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GROUND WATER
QUALITY BUREAU

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Date: February 28, 2023
Refer To: N3B-2023-0071

Justin Ball, Chief
Ground Water Quality Bureau
New Mexico Environment Department
1190 S. St. Francis Drive
Santa Fe, NM 87502-5469

Subject: Submittal of the Quarterly Report for the Discharge of Treated Groundwater to the Regional Aquifer under Discharge Permit 1835, Calendar Year 2022 Quarter 4, Class V Underground Injection Control Wells

Dear Mr. Ball:

On August 31, 2016, the New Mexico Environment Department (NMED) issued Discharge Permit 1835 (DP-1835) to the U.S. Department of Energy (DOE) and Los Alamos National Security, LLC (LANS) for the discharge of treated groundwater to the regional aquifer from up to six Class V underground injection control (UIC) wells. On July 21, 2017, NMED approved minor updates to DP-1835. During the second quarter of calendar year (CY) 2018, ownership of the discharge permit transferred from LANS to Newport News Nuclear BWXT-Los Alamos, LLC (N3B). Pursuant to Condition Number 10 of the above-referenced discharge permit, DOE/N3B are required to submit quarterly reports to document the following:

1. influent and discharge volumes from the treatment systems,
2. quarterly groundwater and treated effluent sampling results, and
3. operations and maintenance activities.

Pursuant to Condition Numbers No. 11, 12, and 13 of DP-1835, the quarterly reports shall also contain general information, performance information, and monitoring data for treated effluent from each ion exchange treatment system. Condition Number 10 requires submission of a quarterly report to NMED by March 1, 2023, for the October 1 through December 30, 2022, discharge period.

During the CY 2022 Quarter 4 reporting period for DP-1835, discharge of treated groundwater to the regional aquifer occurred at five UIC wells: CrIN-1 through CrIN-5. Groundwater originated predominantly from five extraction wells: CrEX-1 through CrEX-5. In November 2022, the extraction and discharge was reduced to two extraction wells, CrEX-4 and CrEX-5, and two UIC wells, CrIN-4 and CrIN-5. The groundwater was treated by chromium treatment unit A (CTUA) and chromium treatment unit C (CTUC) before injection at the UIC wells.

The enclosed “Quarterly Report for the Discharge of Treated Groundwater to the Regional Aquifer under Discharge Permit 1835, Calendar Year 2022 Quarter 4,” provides the information required under DP-1835 for this reporting period.

If you have 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,



Robert Macfarlane
Program Manager
Environment, Safety, Health and Quality
N3B-Los Alamos

Sincerely,

ARTURO DURAN

Digitally signed by ARTURO
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Arturo Q. Duran
Office of Quality and Regulatory Compliance
U.S. Department of Energy
Environmental Management
Los Alamos Field Office

Enclosure(s):

1. Two hard copies with electronic files – Quarterly Report for the Discharge of Treated Groundwater to the Regional Aquifer under Discharge Permit 1835, Calendar Year 2022 Quarter 4 (EM2023-0059)

cc (letter and enclosure[s] emailed):


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March 2023
EM2023-0059

**Quarterly Report for the
Discharge of Treated
Groundwater to the
Regional Aquifer under
Discharge Permit 1835,
Calendar Year 2022 Quarter 4**





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. The public may copy and use this document without charge, provided that this notice and any statement of authorship are reproduced on all copies.

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1.0 INTRODUCTION

On August 31, 2016, the New Mexico Environment Department (NMED) issued Discharge Permit 1835 (DP-1835) to the U.S. Department of Energy (DOE) and Los Alamos National Security, LLC (LANS) for the discharge of treated groundwater to the regional aquifer through Class V underground injection control (UIC) wells. On July 21, 2017, NMED approved minor updates to DP-1835. During Quarter 4 of calendar year (CY) 2018, ownership of the discharge permit transferred from LANS to Newport News Nuclear BWXT-Los Alamos, LLC (N3B).

During the calendar year (CY) 2022 Quarter 4 reporting period for DP-1835, groundwater was extracted for treatment from five extraction wells, CrEX-1 through CrEX-5. The groundwater was treated by ion exchange (IX) in Chromium Treatment Unit A (CTUA) and Chromium Treatment Unit C (CTUC). Discharge of treated groundwater to the regional aquifer occurred at five UIC wells, CrIN-1 through CrIN-5. In November 2022, the extraction and discharge was reduced to two extraction wells, CrEX-4 and CrEX-5, and two UIC wells, CrIN-4 and CrIN-5.

Condition No. 10 of DP-1835 requires submission of a quarterly report to NMED by March 1 for the October 1 through December 30 discharge period. Several conditions within the permit identify information to be submitted in the quarterly report. These conditions are addressed in this report in the following requirements:

1. Influent and discharge volumes for the IX treatment systems (Condition No. 10)
2. Quarterly treated-effluent sampling results from each IX treatment system (Conditions No. 10 and 13)
3. Quarterly depth-to-groundwater and groundwater-quality sampling results (Conditions No. 10 and 14)
4. Any operations/maintenance activities performed (Condition No. 10)
5. Any periodic test of mechanical integrity conducted (Condition No. 11.a)
6. Any replacement of primary or secondary IX vessels or associated treatment system infrastructure (Condition No. 11.b)
7. Any well workovers conducted (Condition No. 11.c)
8. Any additional operational changes with the potential to markedly affect the discharge (Condition No. 11.d)
9. Monthly average, maximum, and minimum values for flow rate and volume of treated effluent transferred to each UIC well (Condition No. 12.a)
10. Total monthly volume of treated effluent transferred to each UIC well (Condition No. 12.b)
11. Monthly average, maximum, and minimum values of injection water level (pressure head) above static level for each UIC well (Condition No. 12.c)
12. Daily volume injected at each UIC well (Condition No. 12.d)
13. Daily volume pumped from each extraction well (Condition No. 12.e)
14. Facility layout map (Condition No. 14)
15. Groundwater elevation contour map (Condition No. 15)

This report addresses each of these requirements.

2.0 REQUIREMENTS

2.1 Influent and Discharge Volumes for the Ion-Exchange Treatment Systems (Requirement 1)

Table 2.1-1 provides the total influent volume to the IX system, and the discharge volumes from IX treatment systems CTUA and CTUC, during CY 2022 Quarter 4 for activities completed under DP-1835.

**Table 2.1-1
Total Influent and Discharge Volumes
for IX Treatment Systems – CY 2022 Quarter 4, DP-1835**

Treatment Unit	Influent Volume ^a (gal.)	Effluent Volume ^b (gal.)
CTUA	23,938,509	18,364,092
CTUC		5,579,737

Note: Individual flow meter accurate to ±5%.

^a Influent volume based on CrEX-1 through CrEX-5 extraction volumes.

^b Effluent volume based on CTUA and CTUC flow-meter readings.

2.2 Quarterly Treated Effluent Sampling Results from Each Ion-Exchange Treatment System (Requirement 2)

Analytical results from samples of treated effluent collected during CY 2022 Quarter 4 for activities completed under DP-1835 are summarized in Table 2.2-1. No sample results for total chromium, nitrate, perchlorate, sulfate, fluoride, chloride, or total dissolved solids exceeded 90% of the numeric standards of 20.6.2.3103 New Mexico Administrative Code (NMAC) or, for constituents not listed in 20.6.2.3103 NMAC, 90% of the numeric screening levels established for tap water in Table A-1 of the 2022 NMED “Risk Assessment Guidance for Site Investigations and Remediation Volume 1, Soil Screening Guidance for Human Health Risk Assessments” (NMED 2022). The values representing 90% of the applicable standards or screening levels for these seven analytes are:

- Chloride 225 mg/L
- Chromium 45 µg/L
- Fluoride 1.44 mg/L
- Nitrate 9 mg/L
- Perchlorate 12.4 µg/L
- Sulfate 540 mg/L
- Total dissolved solids 900 mg/L

