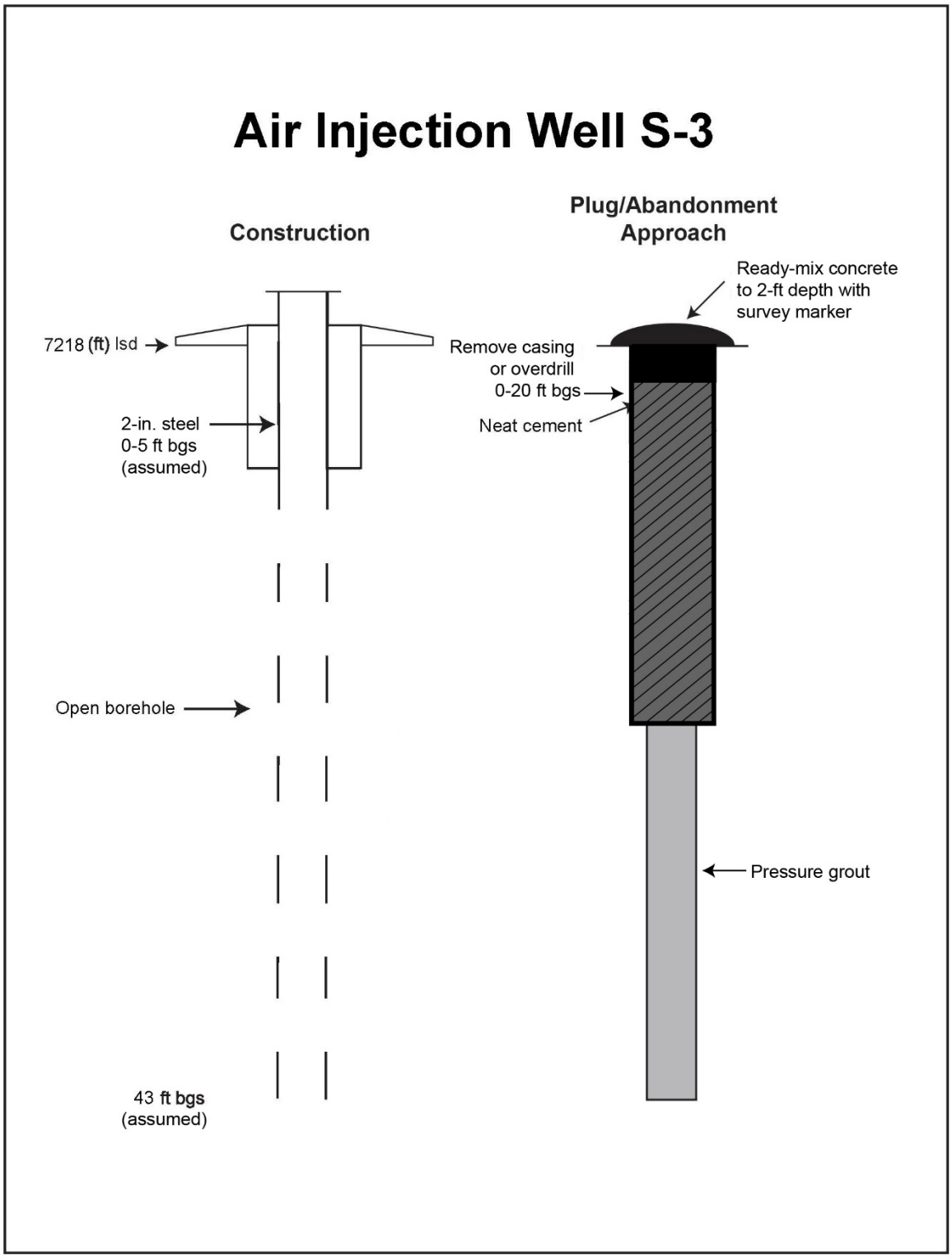
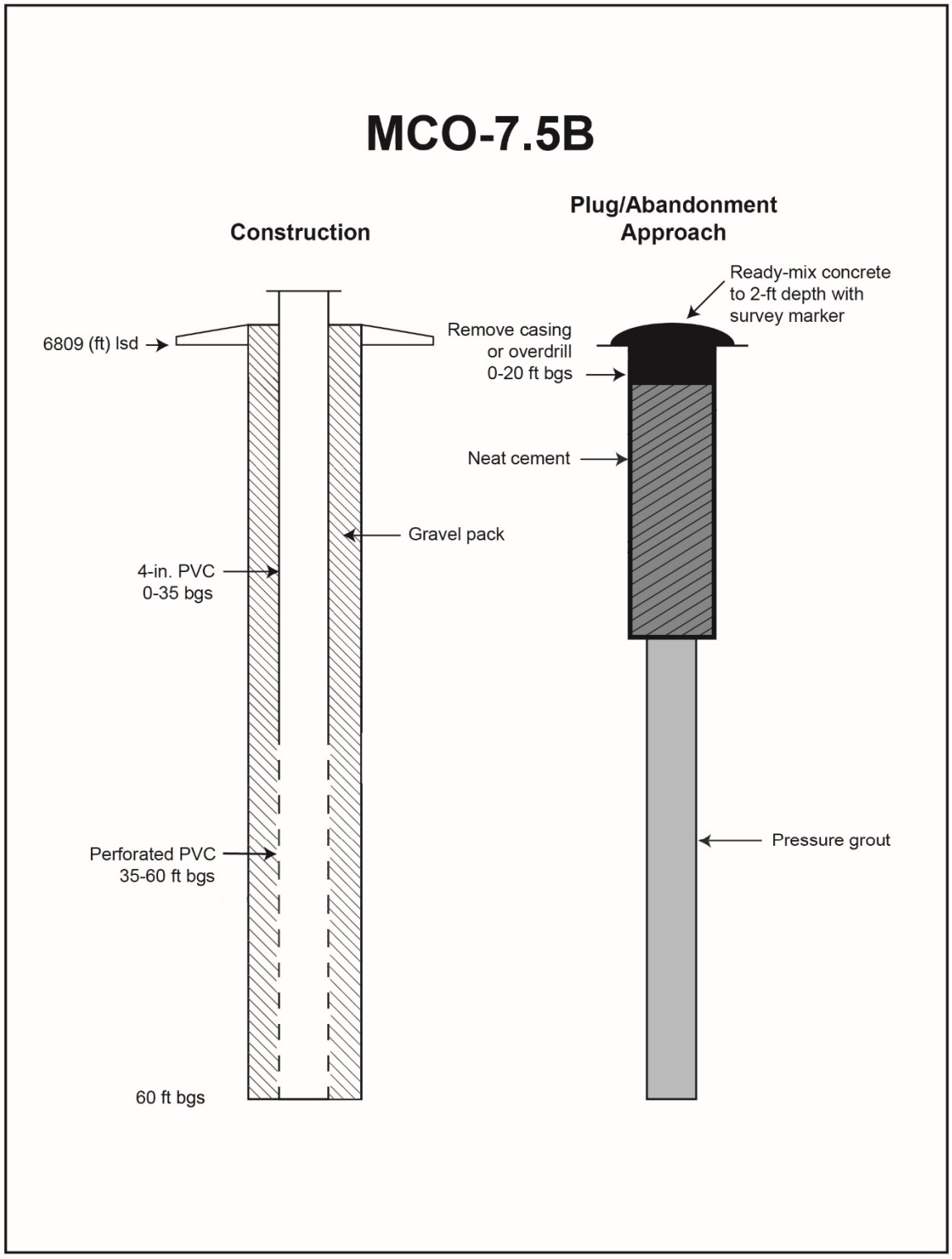
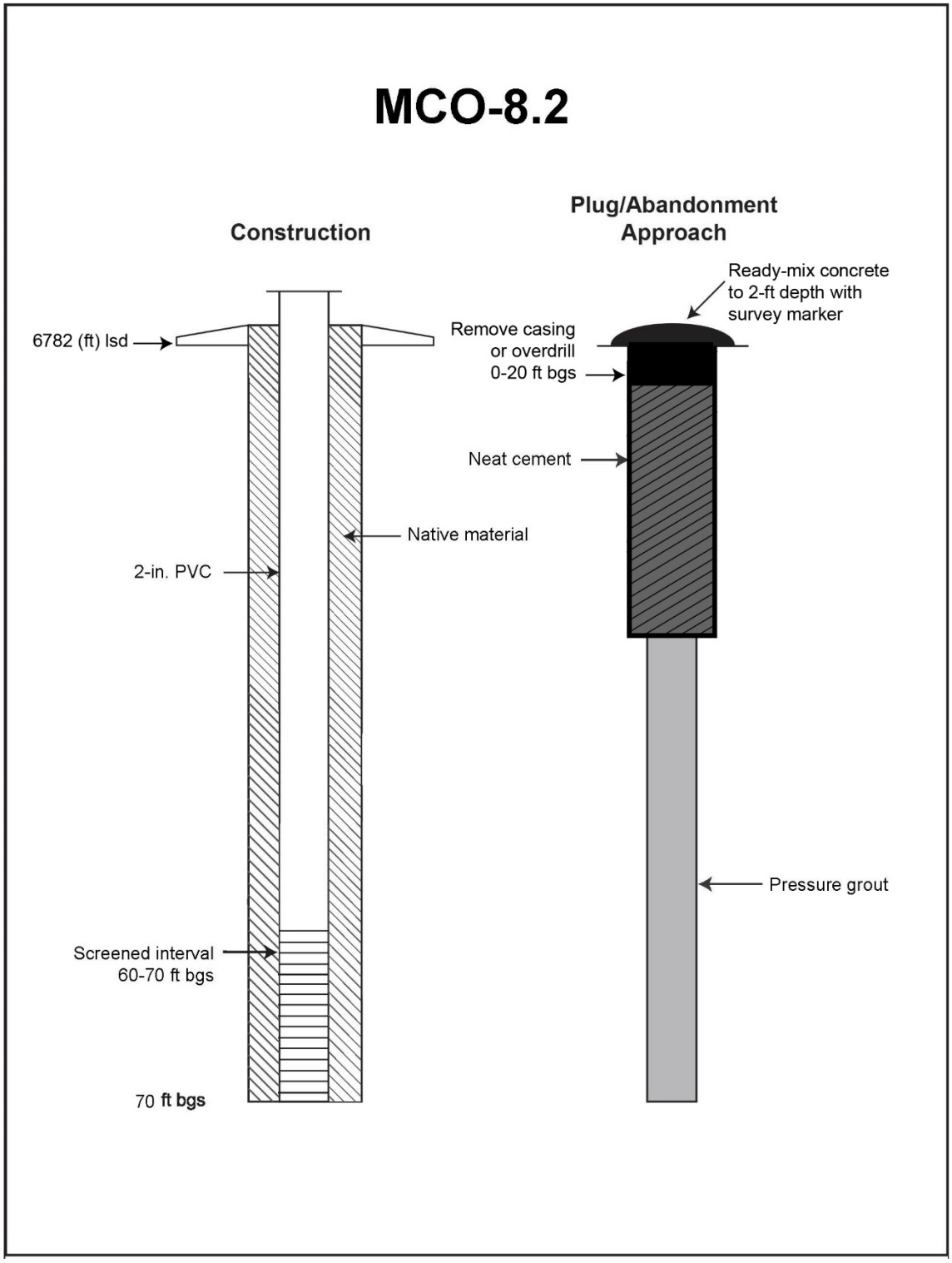


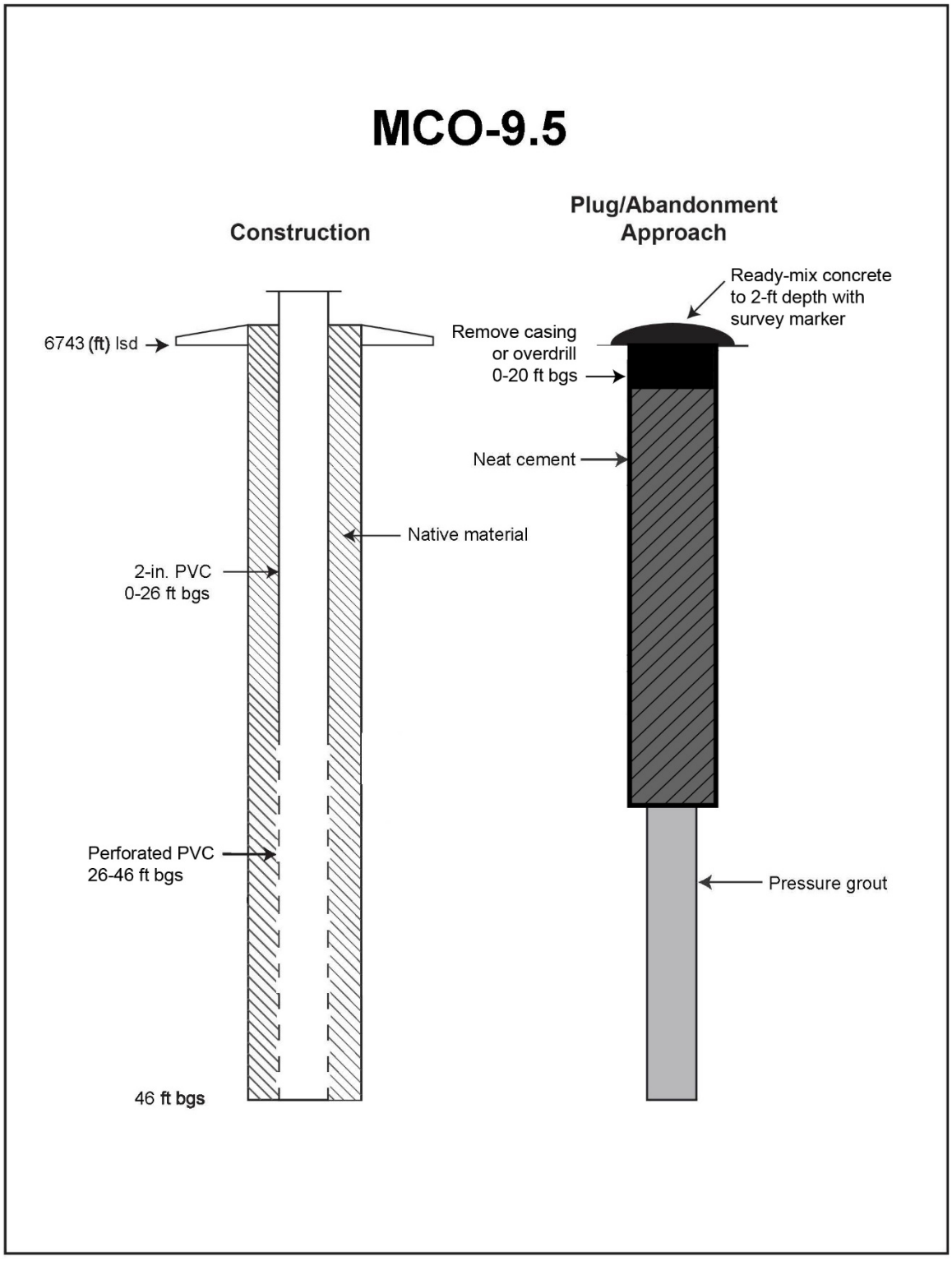
Figure 3.4-1 Air-injection well S-3 abandonment schematic



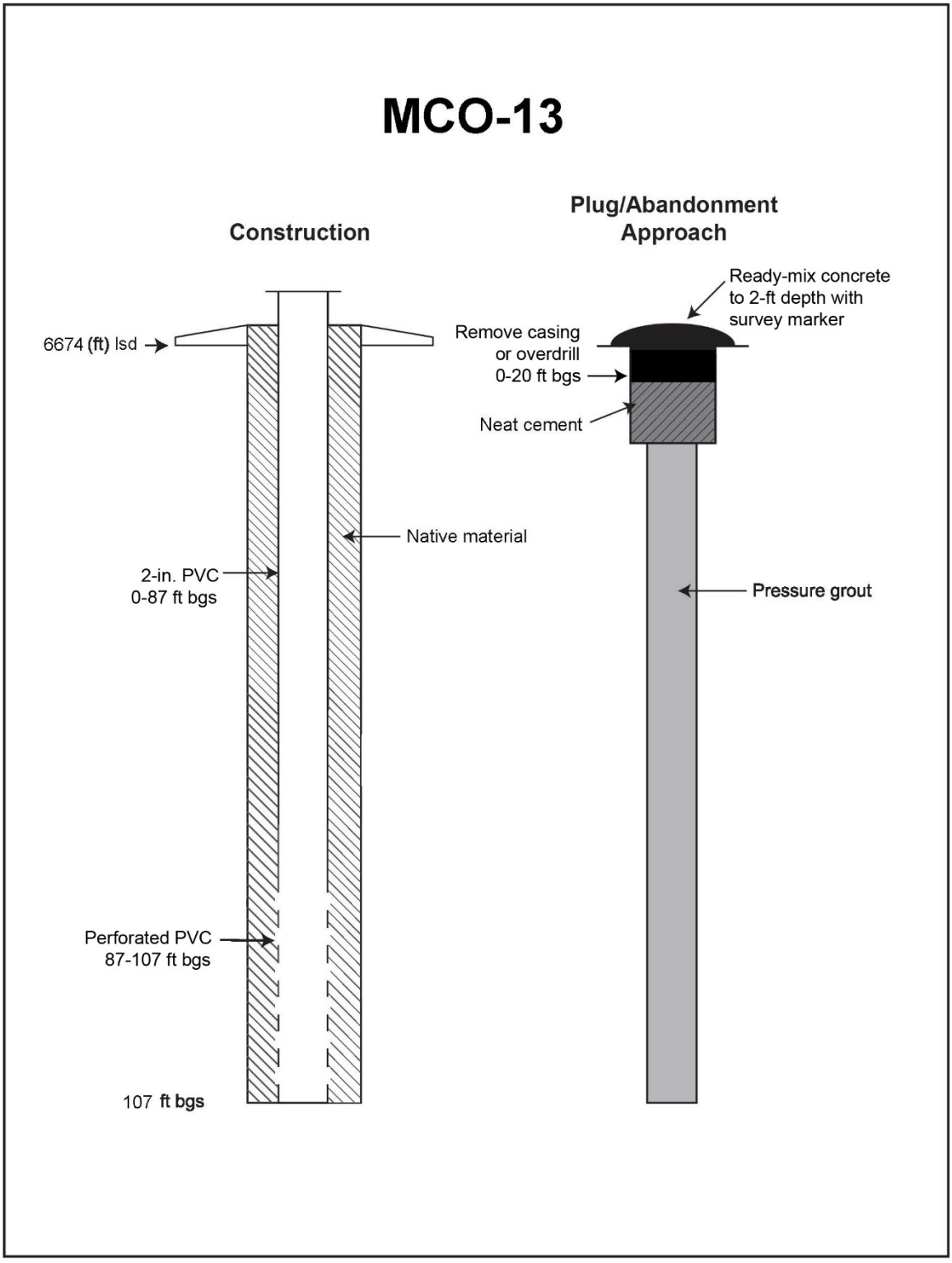
Figures 3.5-1 MCO-7.5B abandonment schematic



Figures 3.5-2 MCO-8.2 abandonment schematic



Figures 3.5-3 MCO-9.5 abandonment schematic



Figures 3.5-4 MCO-13 abandonment schematic

