



DEPARTMENT OF ENERGY
 Environmental Management Los Alamos Field Office (EM-LA)
 Los Alamos, New Mexico 87544

EMLA-23-BF132-2-1

February 28, 2023

Mr. Rick Shean
 Bureau Chief
 Hazardous Waste Bureau
 New Mexico Environment Department
 2905 Rodeo Park Drive East, Building 1
 Santa Fe, NM 87505-6313



Subject: Submittal of the Quarterly Status Report for Westbay Well R-25 Plugging and Abandonment Activities, November 9, 2022–February 7, 2023

Dear Mr. Shean:

Enclosed please find two hard copies with electronic files of the “Quarterly Status Report for Westbay Well R-25 Plugging and Abandonment Activities, November 9, 2022–February 7, 2023.” This report is the twelfth of a series of quarterly reports fulfilling the reporting requirement specified by the New Mexico Environment Department Hazardous Waste Bureau in correspondence dated March 18, 2020, “Approval of Request for Extension of Fiscal Year 2020 Appendix B Milestone #6, Westbay Well Plugging and Abandonment Completion Report for R-25, Los Alamos National Laboratory.” This will be the final quarterly report due to the completion of plugging and abandonment field work on February 6, 2023. The R-25 Plugging and Abandonment Completion Report will be submitted to NMED by April 30, 2023.

If you have any questions, please contact Christian Maupin at (505) 695-4281 (christian.maupin@em-la.doe.gov) or Cheryl Rodriguez at (505) 414-0450 (cheryl.rodriguez@em.doe.gov).

Sincerely,

**ARTURO
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Arturo Q. Duran
 Compliance and Permitting Manager
 U.S. Department of Energy
 Environmental Management
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Enclosure(s):

1. Two hard copies with electronic files – Quarterly Status Report for Westbay Well R-25 Plugging and Abandonment Activities, November 9, 2022–February 7, 2023 (EM2023-0101)

cc (letter and enclosure[s] emailed):

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February 2023
EM2023-0101

**Quarterly Status Report for
Westbay Well R-25 Plugging and
Abandonment Activities,
November 9, 2022–February 7, 2023**

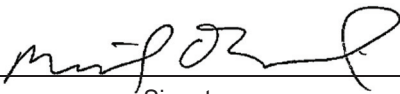


Newport News Nuclear BWXT-Los Alamos, LLC (N3B), under the U.S. Department of Energy Office of Environmental Management Contract No. 89303318CEM000007 (the Los Alamos Legacy Cleanup Contract), has prepared this document pursuant to the Compliance Order on Consent, signed June 24, 2016. The Compliance 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.


Quarterly Status Report for Westbay Well R-25 Plugging and Abandonment Activities, November 9, 2022–February 7, 2023

February 2023


Responsible program director:

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Appendix A Pressure Responses in Nearby Wells During Air/Foam Circulation in R-25 (November 2020–March 2021)

1.0 PURPOSE

This is the twelfth quarterly status report on plugging and abandonment activities for Westbay Well R-25. The report fulfills the quarterly reporting requirement specified by the New Mexico Environment Department (NMED) Hazardous Waste Bureau in correspondence dated March 18, 2020, “Approval, Request for Extension of Fiscal Year 2020 Appendix B Milestone #6, Westbay Well Plugging and Abandonment Completion Report for R-25, Los Alamos National Laboratory” (NMED 2020, 700808), and the “Revised Plugging Plan of Operations for RG-98113 (R-25)” approved by the New Mexico Office of the State Engineer (NMOSE) with amendments (N3B 2020, 700936; NMOSE 2020, 700937).

This report covers the period from November 9, 2022, through February 7, 2023, the twelfth quarter since the extension for R-25 plugging and abandonment activities was requested by the U.S. Department of Energy Environmental Management Los Alamos Field Office (EM-LA) on February 24, 2020 (DOE 2020, 700774). It summarizes activities related to Westbay system removal from well R-25, reviews planned activities for the next quarter, and provides expectations for project completion.

2.0 OVERVIEW

EM-LA and Newport News Nuclear BWXT-Los Alamos, LLC (N3B) have completed the process of plugging and abandoning well R-25, with only waste management and site restoration activities to be accomplished. Requirements for work at R-25 were set forth in the “Work Plan to Plug and Abandon Well R-25” (LANL 2012, 232352), NMED’s approval with direction received January 11, 2013 (NMED 2013, 521801), and guidance provided in the 2016 Compliance Order on Consent (Consent Order) Appendix F, Sampling/Analytical/Field Method Regulatory Guidance, Section II.D, Well Abandonment. NMOSE originally approved the “Plugging Plan of Operations for RG-98113 (R-25)” in correspondence to N3B dated July 15, 2019 (NMOSE 2019, 700876).

Monitoring well R-25, located in Technical Area 16 on the mesa top above Cañon de Valle in the southwestern portion of the Los Alamos National Laboratory (LANL or the Laboratory), was the third well installed as part of the implementation of the “Hydrogeologic Workplan” (LANL 1998, 059599). Well R-25 was primarily designed to provide water-quality, geochemical, hydrologic, and geologic information that would contribute to the understanding of the hydrogeologic setting beneath the Laboratory. Drilling, well installation, and site restoration operations occurred from July 1998 through May 2001. The location of well R-25 is depicted in Figures 2.0-1 and 2.0-2.

The R-25 borehole was drilled to a depth of 1942 ft (all depths are below ground surface) using air-rotary drilling methods. Well R-25 was constructed with nine screened intervals; however, two of the screens, screens 3 and 9, were damaged during well-installation activities. Screens 3 and 9 were restored to partial usefulness, and all well screen intervals were developed before installation of a Westbay multiport sampling system. Because of groundwater sample quality concerns, NMED directed in 2012 that well R-25 be removed from service from the Laboratory monitoring network and plugged and abandoned. A plugging and abandonment plan was submitted on December 13, 2012 (LANL 2012, 232352), and NMED approved the plan with modifications on January 11, 2013 (NMED 2013, 521801).

The original scope of the R-25 plugging and abandonment project included extraction of the 1834-ft, 9-port Westbay sampling system from the R-25 well casing using a hoist rig; perforation of select intervals of well casing; and plugging of the well. Work completed through February 2020 consisted of the removal of approximately 1155 ft of the Westbay system to above packer 11 (of 26 packers total on the Westbay system) using a hoist rig. During retrieval or “fishing” operations to remove the Westbay system, a portion of the steel pipe fishing string (BQ pipe) became lodged adjacent to and at the top of the remaining

Westbay casing and debris. Conventional operations were unable to retrieve the remainder of the components in the well. Depth of the top of the Westbay fish (remaining Westbay system and BQ pipe) was approximately 1088 ft, with approximately 681 ft of the Westbay system remaining in the well.