**Table 2.2-1
Treated Effluent Analytical Results Summary Table – CY 2022 Quarter 4, DP-1835**

Location ID	Sample ID	Sample Date ^a	Parameter Name	Result	Report Unit	90% of Standard or Screening Level	Lab Qualifier	Detect Flag	Filtered	Method Detection Limit
CTUA	CrTMT-23-259606	10-04-2022	Chloride	17.3	mg/L	225	n/a ^b	Y ^c	Y ^d	0.335
CTUA	CrTMT-23-259607	10-11-2022	Chloride	17.0	mg/L	225	n/a	Y	Y	0.335
CTUA	CrTMT-23-259609	10-18-2022	Chloride	84.4	mg/L	225	n/a	Y	Y	1.34
CTUA	CrTMT-23-259610	10-24-2022	Chloride	17.8	mg/L	225	n/a	Y	Y	0.335
CTUA	CrTMT-23-259611	11-03-2022	Chloride	17.2	mg/L	225	n/a	Y	Y	0.335
CTUA	CrTMT-23-259612	11-07-2022	Chloride	17.1	mg/L	225	n/a	Y	Y	0.335
CTUA	CrTMT-23-259608	11-14-2022	Chloride	16.8	mg/L	225	n/a	Y	Y	0.335
CTUA	CrTMT-23-259616	11-22-2022	Chloride	16.4	mg/L	225	n/a	Y	Y	0.335
CTUA	CrTMT-23-259617	11-29-2022	Chloride	17.8	mg/L	225	n/a	Y	Y	0.134
CTUA	CrTMT-23-259613	12-06-2022	Chloride	18.2	mg/L	225	n/a	Y	Y	0.335
CTUA	CrTMT-23-259614	12-13-2022	Chloride	17.2	mg/L	225	n/a	Y	Y	0.335
CTUA	CrTMT-23-259615	12-20-2022	Chloride	16.4	mg/L	225	n/a	Y	Y	0.335
CTUA	CrTMT-23-259618	12-27-2022	Chloride	17.2	mg/L	225	n/a	Y	Y	0.335
CTUA	CrTMT-23-259606	10-04-2022	Chromium	3.00	µg/L	45	U ^e	N ^f	Y	3.00
CTUA	CrTMT-23-259607	10-11-2022	Chromium	3.00	µg/L	45	U	N	Y	3.00
CTUA	CrTMT-23-259609	10-18-2022	Chromium	3.00	µg/L	45	U	N	Y	3.00
CTUA	CrTMT-23-259610	10-24-2022	Chromium	3.00	µg/L	45	U	N	Y	3.00
CTUA	CrTMT-23-259611	11-03-2022	Chromium	3.00	µg/L	45	U	N	Y	3.00
CTUA	CrTMT-23-259612	11-07-2022	Chromium	3.00	µg/L	45	U	N	Y	3.00
CTUA	CrTMT-23-259608	11-14-2022	Chromium	3.00	µg/L	45	U	N	Y	3.00
CTUA	CrTMT-23-259616	11-22-2022	Chromium	3.00	µg/L	45	U	N	Y	3.00
CTUA	CrTMT-23-259617	11-29-2022	Chromium	3.00	µg/L	45	U	N	Y	3.00
CTUA	CrTMT-23-259613	12-06-2022	Chromium	3.00	µg/L	45	U	N	Y	3.00
CTUA	CrTMT-23-259614	12-13-2022	Chromium	3.00	µg/L	45	U	N	Y	3.00

Table 2.2-1 (continued)

Location ID	Sample ID	Sample Date ^a	Parameter Name	Result	Report Unit	90% of Standard or Screening Level	Lab Qualifier	Detect Flag	Filtered	Method Detection Limit
CTUA	CrTMT-23-259615	12-20-2022	Chromium	3.00	µg/L	45	U	N	Y	3.00
CTUA	CrTMT-23-259618	12-27-2022	Chromium	3.00	µg/L	45	U	N	Y	3.00
CTUA	CrTMT-23-259606	10-04-2022	Fluoride	0.25	mg/L	1.44	n/a	Y	Y	0.0330
CTUA	CrTMT-23-259607	10-11-2022	Fluoride	0.25	mg/L	1.44	n/a	Y	Y	0.0330
CTUA	CrTMT-23-259609	10-18-2022	Fluoride	0.03	mg/L	1.44	U	N	Y	0.0330
CTUA	CrTMT-23-259610	10-24-2022	Fluoride	0.37	mg/L	1.44	n/a	Y	Y	0.0330
CTUA	CrTMT-23-259611	11-03-2022	Fluoride	0.26	mg/L	1.44	n/a	Y	Y	0.0330
CTUA	CrTMT-23-259612	11-07-2022	Fluoride	0.45	mg/L	1.44	n/a	Y	Y	0.0330
CTUA	CrTMT-23-259608	11-14-2022	Fluoride	0.41	mg/L	1.44	n/a	Y	Y	0.0330
CTUA	CrTMT-23-259616	11-22-2022	Fluoride	0.41	mg/L	1.44	n/a	Y	Y	0.0330
CTUA	CrTMT-23-259617	11-29-2022	Fluoride	0.26	mg/L	1.44	n/a	Y	Y	0.0330
CTUA	CrTMT-23-259613	12-06-2022	Fluoride	0.32	mg/L	1.44	n/a	Y	Y	0.0330
CTUA	CrTMT-23-259614	12-13-2022	Fluoride	0.39	mg/L	1.44	n/a	Y	Y	0.0330
CTUA	CrTMT-23-259615	12-20-2022	Fluoride	0.414	mg/L	1.44	n/a	Y	Y	0.0330
CTUA	CrTMT-23-259618	12-27-2022	Fluoride	0.346	mg/L	9	n/a	Y	Y	0.0330
CTUA	CrTMT-23-259606	10-04-2022	Nitrate-Nitrite as Nitrogen	2.87	mg/L	9	n/a	Y	Y	0.17
CTUA	CrTMT-23-259607	10-11-2022	Nitrate-Nitrite as Nitrogen	2.87	mg/L	9	n/a	Y	Y	0.085
CTUA	CrTMT-23-259609	10-18-2022	Nitrate-Nitrite as Nitrogen	0.017	mg/L	9	U	N	Y	0.017
CTUA	CrTMT-23-259610	10-24-2022	Nitrate-Nitrite as Nitrogen	3.99	mg/L	9	n/a	Y	Y	0.085
CTUA	CrTMT-23-259611	11-03-2022	Nitrate-Nitrite as Nitrogen	3.55	mg/L	9	n/a	Y	Y	0.17
CTUA	CrTMT-23-259612	11-07-2022	Nitrate-Nitrite as Nitrogen	3.50	mg/L	9	n/a	Y	Y	0.085
CTUA	CrTMT-23-259608	11-14-2022	Nitrate-Nitrite as Nitrogen	3.60	mg/L	9	n/a	Y	Y	0.085
CTUA	CrTMT-23-259616	11-22-2022	Nitrate-Nitrite as Nitrogen	3.60	mg/L	9	n/a	Y	Y	0.17
CTUA	CrTMT-23-259617	11-29-2022	Nitrate-Nitrite as Nitrogen	3.70	mg/L	9	n/a	Y	Y	0.17
CTUA	CrTMT-23-259613	12-06-2022	Nitrate-Nitrite as Nitrogen	4.61	mg/L	9	n/a	Y	Y	0.17
CTUA	CrTMT-23-259614	12-13-2022	Nitrate-Nitrite as Nitrogen	3.61	mg/L	9	n/a	Y	Y	0.17

Table 2.2-1 (continued)

Location ID	Sample ID	Sample Date ^a	Parameter Name	Result	Report Unit	90% of Standard or Screening Level	Lab Qualifier	Detect Flag	Filtered	Method Detection Limit
CTUA	CrTMT-23-259615	12-20-2022	Nitrate-Nitrite as Nitrogen	3.67	mg/L	9	n/a	Y	Y	0.085
CTUA	CrTMT-23-259618	12-27-2022	Nitrate-Nitrite as Nitrogen	4.27	mg/L	9	n/a	Y	Y	0.085
CTUA	CrTMT-23-259606	10-04-2022	Perchlorate	1.01	µg/L	12.4	n/a	Y	Y	0.05
CTUA	CrTMT-23-259607	10-11-2022	Perchlorate	1.07	µg/L	12.4	n/a	Y	Y	0.05
CTUA	CrTMT-23-259609	10-18-2022	Perchlorate	0.20	µg/L	12.4	n/a	Y	Y	0.05
CTUA	CrTMT-23-259610	10-24-2022	Perchlorate	0.53	µg/L	12.4	n/a	Y	Y	0.05
CTUA	CrTMT-23-259611	11-03-2022	Perchlorate	0.77	µg/L	12.4	n/a	Y	Y	0.05
CTUA	CrTMT-23-259612	11-07-2022	Perchlorate	0.77	µg/L	12.4	n/a	Y	Y	0.05
CTUA	CrTMT-23-259608	11-14-2022	Perchlorate	0.82	µg/L	12.4	n/a	Y	Y	0.05
CTUA	CrTMT-23-259616	11-22-2022	Perchlorate	0.78	µg/L	12.4	n/a	Y	Y	0.05
CTUA	CrTMT-23-259617	11-29-2022	Perchlorate	0.55	µg/L	12.4	n/a	Y	Y	0.05
CTUA	CrTMT-23-259613	12-06-2022	Perchlorate	0.37	µg/L	12.4	n/a	Y	Y	0.05
CTUA	CrTMT-23-259614	12-13-2022	Perchlorate	0.46	µg/L	12.4	n/a	Y	Y	0.05
CTUA	CrTMT-23-259615	12-20-2022	Perchlorate	0.46	µg/L	12.4	n/a	Y	Y	0.05
CTUA	CrTMT-23-259618	12-27-2022	Perchlorate	0.498	µg/L	12.4	n/a	Y	Y	0.05
CTUA	CrTMT-23-259606	10-04-2022	Sulfate	23.60	mg/L	540	n/a	Y	Y	0.665
CTUA	CrTMT-23-259607	10-11-2022	Sulfate	23.20	mg/L	540	n/a	Y	Y	0.665
CTUA	CrTMT-23-259609	10-18-2022	Sulfate	0.13	mg/L	540	U	N	Y	0.133
CTUA	CrTMT-23-259610	10-24-2022	Sulfate	10.10	mg/L	540	n/a	Y	Y	0.133
CTUA	CrTMT-23-259611	11-03-2022	Sulfate	25.40	mg/L	540	n/a	Y	Y	0.665
CTUA	CrTMT-23-259612	11-07-2022	Sulfate	25.50	mg/L	540	n/a	Y	Y	0.665
CTUA	CrTMT-23-259608	11-14-2022	Sulfate	24.60	mg/L	540	n/a	Y	Y	0.665
CTUA	CrTMT-23-259616	11-22-2022	Sulfate	24.20	mg/L	540	n/a	Y	Y	0.665
CTUA	CrTMT-23-259617	11-29-2022	Sulfate	23.00	mg/L	540	n/a	Y	Y	0.266
CTUA	CrTMT-23-259613	12-06-2022	Sulfate	9.56	mg/L	540	n/a	Y	Y	0.133
CTUA	CrTMT-23-259614	12-13-2022	Sulfate	25.20	mg/L	540	n/a	Y	Y	0.665