Table 2.0-1
Wells for Plugging and Abandonment in Fiscal Year 2017

Well Name	Depth of Casing (ft)	Diameter (in.)	2017 Water Level (ft bgs)	2017 Total Depth (ft)	Perforated Interval (ft)	Construction Material	Easting	Northing	Elevation
LAO-C	13	3	Bentonite filled	0	3–13	PVC	1622157.8	1775249.7	7050
LAO-1	28	3	3.7	24	8–28	PVC	1629395	1773956.3	6836
LAO-1.2	18	3	5.3	25.3	8–18	PVC	1634642.4	1773082.7	6720
LAO-1.8	18	3	11.3	14.7	8–18	PVC	1635443.1	1772713.5	6680
LAO-2	32	3	11.2	28.7	12–32	PVC	1637607.7	1773095.8	6623
LAO-3	24	3	8.2	18.2	9–24	PVC	1638010.6	1773098.3	6578
LAO-4	24	3	12.8	24.9	14–24	PVC	1640752	1772729.5	6518
LAO-4.5	40	3	4.5	7.7	10–30	PVC	1643659.1	1772087.8	6479
LAO-5	25	3	Dry	22.8	5–25	PVC	1646203	1771424.8	6427
LAO-6	16	3	Dry	14.3	6–16	PVC	1646222.1	1771329.5	6423
PCO-1	12	4	1.3	12	4–12	PVC	1637919.2	1759990.6	6687
PCO-2	9.8	4	6.3	9.8	1.5–9.5	PVC	1641700.3	1757442.75	6618