The R-25 well site was placed in safe configuration for Mexican spotted owl restrictions starting March 1, 2020. The hoist rig and related equipment were demobilized from the site. Spotted owl restrictions were lifted on March 10, 2020, for the R-25 project after Triad National Security, LLC, biologists reevaluated the well maintenance biological assessment (Hathcock et al. 2017, 700877) and determined that the R-25 work would not interfere with spotted owl activities.

On March 23, 2020, N3B/EM-LA transitioned to essential mission critical activities (EMCA) status as a prudent measure in response to the COVID-19 pandemic. Under the EMCA status, the only Consent Order activity that remained operational was the maintenance of groundwater monitoring well packer systems. The R-25 location was placed in safe configuration and field activities remained suspended during EMCA status.

Following the transition to EMCA status, the R-25 Integrated Project Team (IPT) was created to plan, coordinate, and execute project activities. This team has continued to meet regularly to delegate and execute project work, discuss progress, and work through planning and project preparedness issues. Under the EMCA status, the IPT staff were actively working on the R-25 project through telecommuting. Several important R-25 project-related communications via correspondence were generated during the first quarter of the EMCA status. These communications included the following:

- In a letter dated March 17, 2020, EM-LA provided information to NMED regarding the methods for the removal of pipe and Westbay components in R-25 and a listing of potential drilling fluid additives that might be required to complete the work (DOE 2020, 700806). NMED approved the use of a variety of drilling fluids to assist with the recovery of the Westbay system from R-25 in the letter titled “Approval, Drilling Fluid Additive Use Options for Well R-25, Westbay Sampling System Removal,” dated April 7, 2020 (NMED 2020, 700840). Per the approval letter, upon resumption of the field program, details describing the use of drilling fluids and transducer pressure responses recorded at nearby wells R-25b, CdV-16-4ip, and CdV-16-1(i) would be reported in the monthly project status updates and quarterly reports.
- The “Revised Plugging Plan of Operations for RG-98113 (R-25)” was approved by NMOSE with amendments in a letter dated June 19, 2020 (N3B 2020, 700936; NMOSE 2020, 700937).

Following the lifting of EMCA status and the finalization of planning for the continued fishing operations to extract the remaining 681 ft of Westbay system remaining in R-25, a rotary drilling rig was mobilized to the site in November 2020. Milling operations began on November 19, 2020, after reprogramming of pressure transducers in nearby wells R-25b, CdV-16-4ip, and CdV-16-1(i) to record pressure data at 5-min intervals. An estimated 150.5 ft of Westbay sampling system and extraneous metal debris (dropped wrench, grapple dies, dropped BQ pipe) was removed by rotary milling during November 19–December 7, 2020, using air/foam circulation, with an additional downward push of 51 ft of the system recorded, leaving the top of the fish at 1291.5 ft. On December 7, 2020, a partial collapse of the compromised screen 3 interval was discovered. Video evidence confirmed that the collapsed and unstable zone from 1054 ft to 1071 ft presented significant hazards to continued milling operations, with formation material and screen fragments lodged in screen 4.

The rotary rig was demobilized from December 10 through December 16, 2020, because of the timeframe anticipated for discussions of potential paths forward, the upcoming holiday break, and limitations posed by the rig. After investigating available options, the project team decided to use a hydraulic workover rig to install an expandable steel casing patch liner in the screen 3 zone and continue milling/fishing

operations. Mobilization of the hydraulic workover rig and ancillary equipment to R-25 was completed on February 7, 2021, followed by caliper and video logging of the damaged zone during February 7–February 9, 2021, in preparation for the casing patch installation.

After programming nearby wells R-25b, CdV-16-4ip, and CdV-16-1(i) to record pressure data in 5-min intervals, the 40-ft-long, 4.25-in.-inside-diameter (I.D.) casing patch liner was successfully installed from 1044 ft to 1084 ft on March 2, 2021. Milling operations with a 4.25-in. concave mill began on March 3, 2021, at a depth of 1293 ft, and progressed to 1305.4 ft on March 7, 2021, just below screen 5, when the work string became stuck while being pulled upwards. After 2 days of working the stuck tool string with rotation, air/foam circulation, and up to 90,000 lb of rig over-pull (rig pull in excess of the tool string weight), the field team was successful in freeing the stuck tools and removing them from the well.

A subsequent camera survey revealed that a 69-ft section of well casing had parted at a coupling and had been raised and forced into the section of casing above. The top of the lifted section was lodged at 1155 ft and the base at 1224 ft, with exposed Puye Formation sediments from 1224 ft to 1252 ft and formation slough below. This situation made any further Westbay extraction operation impossible.

A 4.25-in. string mill was run through the lifted casing section to smooth the torn and ragged edges to ensure later passage of a knife perforator in this zone during the anticipated plugging and abandonment operations. A retrievable packer below screen 2 was then installed to prevent the downward movement and commingling of contaminated groundwater. Discussion began with the NMED Hazardous Waste Bureau regarding a revised plugging and abandonment plan consistent with current well conditions, as well as communication of well status to NMOSE. Demobilization of the hydraulic workover rig began on March 19, 2021, and was completed on March 25, 2021. The well site was secured and no further activities have taken place at the site. IPT meetings were discontinued in March 2021 pending decisions on forward progress.

In April 2021, N3B proposed to NMOSE a revision to the plugging and abandonment plan (Gaddy 2021, 701382). On February 7, 2022, NMOSE provided direction on plugging and abandonment in a letter titled “Re: Request for Amendment to Approved [Amended] Well Plugging Plan of Operation Conditions of Approval for RG-98113” (NMOSE 2022, 701871). A follow-up meeting was held on February 8, 2022, with representatives of NMOSE, NMED, EM-LA, and N3B to discuss the details of the amended and approved plugging plan of operations. Since this meeting, preparedness for the next phase of plugging and abandonment has been ongoing. A New Mexico licensed drilling subcontractor, Layne Christensen (Layne), was selected to perform the scope of work in accordance with NMOSE conditions of approval and was awarded a contract. Layne rig and equipment was mobilized to site in December 2022.

After removal of the bridge plug installed below screen 2, the depth of formation slough was tagged at 1253 ft and the well was video logged to verify well condition and depth of important features. NMOSE witnessed the tagging and logging, and received copies of the video files. Following the video logging, a neat cement plug was installed to seal the interval 1253 ft to 1220 ft. Cement pumping was witnessed by NMOSE and photos of the operation provided to them. The rig and site were then secured for the holiday break. Upon resumption of field activities on January 9, 2023, the top of cement was tagged to verify depth. Unfortunately, the apparent collapse of formation slough during cement pumping led to the top of cement being located at 1268 ft, approximately 15 ft below the anticipated bottom of the plug.