Table 2.2-1 (continued)

Location ID	Sample ID	Sample Date ^a	Parameter Name	Result	Report Unit	90% of Standard or Screening Level	Lab Qualifier	Detect Flag	Filtered	Method Detection Limit
CTUA	CrTMT-23-259615	12-20-2022	Sulfate	24.70	mg/L	540	n/a	Y	Y	0.665
CTUA	CrTMT-23-259618	12-27-2022	Sulfate	24.8	mg/L	540	n/a	Y	Y	0.665
CTUA	CrTMT-23-259606	10-04-2022	Total Dissolved Solids	208	mg/L	900	n/a	Y	Y	3.40
CTUA	CrTMT-23-259607	10-11-2022	Total Dissolved Solids	217	mg/L	900	n/a	Y	Y	3.40
CTUA	CrTMT-23-259609	10-18-2022	Total Dissolved Solids	211	mg/L	900	n/a	Y	Y	3.40
CTUA	CrTMT-23-259610	10-24-2022	Total Dissolved Solids	202	mg/L	900	n/a	Y	Y	2.38
CTUA	CrTMT-23-259611	11-03-2022	Total Dissolved Solids	223	mg/L	900	n/a	Y	Y	2.38
CTUA	CrTMT-23-259612	11-07-2022	Total Dissolved Solids	220	mg/L	900	n/a	Y	Y	2.38
CTUA	CrTMT-23-259608	11-14-2022	Total Dissolved Solids	215	mg/L	900	n/a	Y	Y	2.38
CTUA	CrTMT-23-259616	11-22-2022	Total Dissolved Solids	222	mg/L	900	n/a	Y	Y	2.38
CTUA	CrTMT-23-259617	11-29-2022	Total Dissolved Solids	225	mg/L	900	n/a	Y	Y	2.38
CTUA	CrTMT-23-259613	12-06-2022	Total Dissolved Solids	206	mg/L	900	n/a	Y	Y	2.38
CTUA	CrTMT-23-259614	12-13-2022	Total Dissolved Solids	214	mg/L	900	n/a	Y	Y	2.38
CTUA	CrTMT-23-259615	12-20-2022	Total Dissolved Solids	200	mg/L	900	n/a	Y	Y	2.38
CTUC	CrTMT-23-259618	12-27-2022	Total Dissolved Solids	817	mg/L	900	n/a	Y	Y	2.38
CTUC	CrTMT-23-259652	10-04-2022	Chloride	17.5	mg/L	225	n/a	Y	Y	0.335
CTUC	CrTMT-23-259653	10-11-2022	Chloride	17.4	mg/L	225	n/a	Y	Y	0.335
CTUC	CrTMT-23-259654	10-18-2022	Chloride	16.5	mg/L	225	n/a	Y	Y	0.335
CTUC	CrTMT-23-259655	10-24-2022	Chloride	16.8	mg/L	225	n/a	Y	Y	0.335
CTUC	CrTMT-23-259656	11-03-2022	Chloride	66.9	mg/L	225	n/a	Y	Y	0.67
CTUC	CrTMT-23-259657	11-07-2022	Chloride	21.0	mg/L	225	n/a	Y	Y	0.335
CTUC	CrTMT-23-259652	10-04-2022	Chromium	3.00	µg/L	45	U	N	Y	3
CTUC	CrTMT-23-259653	10-11-2022	Chromium	3.00	µg/L	45	U	N	Y	3
CTUC	CrTMT-23-259654	10-18-2022	Chromium	3.00	µg/L	45	U	N	Y	3
CTUC	CrTMT-23-259655	10-24-2022	Chromium	3.00	µg/L	45	U	N	Y	3
CTUC	CrTMT-23-259656	11-03-2022	Chromium	3.00	µg/L	45	U	N	Y	3

Table 2.2-1 (continued)

Location ID	Sample ID	Sample Date ^a	Parameter Name	Result	Report Unit	90% of Standard or Screening Level	Lab Qualifier	Detect Flag	Filtered	Method Detection Limit
CTUC	CrTMT-23-259657	11-07-2022	Chromium	3.00	µg/L	45	U	N	Y	3
CTUC	CrTMT-23-259652	10-04-2022	Fluoride	0.251	mg/L	1.44	n/a	Y	Y	0.033
CTUC	CrTMT-23-259653	10-11-2022	Fluoride	0.248	mg/L	1.44	n/a	Y	Y	0.033
CTUC	CrTMT-23-259654	10-18-2022	Fluoride	0.246	mg/L	1.44	n/a	Y	Y	0.033
CTUC	CrTMT-23-259655	10-24-2022	Fluoride	0.365	mg/L	1.44	n/a	Y	Y	0.033
CTUC	CrTMT-23-259656	11-03-2022	Fluoride	0.293	mg/L	1.44	n/a	Y	Y	0.033
CTUC	CrTMT-23-259657	11-07-2022	Fluoride	0.275	mg/L	1.44	n/a	Y	Y	0.033
CTUC	CrTMT-23-259652	10-04-2022	Nitrate-Nitrite as Nitrogen	3.210	mg/L	9	n/a	Y	Y	0.17
CTUC	CrTMT-23-259653	10-11-2022	Nitrate-Nitrite as Nitrogen	2.910	mg/L	9	n/a	Y	Y	0.085
CTUC	CrTMT-23-259654	10-18-2022	Nitrate-Nitrite as Nitrogen	2.880	mg/L	9	n/a	Y	Y	0.085
CTUC	CrTMT-23-259655	10-24-2022	Nitrate-Nitrite as Nitrogen	3.250	mg/L	9	n/a	Y	Y	0.085
CTUC	CrTMT-23-259656	11-03-2022	Nitrate-Nitrite as Nitrogen	0.017	mg/L	9	U	N	Y	0.017
CTUC	CrTMT-23-259657	11-07-2022	Nitrate-Nitrite as Nitrogen	4.970	mg/L	9	n/a	Y	Y	0.085
CTUC	CrTMT-23-259652	10-04-2022	Perchlorate	0.511	µg/L	12.4	n/a	Y	Y	0.0500
CTUC	CrTMT-23-259653	10-11-2022	Perchlorate	0.62	µg/L	12.4	n/a	Y	Y	0.0500
CTUC	CrTMT-23-259654	10-18-2022	Perchlorate	0.60	µg/L	12.4	n/a	Y	Y	0.0500
CTUC	CrTMT-23-259655	10-24-2022	Perchlorate	0.66	µg/L	12.4	n/a	Y	Y	0.0500
CTUC	CrTMT-23-259656	11-03-2022	Perchlorate	0.10	µg/L	12.4	J ⁹	Y	Y	0.0500
CTUC	CrTMT-23-259657	11-07-2022	Perchlorate	0.22	µg/L	12.4	n/a	Y	Y	0.0500
CTUC	CrTMT-23-259652	10-04-2022	Sulfate	18.80	mg/L	1.44	n/a	Y	Y	0.033
CTUC	CrTMT-23-259653	10-11-2022	Sulfate	23.70	mg/L	1.44	n/a	Y	Y	0.033
CTUC	CrTMT-23-259654	10-18-2022	Sulfate	24.40	mg/L	1.44	n/a	Y	Y	0.033
CTUC	CrTMT-23-259655	10-24-2022	Sulfate	22.80	mg/L	1.44	n/a	Y	Y	0.033
CTUC	CrTMT-23-259656	11-03-2022	Sulfate	0.229	mg/L	1.44	J	Y	Y	0.133
CTUC	CrTMT-23-259657	11-07-2022	Sulfate	0.28	mg/L	1.44	J	Y	Y	0.133
CTUC	CrTMT-23-259652	10-04-2022	Total Dissolved Solids	218.0	mg/L	900	n/a	Y	Y	2.38