PCO-3	17	4	3.1	17	5–17	PVC	1646088.6	1755489.3	6546
PCO-4	18	4	Dry	18	Unknown	PVC	1641841.1	1755489.3	6546
PCM-1	8	4	Dry	52	Open hole	PVC/Open	1637944	1760162	6698
PCM-2	7	4	Dry	120?	Open hole	PVC/Open	1641982	1757749.2	6640
PCM-2a	18	2	Dry	18	Unknown	PVC/Open	1641975.3	1757612.5	na*
PCM-3	8	4	Dry	51	Open hole	PVC/Open	1643044	1757162	6615
PCM-4	10	4	Dry	47.4	Open hole	PVC/Open	1644770.8	1756546.1	6585
SCO-2 (old)	20	2	Soil filled	0	10–20	PVC	1647297.5	1768031.5	6500
SCO-2 (new)	18.4	4.5	Dry	18.4	8.4-18.4	PVC	1647288.5	1768026.5	6500
S-3	Unknown	2	Dry	~43 (obstructed at top)	na	Steel	1626587.4	1768998.9	7218
MCO-7.5B	60	4	48.5	55	35–60	PVC	1635455	1768441	6809
MCO-8.2	72	2	Dry	60	60–70	PVC	1636704	1768646	6782
MCO-9.5	46	2	Dry	39.7	26–46	PVC	1638348.5	1768505.8	6743
MCO-13	107	2	Dry	106	87–107	PVC	1641174.2	1767501.8	6674

*na = Not available.