Another lift of cement (130 gal.) was pumped on January 10, 2023, and after curing was tagged at 1248 ft. A second lift of 130 gal. was pumped on January 10, but the field crew was unable to tag this due to an obstruction at 1205 ft preventing passage of pipe or depth sounder. Per discussion with NMOSE, it was determined that jet perforation could proceed from 1205 ft. Explosive jet perforation was conducted

on January 20, 2023, with successful perforation from 1201ft to 1175 ft. Perforation was witnessed by NMOSE.

After a successful pressure test of the perforated interval, pressure cementing was conducted on January 25, 2023, using a packer assembly and procedure approved by NMOSE with conditions on December 23, 2022. A fixed calculated volume of 120 gal. of cement was pumped, but no positive pressures were noted during the operation. After it was subsequently confirmed that no seal had been achieved, a second pressure cementing operation was conducted on January 31, 2023. During this operation, cement with N-Seal LCM (lost circulation material, NSF [National Sanitary Foundation] approved, with fibrous content to seal off formation porosity) was pumped until positive pressure of 2300 psi was recorded, followed by water to displace cement in the tremie pipe. When pressure climbed to 2500 psi, water displacement was stopped to prevent damage to the formation. The packer was immediately deflated and removed from the well. A total volume of 1134 gal. of cement was pumped in this operation. The emplaced seal was tagged at 915 ft the following day. NMOSE witnessed both cementing operations and approved the continuation of planned plugging and abandonment activities upward from 915 ft.

The well casing was mechanically perforated from 915 ft to 55 ft using a starwheel perforator on February 2–3, 2023, and this entire interval was filled in one continuous lift of neat cement grout on February 4, 2023. Overnight settling of the cement required an additional 4 ft of cement to be added to the well on February 5, 2023, with no additional settling noted on February 6, 2023, a full 48 hr after completion of the cement plug. Demobilization of rig and equipment from site was conducted on February 6 and February 7, 2023.

2.1 Fluids Injected and Fluids Circulated to Surface (2020 – 2021)

No circulation has been conducted since the retrievable packer was installed in March 2021. The following are totals of fluids injected and circulated from November 2020 through March 2021.

- 345 gal. of AQF-2 foaming agent injected
- 84,000 gal. of potable water injected and pumped (includes water introduced during milling, video logging, and casing patch expansion)
- 59,000 gal. of water (injected and formation), foaming agent, suspended fine Westbay solid material, and suspended formation fines circulated to surface and collected as waste

All 59,000 gal. of liquid waste have been shipped off-site for disposal.

2.2 Fluids Pumped During Cementing Operations (2022 – 2023)

During pressure testing and cementing operations, the following fluids were introduced into the well:

- 2198 gal. of potable water
- 2565 gal. of cement slurry

2.3 Solid Waste Generated (2020 – 2021)

Solid waste generated from November 2020 through March 2021 totaled

- eight 55-gal. drums of Westbay solid and formation debris and
- four 5-gal. pails of oil-stained base course material (hydraulic fluid).

All solid waste was disposed of during the sixth and eighth quarterly reporting periods.

2.4 Waste Generated During Pressure Cementing (2022 – 2023)

Approximately 1800 gal. of cement washout was collected during cementing operations, consisting of cement slurry residue and potable water used to rinse equipment. After evaporation, the solid material will be disposed of as solid cement debris.

2.5 Pressure Response in Nearby Wells

Pressure data for wells R-25b, CdV-161(i), and CdV-16-4ip and air/foam circulation dates and times during milling operations are presented in Appendix A.

Cross-hole aquifer tests performed in 2016 indicated that hydraulic communication between water-bearing zones in the upper Puye Formation in CdV-16-1(i), CdV-16-4ip, R-25b, and R-25 screen 2 occurs as a laterally interconnected saturated zone that is at least as large as the rough triangle formed by these wells. As expected, water-level responses were noted in adjacent wells during open-hole drilling of CdV-16-1(i), CdV-16-4ip, and R-25b. In the recent R-25 fishing operations, however, the air/foam circulation discharge was constrained within the 5-in.-I.D. stainless-steel well casing and exposed to the formation only through screens 1 and 2, both of which are located in relatively tight strata. Therefore, it is not surprising that pressure responses in the nearby wells were not apparent in the pressure data.

Pressure responses in nearby wells were not monitored during plugging and abandonment activities in December 2022–February 2023.

3.0 SUMMARY OF WORK COMPLETED DURING THE TWELFTH QUARTERLY REPORTING PERIOD

As required during the twelfth quarterly reporting period, EM-LA submitted two monthly status reports to NMED on December 29, 2022, and January 27, 2023. This twelfth quarterly report summarizes project work completed through the end of the twelfth quarter of the reporting period (November 9, 2022–February 7, 2023). IPT status meeting were held weekly.

Project progress during the twelfth quarter included the following:

- Conducting weekly Storm Water Pollution Prevention Plan inspections and regular waste management activities
- Preparing the December 2022 and January 2023 R-25 monthly status reports and the R-25 twelfth quarterly report for NMED, due February 28, 2023
- Mobilization of equipment and personnel for the field work, successful completion of all field activities as defined in the Approved Plugging Plan of Operations, and demobilization of all equipment and personnel

4.0 SUMMARY OF WORK PLANNED FOR THE NEXT QUARTER

A Well Plugging Record will be submitted to NMOSE by March 8, 2023. The R-25 Plugging and Abandonment Completion Report will be prepared and submitted to NMED by April 30, 2023.

5.0 PROJECT COMPLETION

With the completion of plugging and abandonment field work, monthly updates will no longer be provided. The completion report will be submitted to NMED by April 8, 2023.

6.0 REFERENCES

The following reference list includes documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ERID, ESHID, or EMID. ERIDs were assigned by the Laboratory's Associate Directorate for Environmental Management (IDs through 599999); ESHIDs were assigned by the Laboratory's Associate Directorate for Environment, Safety, and Health (IDs 600000 through 699999); and EMIDs are assigned by N3B (IDs 700000 and above).