Table 2.2-1 (continued)

Location ID	Sample ID	Sample Date ^a	Parameter Name	Result	Report Unit	90% of Standard or Screening Level	Lab Qualifier	Detect Flag	Filtered	Method Detection Limit
CTUC	CrTMT-23-259653	10-11-2022	Total Dissolved Solids	218.0	mg/L	900	n/a	Y	Y	2.38
CTUC	CrTMT-23-259654	10-18-2022	Total Dissolved Solids	206.0	mg/L	900	n/a	Y	Y	3.40
CTUC	CrTMT-23-259655	10-24-2022	Total Dissolved Solids	195.0	mg/L	900	n/a	Y	Y	3.40
CTUC	CrTMT-23-259656	11-03-2022	Total Dissolved Solids	203.0	mg/L	900	n/a	Y	Y	2.38
CTUC	CrTMT-23-259657	11-07-2022	Total Dissolved Solids	202.0	mg/L	900	n/a	Y	Y	2.38

^a In accordance with Condition No. 13 of DP-1835, analysis of the treated effluent from each IX unit is required only once every month for the CY 2022 Quarter 4 reporting period.

^b n/a = Not applicable: no qualifiers applied.

^c In the Detect Flag column, Y = detected.

^d In the Filtered column, Y = filtered.

^e U = Analyte is classified as not detected.

^f N = No (not detected).

^g J = Analyte is classified as estimated.

The pilot-scale molasses and sodium dithionite amendment studies, that began with NMED conditional approvals during CY 2017 Quarter 4 (NMED 2017a, NMED 2017b), continued during CY 2022 Quarter 4. NMED determined that no permit was required for the deployment of these amendments. In accordance with the NMED conditional approvals, iron, manganese, and arsenic sampling in the treated water from extraction wells was completed, and the results were submitted in the quarterly monitoring reports under DP-1835. These results for CY 2022 Quarter 4 are provided in Table 2.2-2. No results for iron, manganese, or arsenic exceeded 90% of the numeric standards (900 µg/L, 180 µg/L, and 9 µg/L, respectively) as specified in 20.6.2.3103 NMAC.

2.3 Quarterly Depth to Groundwater and Groundwater Quality Sampling Results (Requirement 3)

Depth to groundwater is expressed as the elevation of the groundwater above sea level. Figure 2.3-1 is the groundwater elevation map, and Table 2.3-1 provides the quarterly groundwater elevation measurements for a non-exhaustive selection of wells. An explanation of how the groundwater elevation map was generated is provided below. Quarterly groundwater analytical results from samples collected during CY 2022 Quarter 4 for the monitoring wells listed in Condition No. 14 are summarized in Table 2.3-2. Note that some analytes reported in this table exceed their corresponding groundwater standard or screening level.

Sample results for total chromium, nitrate, perchlorate, sulfate, fluoride, chloride, and total dissolved solids are compared with numeric standards of 20.6.2.3103 NMAC or, for constituents not listed in 20.6.2.3103 NMAC, the numeric screening levels established for tap water in Table A-1 of the 2022 NMED “Risk Assessment Guidance for Site Investigations and Remediation Volume 1, Soil Screening Guidance for Human Health Risk Assessments” (NMED 2022). The values of the applicable standards or screening levels for these seven analytes are:

- Chloride 250 mg/L
- Perchlorate 13.8 µg/L
- Chromium 50 µg/L
- Fluoride 1.6 mg/L
- Nitrate 10 mg/L
- Sulfate 600 mg/L
- Total dissolved solids 1000 mg/L

The regional aquifer beneath the Pajarito Plateau, on which Los Alamos National Laboratory (LANL or the Laboratory) is situated, is a complex hydrogeological system. The shape of the regional water table is predominantly controlled by the areas of recharge to the west (the flanks of the Sierra de los Valles and the Pajarito fault zone) and discharge to the east (the Rio Grande and the White Rock Canyon Springs). At a more local scale, such as the chromium plume area, the structure of the regional water table and groundwater flow is also expected to be influenced by

- local infiltration zones and recharge areas (e.g., beneath canyons),
- heterogeneity and anisotropy in the aquifer properties, and
- extraction and injection locations (municipal water-supply wells and chromium interim measure [IM] extraction/injection wells).

**Table 2.2-2
Treated Effluent Analytical Results Summary Table Related to Molasses and
Sodium Dithionite Pilot Studies under NMED Conditional Approval – CY 2022 Quarter 4, DP-1835**

Location ID	Sample ID	Sample Date ^a	Parameter Name	Result	Report Unit	90% of Standard or Screening Level	Lab Qualifier	Detect Flag	Filtered	Method Detection Limit
CTUA	CrTMT-23-259606	10-04-2022	Arsenic	2.00	µg/L	9	U ^b	N ^c	Y ^d	2.00
CTUA	CrTMT-23-259607	10-11-2022	Arsenic	2.00	µg/L	9	U	N	Y	2.00
CTUA	CrTMT-23-259609	10-18-2022	Arsenic	2.00	µg/L	9	U	N	Y	2.00
CTUA	CrTMT-23-259610	10-24-2022	Arsenic	3.30	µg/L	9	J ^e	Y ^f	Y	2.00
CTUA	CrTMT-23-259611	11-03-2022	Arsenic	2.38	µg/L	9	J	Y	Y	2.00
CTUA	CrTMT-23-259612	11-07-2022	Arsenic	2.12	µg/L	9	J	Y	Y	2.00
CTUA	CrTMT-23-259608	11-14-2022	Arsenic	2.10	µg/L	9	J	Y	Y	2.00
CTUA	CrTMT-23-259616	11-22-2022	Arsenic	2.03	µg/L	9	J	Y	Y	2.00
CTUA	CrTMT-23-259617	11-29-2022	Arsenic	2.59	µg/L	9	J	Y	Y	2.00
CTUA	CrTMT-23-259613	12-06-2022	Arsenic	2.00	µg/L	9	U	N	Y	2.00
CTUA	CrTMT-23-259614	12-13-2022	Arsenic	2.24	µg/L	9	J	Y	Y	2.00
CTUA	CrTMT-23-259615	12-20-2022	Arsenic	2.50	µg/L	9	J	Y	Y	2.00
CTUA	CrTMT-23-259618	12-27-2022	Arsenic	3.83	µg/L	9	J	Y	Y	2.00
CTUC	CrTMT-23-259652	10-04-2022	Arsenic	2.79	µg/L	9	J	Y	Y	2.00
CTUC	CrTMT-23-259653	10-11-2022	Arsenic	2.02	µg/L	9	J	Y	Y	2.00
CTUC	CrTMT-23-259654	10-18-2022	Arsenic	2.75	µg/L	9	J	Y	Y	2.00
CTUC	CrTMT-23-259655	10-24-2022	Arsenic	2.00	µg/L	9	U	N	Y	2.00
CTUC	CrTMT-23-259656	11-03-2022	Arsenic	2.00	µg/L	9	U	N	Y	2.00
CTUC	CrTMT-23-259657	11-07-2022	Arsenic	2.00	µg/L	9	U	N	Y	2.00
CTUA	CrTMT-23-259606	10-04-2022	Iron	30.00	µg/L	900	U	N	Y	30.0
CTUA	CrTMT-23-259607	10-11-2022	Iron	30.00	µg/L	900	U	N	Y	30.0
CTUA	CrTMT-23-259609	10-18-2022	Iron	30.00	µg/L	900	U	N	Y	30.0
CTUA	CrTMT-23-259610	10-24-2022	Iron	30.00	µg/L	900	U	N	Y	30.0
CTUA	CrTMT-23-259611	11-03-2022	Iron	30.00	µg/L	900	U	N	Y	30.0

Table 2.2-2 (continued)

Location ID	Sample ID	Sample Date ^a	Parameter Name	Result	Report Unit	90% of Standard or Screening Level	Lab Qualifier	Detect Flag	Filtered	Method Detection Limit
CTUA	CrTMT-23-259612	11-07-2022	Iron	30.0	µg/L	900	U	N	Y	30.0
CTUA	CrTMT-23-259608	11-14-2022	Iron	30.0	µg/L	900	U	N	Y	30.0
CTUA	CrTMT-23-259616	11-22-2022	Iron	30.0	µg/L	900	U	N	Y	30.0
CTUA	CrTMT-23-259617	11-29-2022	Iron	30.0	µg/L	900	U	N	Y	30.0
CTUA	CrTMT-23-259613	12-06-2022	Iron	30.0	µg/L	900	U	N	Y	30.0
CTUA	CrTMT-23-259614	12-13-2022	Iron	30.0	µg/L	900	U	N	Y	30.0
CTUA	CrTMT-23-259615	12-20-2022	Iron	30.0	µg/L	900	U	N	Y	30.0
CTUA	CrTMT-23-259618	12-27-2022	Iron	30.0	µg/L	900	U	N	Y	30.0
CTUC	CrTMT-23-259652	10-04-2022	Iron	30.0	µg/L	900	U	N	Y	30.0
CTUC	CrTMT-23-259653	10-11-2022	Iron	30.0	µg/L	900	U	N	Y	30.0
CTUC	CrTMT-23-259654	10-18-2022	Iron	30.0	µg/L	900	U	N	Y	30.0
CTUC	CrTMT-23-259655	10-24-2022	Iron	30.0	µg/L	900	U	N	Y	30.0
CTUC	CrTMT-23-259656	11-03-2022	Iron	30.0	µg/L	900	U	N	Y	30.0
CTUC	CrTMT-23-259657	11-07-2022	Iron	30.0	µg/L	900	U	N	Y	30.0
CTUA	CrTMT-23-259606	10-04-2022	Manganese	2.0	µg/L	180	U	N	Y	2
CTUA	CrTMT-23-259607	10-11-2022	Manganese	2.0	µg/L	180	U	N	Y	2
CTUA	CrTMT-23-259609	10-18-2022	Manganese	11.9	µg/L	180	n/a ^g	N	Y	2
CTUA	CrTMT-23-259610	10-24-2022	Manganese	2.0	µg/L	180	U	N	Y	2
CTUA	CrTMT-23-259611	11-03-2022	Manganese	2.0	µg/L	180	U	N	Y	2
CTUA	CrTMT-23-259612	11-07-2022	Manganese	2.0	µg/L	180	U	N	Y	2
CTUA	CrTMT-23-259608	11-14-2022	Manganese	2.0	µg/L	180	U	N	Y	2
CTUA	CrTMT-23-259616	11-22-2022	Manganese	2.0	µg/L	180	U	N	Y	2
CTUA	CrTMT-23-259617	11-29-2022	Manganese	2.0	µg/L	180	U	N	Y	2
CTUA	CrTMT-23-259613	12-06-2022	Manganese	2.0	µg/L	180	U	N	Y	2
CTUA	CrTMT-23-259614	12-13-2022	Manganese	2.00	µg/L	180	U	N	Y	2

Table 2.2-2 (continued)

Location ID	Sample ID	Sample Date ^a	Parameter Name	Result	Report Unit	90% of Standard or Screening Level	Lab Qualifier	Detect Flag	Filtered	Method Detection Limit
CTUA	CrTMT-23-259615	12-20-2022	Manganese	2.00	µg/L	180	U	N	Y	2
CTUA	CrTMT-23-259618	12-27-2022	Manganese	2.00	µg/L	180	U	N	Y	2
CTUC	CrTMT-23-259652	10-04-2022	Manganese	2.00	µg/L	180	U	N	Y	2
CTUC	CrTMT-23-259653	10-11-2022	Manganese	2.00	µg/L	180	U	N	Y	2
CTUC	CrTMT-23-259654	10-18-2022	Manganese	2.00	µg/L	180	U	N	Y	2
CTUC	CrTMT-23-259655	10-24-2022	Manganese	2.00	µg/L	180	U	N	Y	2
CTUC	CrTMT-23-259656	11-03-2022	Manganese	2.00	µg/L	180	U	N	Y	2
CTUC	CrTMT-23-259657	11-07-2022	Manganese	2.00	µg/L	180	U	N	Y	2

^a In accordance with Condition No. 13 of DP-1835, analysis of the treated effluent from each IX unit is required only once every month for the CY 2022 Quarter 4 reporting period.

^b U = Analyte is classified as not detected.

^c N = No (not detected).

^d In the Filtered column, Y = filtered.

^e J = Analyte is classified as estimated.

^f In the Detect Flag column, Y = detected.

^g n/a = Not applicable: no qualifiers applied.

Wells without listed water levels do not have data for 2022 Q4

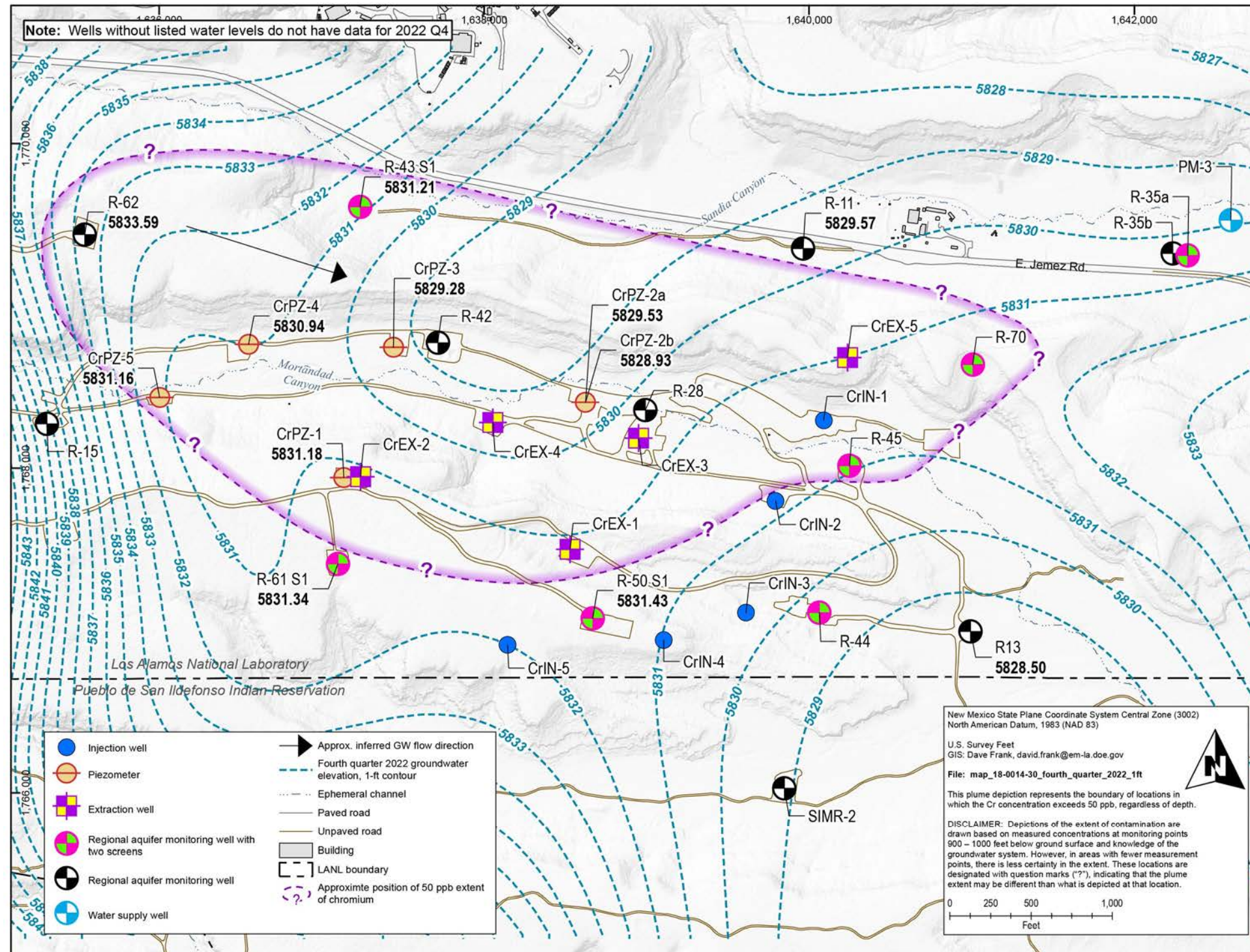


Figure 2.3-1 Groundwater elevation contour map – CY 2022 Quarter 4, DP-1835

**Table 2.3-1
Groundwater Elevations Summary for
Groundwater Monitoring Wells – CY 2022 Quarter 4, DP-1835**

Monitoring Well	Groundwater Elevation ^a (ft)
CrPZ-1 (CrCH-1)	5831.18
CrPZ-2a (CrCH-2a)	5829.53
CrPZ-2b (CrCH-2b)	5828.93
CrPZ-3 (CrCH-3)	5829.28
CrPZ-4 (CrCH-4)	5830.94
CrPZ-5 (CrCH-5)	5831.16
R-11	5829.57
R-13	5828.50
R-43 S1 ^b	5831.21
R-43 S2 ^c	5830.76
R-44 S1	na ^d
R-44 S2	na
R-45 S1	na
R-45 S2	5829.08
R-50 S1	5831.43
R-50 S2	na
R-61 S1	5831.34
R-61 S2	5831.41
R-62	5833.59
SIMR-2 ^e	na

^a Groundwater elevations provided are based on average November 2022 values from transducers.

^b S1 = Screen 1.

^c S2 = Screen 2.