DOE (U.S. Department of Energy), February 24, 2020. "Status of Westbay Well R-25 Reconfiguration Efforts and Request for Extension of Fiscal Year 2020 Appendix B Milestone #6, Westbay Well Plugging and Abandonment Completion Report for R-25," U.S. Department of Energy letter (EMLA-2020-1275-02-001) to K. Pierard (NMED-HWB) from A. Duran (EM-LA), Los Alamos, New Mexico. (DOE 2020, 700774)

DOE (U.S. Department of Energy), March 17, 2020. "Drilling Fluid Additive Use Options for Well R-25 Westbay Sampling System Removal," U.S. Department of Energy letter (EMLA-2020-1274-02-001) to K. Pierard (NMED-HWB) from A. Duran (EM-LA), Los Alamos, New Mexico. (DOE 2020, 700806)

Gaddy, S.L., April 15, 2021. R-25 Plug and Abandonment meeting. E-mail message to C. Thornburg (NMOSE) from S.L. Gaddy (N3B), Los Alamos, New Mexico. (Gaddy 2021, 701382)

Hathcock, C.D., D.C. Keller, B.E. Thompson, and J. Berryhill, February 2017. "Biological Assessment of the Continued Operation and Expansion of the Water Monitoring Programs at Los Alamos National Laboratory," Los Alamos National Laboratory document LA-UR-17-20753, Los Alamos, New Mexico. (Hathcock et al. 2017, 700877)

LANL (Los Alamos National Laboratory), May 22, 1998. "Hydrogeologic Workplan," Los Alamos National Laboratory document LA-UR-01-6511, Los Alamos, New Mexico. (LANL 1998, 059599)

LANL (Los Alamos National Laboratory), December 2012. "Work Plan to Plug and Abandon Well R-25," Los Alamos National Laboratory document LA-UR-12-26836, Los Alamos, New Mexico. (LANL 2012, 232352)

N3B (Newport News Nuclear BWXT-Los Alamos, LLC), May 28, 2020. "Revised Plugging Plan of Operations for RG-98113 (R-25)," N3B letter (N3B-2020-0181) to L. Garcia (NMOSE) from B. Smith (N3B) and A.Q. Duran (EM-LA), Los Alamos, New Mexico. (N3B 2020, 700936)

NMED (New Mexico Environment Department), January 11, 2013. "Approval with Modification, Work Plan to Plug and Abandon Well R-25," New Mexico Environment Department letter to P. Maggiore (DOE-LASO) and J.D. Mousseau (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2013, 521801)

NMED (New Mexico Environment Department), March 18, 2020. "Approval, Request for Extension of Fiscal Year 2020 Appendix B Milestone #6, Westbay Well Plugging and Abandonment Completion Report for R-25," New Mexico Environment Department letter to A. Duran (EM-LA) from K. Pierard (NMED-HWB), Santa Fe, New Mexico. (NMED 2020, 700808)

NMED (New Mexico Environment Department), April 7, 2020. "Approval, Drilling Fluid Additive Use Options for Well R-25, Westbay Sampling System Removal," New Mexico Environment Department letter to A. Duran (EM-LA) from K. Pierard (NMED-HWB), Santa Fe, New Mexico. (NMED 2020, 700840)

NMOSE (New Mexico Office of the State Engineer), July 15, 2019. "Re: Plugging Plan of Operations for RG-98113 (R-25)," NMOSE letter to M. Everett (N3B) from L. Garcia (NMOSE), Santa Fe, New Mexico. (NMOSE 2019, 700876)

NMOSE (New Mexico Office of the State Engineer), June 19, 2020. "Re: Plugging Plan of Operations for RG-98113 (R-25)," NMOSE letter to M. Everett (N3B) from L. Garcia (NMOSE), Santa Fe, New Mexico. (NMOSE 2020, 700937)

NMOSE (New Mexico Office of the State Engineer), February 7, 2022. "Re: Request for Amendment to Approved [Amended] Well Plugging Plan of Operation Conditions of Approval for RG-98113," NMOSE letter to C. Maupin (N3B) from C. Thornburg (NMOSE), Santa Fe, New Mexico. (NMOSE 2022, 701871)