^d na = data were not available in November 2022

^e SIMR-2 data are reported here in accordance with the memorandum of agreement and protocol agreement between San Ildefonso Pueblo and DOE.

**Table 2.3-2
Groundwater Monitoring Wells Analytical Results Summary Table – CY 2022 Quarter 4, DP-1835**

Field Sample ID	Location ID	Sample Date	Parameter Name	Report Result	Report Unit	Standard or Screening Level	Exceeds Standard or Screening Level	Lab Qualifier	Detect Flag	Filtered	Method Detection Limit
CASA-23-259261	R-11	10/17/2022	Chloride	3.72	mg/L	250	No	n/a ^a	Y ^b	Y ^c	0.0670
CASA-23-259261	R-11	10/17/2022	Perchlorate	0.664	µg/L	13.8	No	n/a	Y	Y	0.0500
CASA-23-259261	R-11	10/17/2022	Chromium	11.8	µg/L	50	No	n/a	Y	Y	3.00
CASA-23-259261	R-11	10/17/2022	Fluoride	0.600	mg/L	1.6	No	n/a	Y	Y	0.0330
CASA-23-259261	R-11	10/17/2022	Nitrate-Nitrite as Nitrogen	7.37	mg/L	10	No	n/a	Y	Y	0.170
CASA-23-259261	R-11	10/17/2022	Sulfate	9.79	mg/L	600	No	n/a	Y	Y	0.133
CASA-23-259261	R-11	10/17/2022	Total Dissolved Solids	197	mg/L	1000	No	n/a	Y	Y	2.38
CASA-23-259264	R-11	10/17/2022	Chloride	3.87	mg/L	250	No	n/a	Y	Y	0.0670
CASA-23-259264	R-11	10/17/2022	Perchlorate	0.728	µg/L	13.8	No	n/a	Y	Y	0.0500
CASA-23-259264	R-11	10/17/2022	Chromium	11.8	µg/L	50	No	n/a	Y	Y	3.00
CASA-23-259264	R-11	10/17/2022	Fluoride	0.601	mg/L	1.6	No	n/a	Y	Y	0.0330
CASA-23-259264	R-11	10/17/2022	Nitrate-Nitrite as Nitrogen	7.38	mg/L	10	No	n/a	Y	Y	0.170
CASA-23-259264	R-11	10/17/2022	Sulfate	9.85	mg/L	600	No	n/a	Y	Y	0.133
CASA-23-259264	R-11	10/17/2022	Total Dissolved Solids	186	mg/L	1000	No	n/a	Y	Y	2.38
CASA-23-259265	R-11	10/17/2022	Chloride	0.338	mg/L	250	No	n/a	Y	N ^d	0.0670
CASA-23-259265	R-11	10/17/2022	Perchlorate	0.0500	µg/L	13.8	No	U ^e	N ^f	N	0.0500
CASA-23-259265	R-11	10/17/2022	Chromium	3.00	µg/L	50	No	U	N	N	3.00
CASA-23-259265	R-11	10/17/2022	Fluoride	0.0330	mg/L	1.6	No	U	N	N	0.0330
CASA-23-259265	R-11	10/17/2022	Nitrate-Nitrite as Nitrogen	0.0170	mg/L	10	No	U	N	N	0.0170
CASA-23-259265	R-11	10/17/2022	Sulfate	0.133	mg/L	600	No	U	N	N	0.133
CASA-23-259265	R-11	10/17/2022	Total Dissolved Solids	2.38	mg/L	1000	No	U	N	N	2.38
CASA-23-259266	R-11	10/17/2022	Chloride	0.524	mg/L	250	No	n/a	Y	N	0.0670
CASA-23-259266	R-11	10/17/2022	Perchlorate	0.0500	µg/L	13.8	No	U	N	N	0.0500
CASA-23-259266	R-11	10/17/2022	Chromium	3.00	µg/L	50	No	U	N	N	3.00
CASA-23-259266	R-11	10/17/2022	Fluoride	0.0330	mg/L	1.6	No	U	N	N	0.0330

Table 2.3-2 (continued)

Field Sample ID	Location ID	Sample Date	Parameter Name	Report Result	Report Unit	Standard or Screening Level	Exceeds Standard or Screening Level	Lab Qualifier	Detect Flag	Filtered	Method Detection Limit
CASA-23-259266	R-11	10/17/2022	Nitrate-Nitrite as Nitrogen	0.0170	mg/L	10	No	U	N	N	0.0170
CASA-23-259266	R-11	10/17/2022	Sulfate	0.133	mg/L	600	No	U	N	N	0.133
CASA-23-259266	R-11	10/17/2022	Total Dissolved Solids	2.38	mg/L	1000	No	U	N	N	2.38
CASA-23-261102	R-11	11/01/2022	Chloride	3.49	mg/L	250	No	n/a	Y	Y	0.0670
CASA-23-261102	R-11	11/01/2022	Perchlorate	0.708	µg/L	13.8	No	n/a	Y	Y	0.0500
CASA-23-261102	R-11	11/01/2022	Chromium	9.32	µg/L	50	No	J ^g	Y	Y	3.00
CASA-23-261102	R-11	11/01/2022	Fluoride	0.545	mg/L	1.6	No	n/a	Y	Y	0.0330
CASA-23-261102	R-11	11/01/2022	Nitrate-Nitrite as Nitrogen	7.43	mg/L	10	No	n/a	Y	Y	0.425
CASA-23-261102	R-11	11/01/2022	Sulfate	9.92	mg/L	600	No	n/a	Y	Y	0.133
CASA-23-261102	R-11	11/01/2022	Total Dissolved Solids	182	mg/L	1000	No	n/a	Y	Y	2.38
CASA-23-261843	R-11	12/01/2022	Chloride	3.50	mg/L	250	No	n/a	Y	Y	0.0670
CASA-23-261843	R-11	12/01/2022	Perchlorate	0.813	µg/L	13.8	No	n/a	Y	Y	0.0500
CASA-23-261843	R-11	12/01/2022	Chromium	9.96	µg/L	50	No	J	Y	Y	3.00
CASA-23-261843	R-11	12/01/2022	Fluoride	0.427	mg/L	1.6	No	n/a	Y	Y	0.0330
CASA-23-261843	R-11	12/01/2022	Nitrate-Nitrite as Nitrogen	9.25	mg/L	10	No	n/a	Y	Y	0.170
CASA-23-261843	R-11	12/01/2022	Sulfate	10.3	mg/L	600	No	n/a	Y	Y	0.133
CASA-23-261843	R-11	12/01/2022	Total Dissolved Solids	187	mg/L	1000	No	n/a	Y	Y	2.38
CAMO-23-261038	R-13	11/08/2022	Chloride	3.18	mg/L	250	No	n/a	Y	Y	0.0670
CAMO-23-261038	R-13	11/08/2022	Perchlorate	0.343	µg/L	13.8	No	n/a	Y	Y	0.0500
CAMO-23-261038	R-13	11/08/2022	Chromium	4.18	µg/L	50	No	J	Y	Y	3.00
CAMO-23-261038	R-13	11/08/2022	Fluoride	0.417	mg/L	1.6	No	n/a	Y	Y	0.0330
CAMO-23-261038	R-13	11/08/2022	Nitrate-Nitrite as Nitrogen	0.899	mg/L	10	No	n/a	Y	Y	0.0170
CAMO-23-261038	R-13	11/08/2022	Sulfate	3.96	mg/L	600	No	n/a	Y	Y	0.133
CAMO-23-261038	R-13	11/08/2022	Total Dissolved Solids	133	mg/L	1000	No	n/a	Y	Y	2.38
CASA-23-261119	R-43 S1 ^h	11/17/2022	Chloride	6.75	mg/L	250	No	n/a	Y	Y	0.0670
CASA-23-261119	R-43 S1	11/17/2022	Perchlorate	0.575	µg/L	13.8	No	n/a	Y	Y	0.0500

Table 2.3-2 (continued)

Field Sample ID	Location ID	Sample Date	Parameter Name	Report Result	Report Unit	Standard or Screening Level	Exceeds Standard or Screening Level	Lab Qualifier	Detect Flag	Filtered	Method Detection Limit
CASA-23-261119	R-43 S1	11/17/2022	Chromium	170	µg/L	50	Yes	n/a	Y	Y	3.00
CASA-23-261119	R-43 S1	11/17/2022	Fluoride	0.466	mg/L	1.6	No	n/a	Y	Y	0.0330
CASA-23-261119	R-43 S1	11/17/2022	Nitrate-Nitrite as Nitrogen	4.93	mg/L	10	No	n/a	Y	Y	0.170
CASA-23-261119	R-43 S1	11/17/2022	Sulfate	15.1	mg/L	600	No	n/a	Y	Y	0.133
CASA-23-261119	R-43 S1	11/17/2022	Total Dissolved Solids	171	mg/L	1000	No	n/a	Y	Y	2.38
CASA-23-261121	R-43 S2 ⁱ	11/01/2022	Chloride	6.55	mg/L	250	No	n/a	Y	Y	0.0670
CASA-23-261121	R-43 S2	11/01/2022	Perchlorate	0.729	µg/L	13.8	No	n/a	Y	Y	0.0500
CASA-23-261121	R-43 S2	11/01/2022	Chromium	27.7	µg/L	50	No	n/a	Y	Y	3.00
CASA-23-261121	R-43 S2	11/01/2022	Fluoride	0.470	mg/L	1.6	No	n/a	Y	Y	0.0330
CASA-23-261121	R-43 S2	11/01/2022	Nitrate-Nitrite as Nitrogen	3.73	mg/L	10	No	n/a	Y	Y	0.170
CASA-23-261121	R-43 S2	11/01/2022	Sulfate	9.55	mg/L	600	No	n/a	Y	Y	0.133
CASA-23-261121	R-43 S2	11/01/2022	Total Dissolved Solids	146	mg/L	1000	No	n/a	Y	Y	2.38
CAMO-23-259284	R-45 S1	10/25/2022	Chloride	19.5	mg/L	250	No	n/a	Y	Y	0.335
CAMO-23-259284	R-45 S1	10/25/2022	Perchlorate	0.338	µg/L	13.8	No	n/a	Y	Y	0.0500
CAMO-23-259284	R-45 S1	10/25/2022	Chromium	3.00	µg/L	50	No	U	N	Y	3.00
CAMO-23-259284	R-45 S1	10/25/2022	Fluoride	0.236	mg/L	1.6	No	n/a	Y	Y	0.0330
CAMO-23-259284	R-45 S1	10/25/2022	Nitrate-Nitrite as Nitrogen	3.01	mg/L	10	No	n/a	Y	Y	0.0850
CAMO-23-259284	R-45 S1	10/25/2022	Sulfate	19.6	mg/L	600	No	n/a	Y	Y	0.133
CAMO-23-259284	R-45 S1	10/25/2022	Total Dissolved Solids	188	mg/L	1000	No	n/a	Y	Y	2.38
CAMO-23-261054	R-45 S1	11/17/2022	Chloride	20.5	mg/L	250	No	n/a	Y	Y	0.335
CAMO-23-261054	R-45 S1	11/17/2022	Perchlorate	0.0860	µg/L	13.8	No	J	Y	Y	0.0500
CAMO-23-261054	R-45 S1	11/17/2022	Chromium	3.00	µg/L	50	No	U	N	Y	3.00
CAMO-23-261054	R-45 S1	11/17/2022	Fluoride	0.262	mg/L	1.6	No	n/a	Y	Y	0.0330
CAMO-23-261054	R-45 S1	11/17/2022	Nitrate-Nitrite as Nitrogen	3.03	mg/L	10	No	n/a	Y	Y	0.170
CAMO-23-261054	R-45 S1	11/17/2022	Sulfate	19.9	mg/L	600	No	n/a	Y	Y	0.665
CAMO-23-261054	R-45 S1	11/17/2022	Total Dissolved Solids	213	mg/L	1000	No	n/a	Y	Y	2.38

Table 2.3-2 (continued)

Field Sample ID	Location ID	Sample Date	Parameter Name	Report Result	Report Unit	Standard or Screening Level	Exceeds Standard or Screening Level	Lab Qualifier	Detect Flag	Filtered	Method Detection Limit
CAMO-23-261059	R-45 S1	11/17/2022	Chloride	20.1	mg/L	250	No	n/a	Y	Y	0.335
CAMO-23-261059	R-45 S1	11/17/2022	Perchlorate	0.104	µg/L	13.8	No	J	Y	Y	0.0500
CAMO-23-261059	R-45 S1	11/17/2022	Chromium	3.00	µg/L	50	No	U	N	Y	3.00
CAMO-23-261059	R-45 S1	11/17/2022	Fluoride	0.293	mg/L	1.6	No	n/a	Y	Y	0.0330
CAMO-23-261059	R-45 S1	11/17/2022	Nitrate-Nitrite as Nitrogen	3.03	mg/L	10	No	n/a	Y	Y	0.170
CAMO-23-261059	R-45 S1	11/17/2022	Sulfate	19.7	mg/L	600	No	n/a	Y	Y	0.665
CAMO-23-261059	R-45 S1	11/17/2022	Total Dissolved Solids	222	mg/L	1000	No	n/a	Y	Y	2.38
CAMO-23-261060	R-45 S1	11/17/2022	Chloride	0.161	mg/L	250	No	J	Y	N	0.0670
CAMO-23-261060	R-45 S1	11/17/2022	Perchlorate	0.0500	µg/L	13.8	No	U	N	N	0.0500
CAMO-23-261060	R-45 S1	11/17/2022	Chromium	3.00	µg/L	50	No	U	N	N	3.00
CAMO-23-261060	R-45 S1	11/17/2022	Fluoride	0.0330	mg/L	1.6	No	U	N	N	0.0330
CAMO-23-261060	R-45 S1	11/17/2022	Nitrate-Nitrite as Nitrogen	0.0170	mg/L	10	No	U	N	N	0.0170
CAMO-23-261060	R-45 S1	11/17/2022	Sulfate	0.133	mg/L	600	No	U	N	N	0.133
CAMO-23-261060	R-45 S1	11/17/2022	Total Dissolved Solids	3.00	mg/L	1000	No	J	Y	N	2.38
CAMO-23-261142	R-45 S1	11/17/2022	Chloride	0.156	mg/L	250	No	J	Y	N	0.0670
CAMO-23-261142	R-45 S1	11/17/2022	Perchlorate	0.0500	µg/L	13.8	No	U	N	N	0.0500
CAMO-23-261142	R-45 S1	11/17/2022	Chromium	3.00	µg/L	50	No	U	N	N	3.00
CAMO-23-261142	R-45 S1	11/17/2022	Fluoride	0.0330	mg/L	1.6	No	U	N	N	0.0330
CAMO-23-261142	R-45 S1	11/17/2022	Nitrate-Nitrite as Nitrogen	0.0170	mg/L	10	No	U	N	N	0.0170
CAMO-23-261142	R-45 S1	11/17/2022	Sulfate	0.133	mg/L	600	No	U	N	N	0.133
CAMO-23-261142	R-45 S1	11/17/2022	Total Dissolved Solids	2.38	mg/L	1000	No	U	N	N	2.38
CAMO-23-261915	R-45 S1	12/13/2022	Chloride	20.7	mg/L	250	No	n/a	Y	Y	0.335
CAMO-23-261915	R-45 S1	12/13/2022	Perchlorate	0.359	µg/L	13.8	No	n/a	Y	Y	0.0500
CAMO-23-261915	R-45 S1	12/13/2022	Chromium	3.00	µg/L	50	No	U	N	Y	3.00
CAMO-23-261915	R-45 S1	12/13/2022	Fluoride	0.335	mg/L	1.6	No	n/a	Y	Y	0.0330
CAMO-23-261915	R-45 S1	12/13/2022	Nitrate-Nitrite as Nitrogen	4.10	mg/L	10	No	n/a	Y	Y	0.0850

Table 2.3-2 (continued)