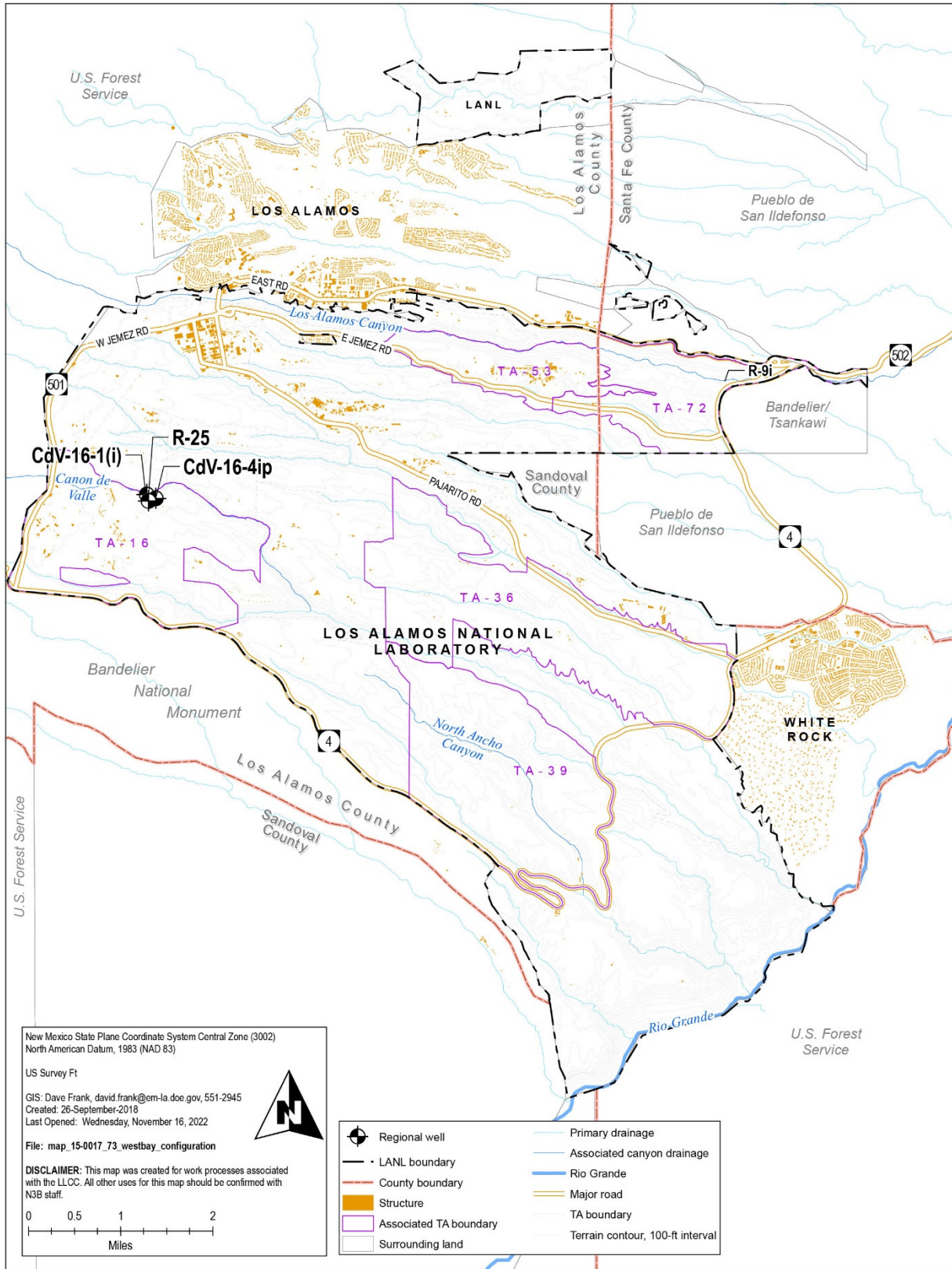


Figure 2.0-1 Location of well R-25

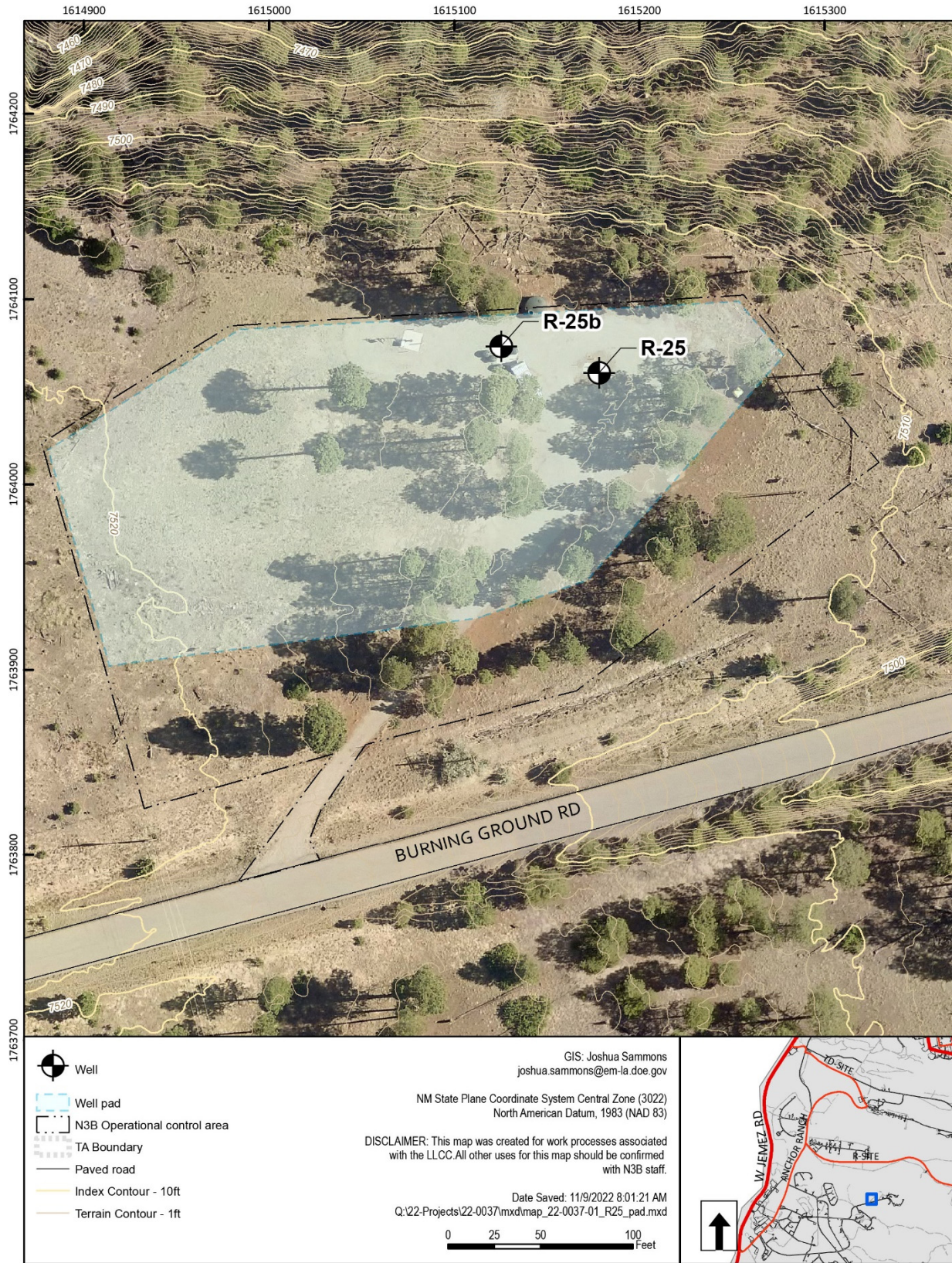


Figure 2.0-2 R-25 project site map

Appendix A

*Pressure Responses in Nearby Wells
During Air/Foam Circulation in R-25
(November 2020–March 2021)*

A-1.0 PRESSURE DATA RECORDING

Pressure transducers in monitoring wells R-25b, CdV-16-4ip, and CdV-16-1(i) were programmed at 13:00–14:00 on November 17, 2020, to record pressure data in 5-min intervals during the period in which air/foam circulation was expected to be used during reaming, milling, and fishing operations at R-25.

Circulation occurred November 20–December 7, 2020, during shifts that ran from 14:00 to 02:00 (2 p.m. one day to 2 a.m. the next). The circulation dates and times are listed in Table A-1.0-1.

After suspension of downhole operations on December 7, 2020, following the partial collapse of screen 3, the transducers were reprogrammed to record in hourly intervals. Before a resumption of operations in February 2021, the transducers in R-25b, CdV-16-4ip, and CdV-16-1(i) were again programmed to record pressure data in 5-min intervals.

Following the successful installation of the casing patch liner on March 2, 2021, milling operations resumed with air/foam circulation occurring March 3–March 9, 2021, during 07:00 to 19:00 shifts in which milling and subsequent stuck tool recovery was conducted. The circulation dates and times for this phase of operations are listed in Table A-1.0-1 as well.

Note: No additional circulation has occurred since March 9, 2021, and no pressure responses were monitored during perforation and cementing operations in 2022–2023.

**Table A-1.0-1
Circulation Dates and Times**

Shift Date	Circulation Time
2020	
11/20–11/21	19:00–21:00
11/21–11/22	None
11/22–11/23	19:15–00:45
11/23–11/24	None
11/24–11/25	15:45–01:08
11/25–11/26	15:20–01:00
11/26–11/27	20:15–01:15
11/27–11/28	15:15–22:50
11/28–11/29	18:30–23:30
11/29–11/30	00:05–01:20
11/30–12/01	15:00–01:10
12/01–12/02	None
12/02–12/03	15:20–01:20
12/03–12/04	16:14–23:30
12/04–12/05	None
12/05–12/06	15:52–00:00
12/06–12/07	17:06–19:00
12/07–12/08	15:50–18:40

Table A-1.0-1 (continued)

Shift Date	Circulation Time
2021	
03/03	13:50–18:20
03/04	09:20–11:55, 17:57–18:40
03/05	11:22–17:50
03/06	None
03/07	08:48–17:30, 19:05–19:25
03/08	11:35–18:45 intermittently
03/09	08:30–14:30 intermittently

Circulation occurred during reaming, milling, and subsequent tool recovery at depths of 1054–1305.4 ft below ground surface (bgs). The regional aquifer was not encountered until the December 6–December 7 shift, at a depth of approximately 1286 ft bgs, according to field records.

Hydrographs of pressure data recorded in the nearby wells during the months of November and December 2020 and March 2021 are presented in Figures A-1.0-1 through A-1.0-6. The data indicate no apparent correlation between R-25 circulation events and pressure responses in the three wells.

It is not surprising that circulation of air/foam during the milling in R-25 did not produce noticeable pressure responses at R-25b, CdV-16-4ip, and CdV-16-1(i). The circulation was constrained within 5-in. inside-diameter stainless-steel well casing at depths of 1054–1291.5 ft, with the pressurized air/foam discharged to the surface. Pressurized drilling fluid had access to the upper perched-intermediate zone only through the R-25 screens 1 and 2. Both screens are located in relatively tight strata and produce low groundwater flows when sampled. Any pressurization of groundwater near screens 1 and 2 was therefore minimal.

In addition to the graphic format presented in Figures A-1.0-1 through A-1.0-6, Attachment A-1 (on CD included with this document) presents data in digital form.

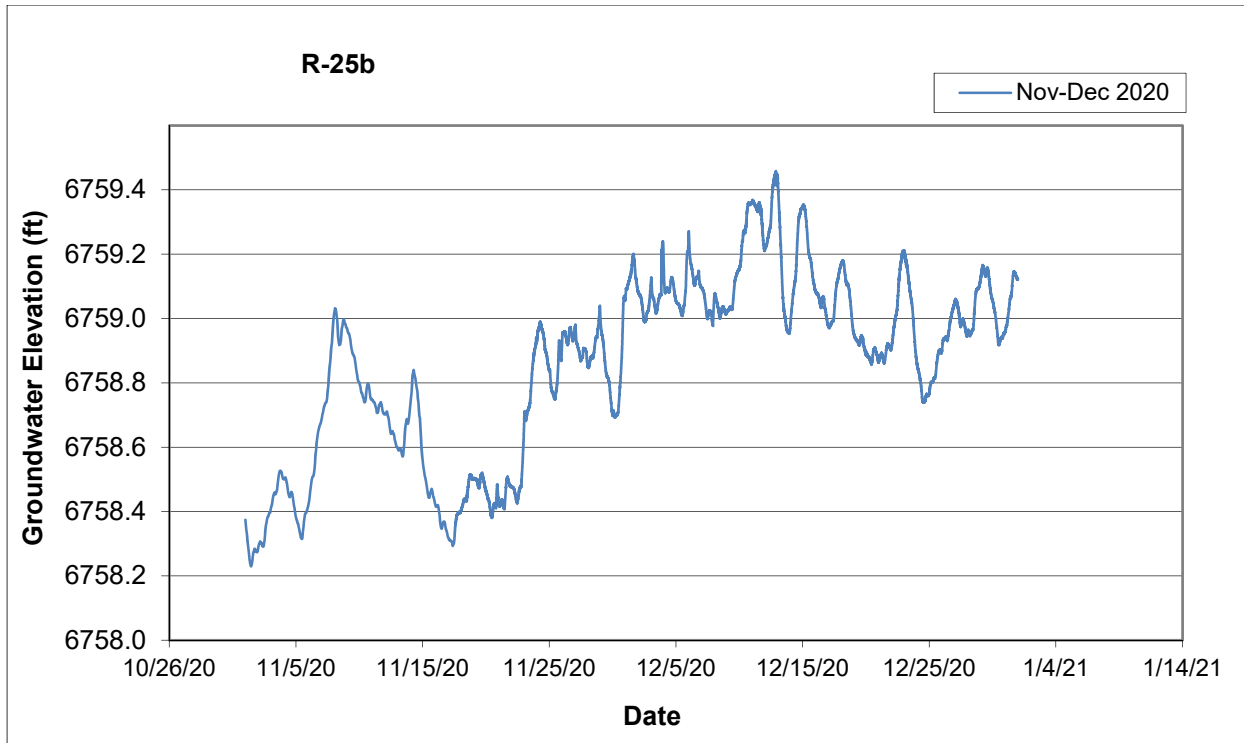


Figure A-1.0-1 R-25b pressure data (November–December 2020)

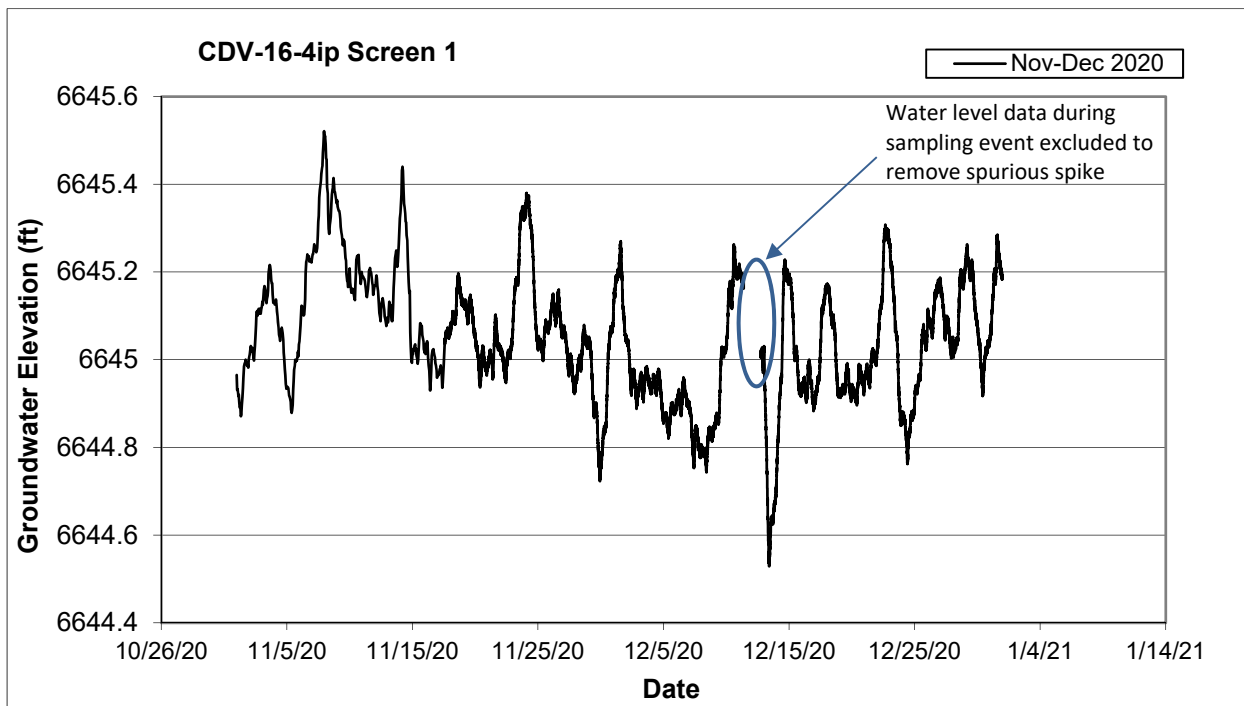


Figure A-1.0-2 CdV-16-4ip pressure data (November–December 2020)

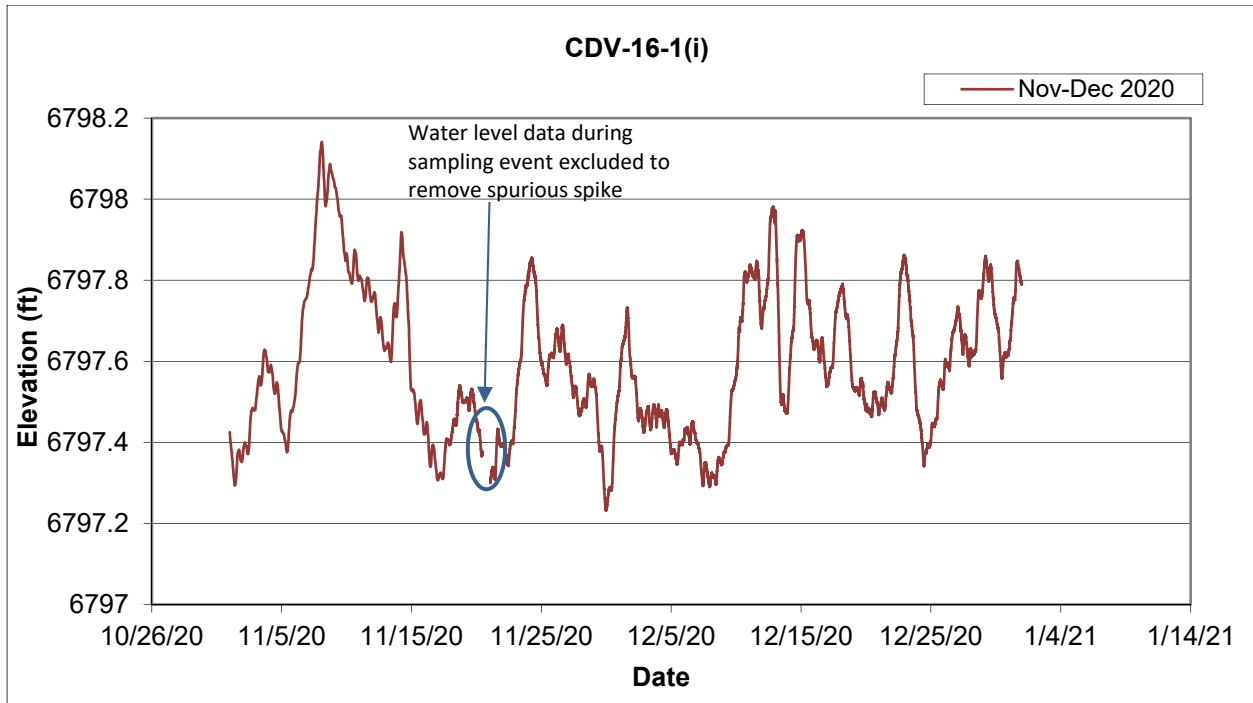


Figure A-1.0-3 CdV-16-1(i) pressure data (November–December 2020)

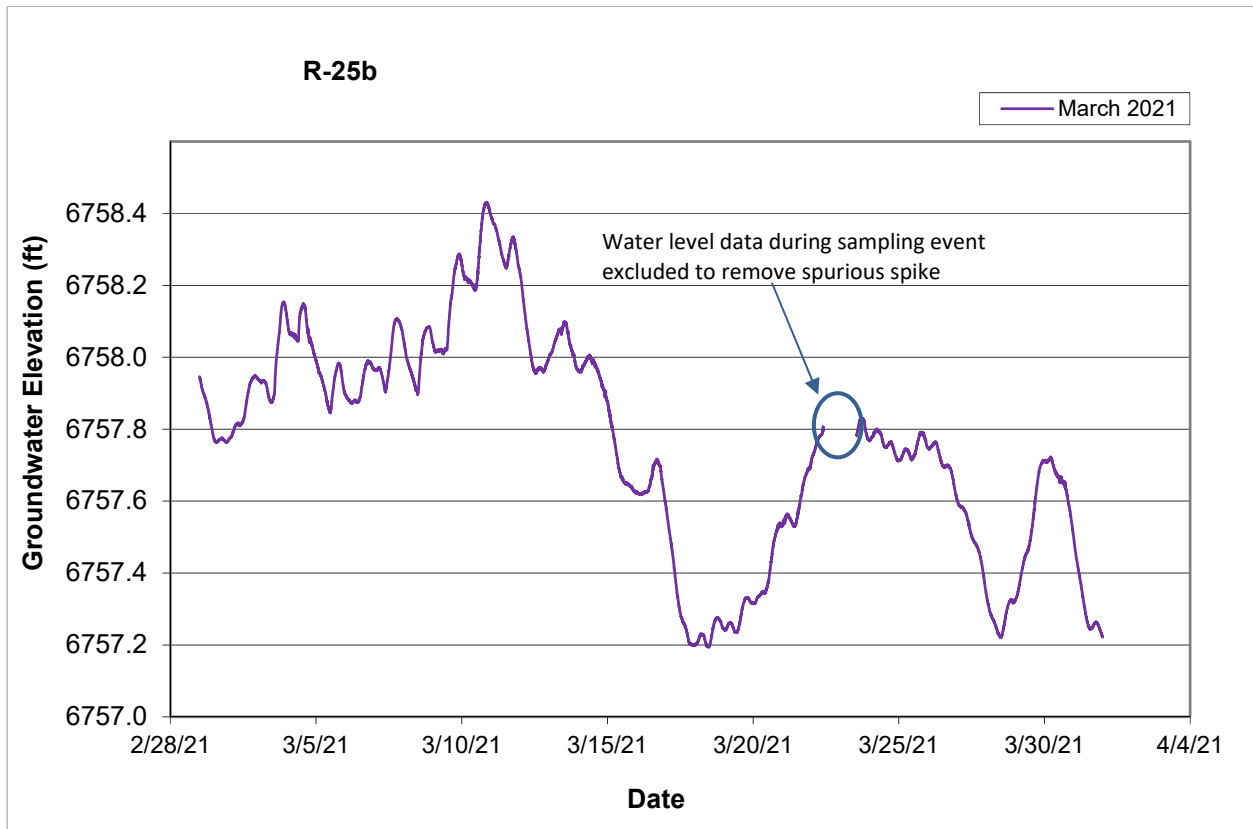


Figure A-1.0-4 R-25b pressure data (March 2021)

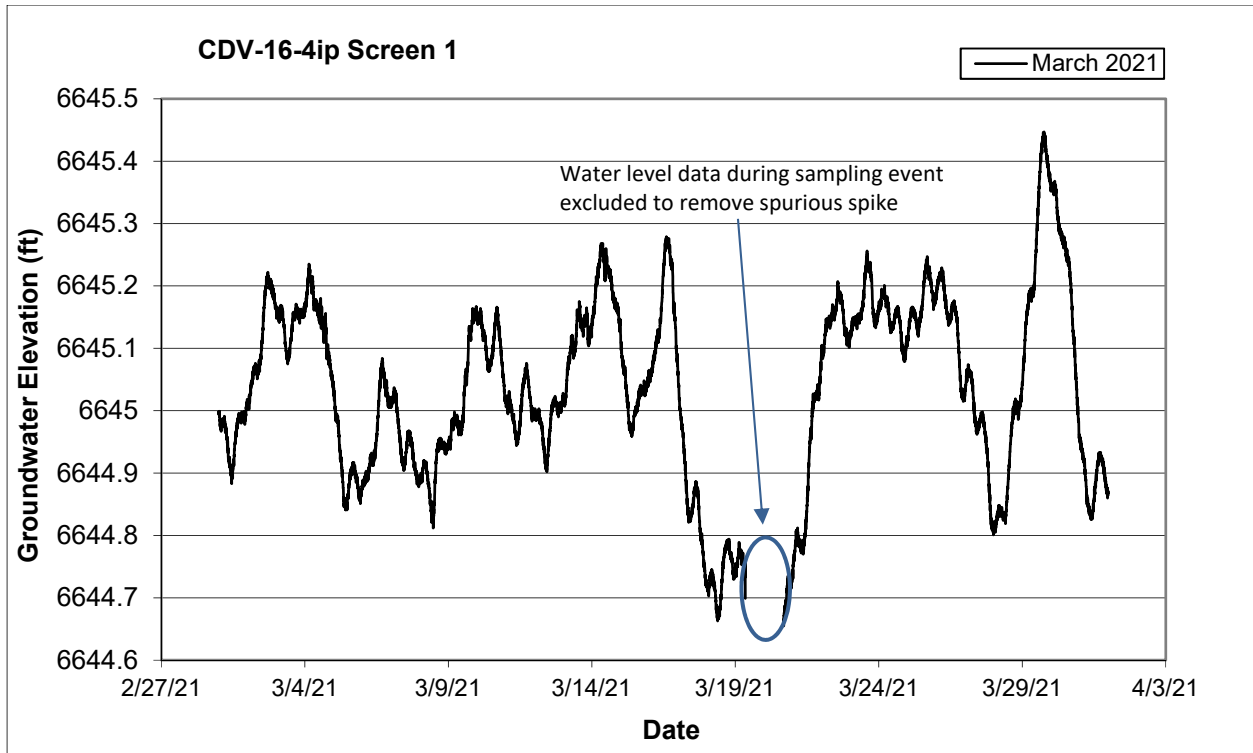


Figure A-1.0-5 CdV-16-4ip pressure data (March 2021)

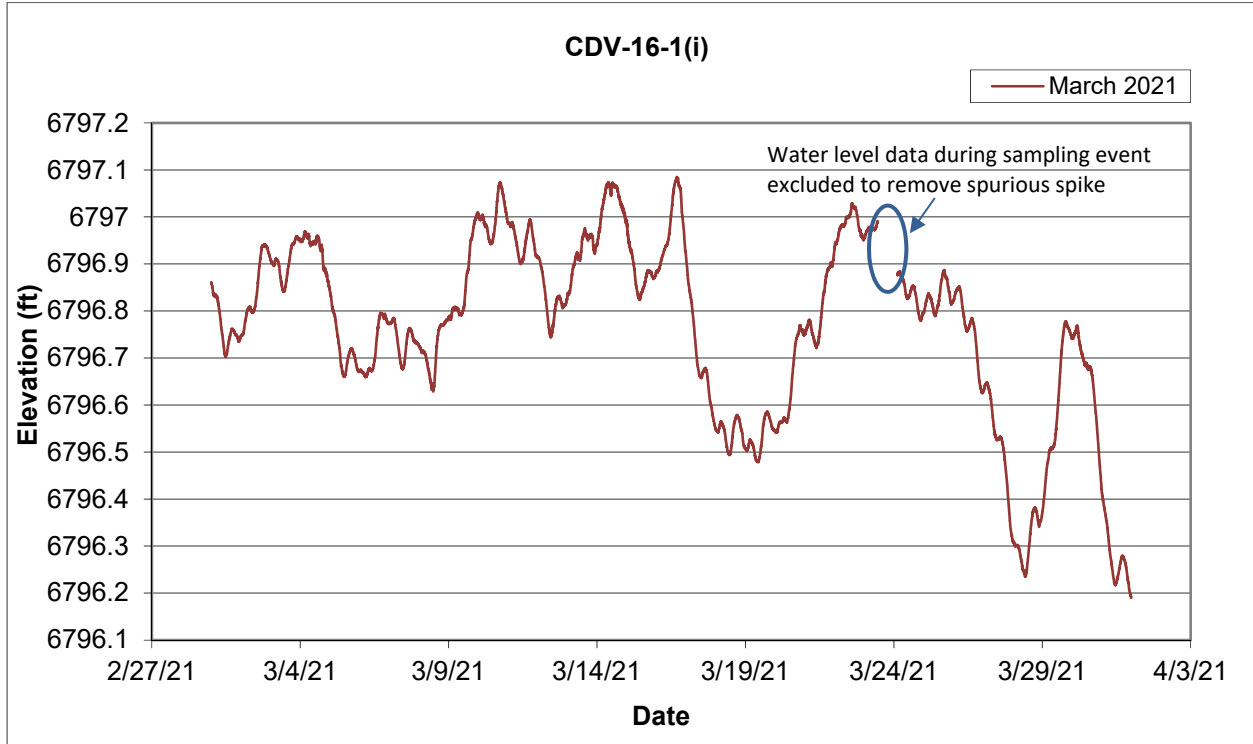


Figure A-1.0-6 CdV-16-1(i) pressure data (March 2021)