Field Sample ID	Location ID	Sample Date	Parameter Name	Report Result	Report Unit	Standard or Screening Level	Exceeds Standard or Screening Level	Lab Qualifier	Detect Flag	Filtered	Method Detection Limit
CAMO-23-261915	R-45 S1	12/13/2022	Sulfate	19.7	mg/L	600	No	n/a	Y	Y	0.665
CAMO-23-261915	R-45 S1	12/13/2022	Total Dissolved Solids	201	mg/L	1000	No	n/a	Y	Y	2.38
CAMO-23-259287	R-45 S2	10/25/2022	Chloride	8.03	mg/L	250	No	n/a	Y	Y	0.0670
CAMO-23-259287	R-45 S2	10/25/2022	Perchlorate	0.399	µg/L	13.8	No	n/a	Y	Y	0.0500
CAMO-23-259287	R-45 S2	10/25/2022	Chromium	69.1	µg/L	50	Yes	n/a	Y	Y	3.00
CAMO-23-259287	R-45 S2	10/25/2022	Fluoride	0.309	mg/L	1.6	No	n/a	Y	Y	0.0330
CAMO-23-259287	R-45 S2	10/25/2022	Nitrate-Nitrite as Nitrogen	1.76	mg/L	10	No	n/a	Y	Y	0.0850
CAMO-23-259287	R-45 S2	10/25/2022	Sulfate	9.66	mg/L	600	No	n/a	Y	Y	0.133
CAMO-23-259287	R-45 S2	10/25/2022	Total Dissolved Solids	162	mg/L	1000	No	n/a	Y	Y	2.38
CAMO-23-261062	R-45 S2	11/17/2022	Chloride	7.66	mg/L	250	No	n/a	Y	Y	0.0670
CAMO-23-261062	R-45 S2	11/17/2022	Perchlorate	0.463	µg/L	13.8	No	n/a	Y	Y	0.0500
CAMO-23-261062	R-45 S2	11/17/2022	Chromium	60.8	µg/L	50	Yes	n/a	Y	Y	3.00
CAMO-23-261062	R-45 S2	11/17/2022	Fluoride	0.415	mg/L	1.6	No	n/a	Y	Y	0.0330
CAMO-23-261062	R-45 S2	11/17/2022	Nitrate-Nitrite as Nitrogen	1.56	mg/L	10	No	n/a	Y	Y	0.0850
CAMO-23-261062	R-45 S2	11/17/2022	Sulfate	9.97	mg/L	600	No	n/a	Y	Y	0.133
CAMO-23-261062	R-45 S2	11/17/2022	Total Dissolved Solids	172	mg/L	1000	No	n/a	Y	Y	2.38
CAMO-23-261918	R-45 S2	12/13/2022	Chloride	7.42	mg/L	250	No	n/a	Y	Y	0.0670
CAMO-23-261918	R-45 S2	12/13/2022	Perchlorate	0.466	µg/L	13.8	No	n/a	Y	Y	0.0500
CAMO-23-261918	R-45 S2	12/13/2022	Chromium	61.1	µg/L	50	Yes	n/a	Y	Y	3.00
CAMO-23-261918	R-45 S2	12/13/2022	Fluoride	0.563	mg/L	1.6	No	n/a	Y	Y	0.0330
CAMO-23-261918	R-45 S2	12/13/2022	Nitrate-Nitrite as Nitrogen	1.42	mg/L	10	No	n/a	Y	Y	0.0170
CAMO-23-261918	R-45 S2	12/13/2022	Sulfate	9.33	mg/L	600	No	n/a	Y	Y	0.133
CAMO-23-261918	R-45 S2	12/13/2022	Total Dissolved Solids	156	mg/L	1000	No	n/a	Y	Y	2.38
CAMO-23-261921	R-45 S2	12/13/2022	Chloride	7.25	mg/L	250	No	n/a	Y	Y	0.0670
CAMO-23-261921	R-45 S2	12/13/2022	Perchlorate	0.449	µg/L	13.8	No	n/a	Y	Y	0.0500
CAMO-23-261921	R-45 S2	12/13/2022	Chromium	63.2	µg/L	50	Yes	n/a	Y	Y	3.00

Table 2.3-2 (continued)

Field Sample ID	Location ID	Sample Date	Parameter Name	Report Result	Report Unit	Standard or Screening Level	Exceeds Standard or Screening Level	Lab Qualifier	Detect Flag	Filtered	Method Detection Limit
CAMO-23-261921	R-45 S2	12/13/2022	Fluoride	0.563	mg/L	1.6	No	n/a	Y	Y	0.0330
CAMO-23-261921	R-45 S2	12/13/2022	Nitrate-Nitrite as Nitrogen	1.40	mg/L	10	No	n/a	Y	Y	0.0170
CAMO-23-261921	R-45 S2	12/13/2022	Sulfate	9.15	mg/L	600	No	n/a	Y	Y	0.133
CAMO-23-261921	R-45 S2	12/13/2022	Total Dissolved Solids	160	mg/L	1000	No	n/a	Y	Y	2.38
CAMO-23-261922	R-45 S2	12/13/2022	Chloride	0.0670	mg/L	250	No	U	N	N	0.0670
CAMO-23-261922	R-45 S2	12/13/2022	Perchlorate	0.0500	µg/L	13.8	No	U	N	N	0.0500
CAMO-23-261922	R-45 S2	12/13/2022	Chromium	3.00	µg/L	50	No	U	N	N	3.00
CAMO-23-261922	R-45 S2	12/13/2022	Fluoride	0.0330	mg/L	1.6	No	U	N	N	0.0330
CAMO-23-261922	R-45 S2	12/13/2022	Nitrate-Nitrite as Nitrogen	0.0170	mg/L	10	No	U	N	N	0.0170
CAMO-23-261922	R-45 S2	12/13/2022	Sulfate	0.133	mg/L	600	No	U	N	N	0.133
CAMO-23-261922	R-45 S2	12/13/2022	Total Dissolved Solids	2.38	mg/L	1000	No	U	N	N	2.38
CAMO-23-261923	R-45 S2	12/13/2022	Chloride	0.0670	mg/L	250	No	U	N	N	0.0670
CAMO-23-261923	R-45 S2	12/13/2022	Perchlorate	0.0500	µg/L	13.8	No	U	N	N	0.0500
CAMO-23-261923	R-45 S2	12/13/2022	Chromium	3.00	µg/L	50	No	U	N	N	3.00
CAMO-23-261923	R-45 S2	12/13/2022	Fluoride	0.0330	mg/L	1.6	No	U	N	N	0.0330
CAMO-23-261923	R-45 S2	12/13/2022	Nitrate-Nitrite as Nitrogen	0.0170	mg/L	10	No	U	N	N	0.0170
CAMO-23-261923	R-45 S2	12/13/2022	Sulfate	0.133	mg/L	600	No	U	N	N	0.133
CAMO-23-261923	R-45 S2	12/13/2022	Total Dissolved Solids	2.38	mg/L	1000	No	U	N	N	2.38
CAMO-23-259290	R-50 S1	10/27/2022	Chloride	21.2	mg/L	250	No	n/a	Y	Y	0.335
CAMO-23-259290	R-50 S1	10/27/2022	Perchlorate	0.334	µg/L	13.8	No	n/a	Y	Y	0.0500
CAMO-23-259290	R-50 S1	10/27/2022	Chromium	6.97	µg/L	50	No	J	Y	Y	3.00
CAMO-23-259290	R-50 S1	10/27/2022	Fluoride	0.369	mg/L	1.6	No	n/a	Y	Y	0.0330
CAMO-23-259290	R-50 S1	10/27/2022	Nitrate-Nitrite as Nitrogen	3.12	mg/L	10	No	n/a	Y	Y	0.0850
CAMO-23-259290	R-50 S1	10/27/2022	Sulfate	20.6	mg/L	600	No	n/a	Y	Y	0.665
CAMO-23-259290	R-50 S1	10/27/2022	Total Dissolved Solids	212	mg/L	1000	No	n/a	Y	Y	2.38
CAMO-23-261065	R-50 S1	11/08/2022	Chloride	21.6	mg/L	250	No	n/a	Y	Y	0.335

Table 2.3-2 (continued)

Field Sample ID	Location ID	Sample Date	Parameter Name	Report Result	Report Unit	Standard or Screening Level	Exceeds Standard or Screening Level	Lab Qualifier	Detect Flag	Filtered	Method Detection Limit
CAMO-23-261065	R-50 S1	11/08/2022	Perchlorate	0.336	µg/L	13.8	No	n/a	Y	Y	0.0500
CAMO-23-261065	R-50 S1	11/08/2022	Chromium	6.29	µg/L	50	No	J	Y	Y	3.00
CAMO-23-261065	R-50 S1	11/08/2022	Fluoride	0.358	mg/L	1.6	No	n/a	Y	Y	0.0330
CAMO-23-261065	R-50 S1	11/08/2022	Nitrate-Nitrite as Nitrogen	3.07	mg/L	10	No	n/a	Y	Y	0.0850
CAMO-23-261065	R-50 S1	11/08/2022	Sulfate	20.8	mg/L	600	No	n/a	Y	Y	0.665
CAMO-23-261065	R-50 S1	11/08/2022	Total Dissolved Solids	203	mg/L	1000	No	n/a	Y	Y	2.38
CAMO-23-261925	R-50 S1	12/13/2022	Chloride	21.4	mg/L	250	No	n/a	Y	Y	0.335
CAMO-23-261925	R-50 S1	12/13/2022	Perchlorate	0.410	µg/L	13.8	No	n/a	Y	Y	0.0500
CAMO-23-261925	R-50 S1	12/13/2022	Chromium	6.67	µg/L	50	No	J	Y	Y	3.00
CAMO-23-261925	R-50 S1	12/13/2022	Fluoride	0.308	mg/L	1.6	No	n/a	Y	Y	0.0330
CAMO-23-261925	R-50 S1	12/13/2022	Nitrate-Nitrite as Nitrogen	3.15	mg/L	10	No	n/a	Y	Y	0.0850
CAMO-23-261925	R-50 S1	12/13/2022	Sulfate	20.3	mg/L	600	No	n/a	Y	Y	0.665
CAMO-23-261925	R-50 S1	12/13/2022	Total Dissolved Solids	203	mg/L	1000	No	n/a	Y	Y	2.38
CAMO-23-259293	R-50 S2	10/27/2022	Chloride	2.24	mg/L	250	No	n/a	Y	Y	0.0670
CAMO-23-259293	R-50 S2	10/27/2022	Perchlorate	0.281	µg/L	13.8	No	n/a	Y	Y	0.0500
CAMO-23-259293	R-50 S2	10/27/2022	Chromium	4.58	µg/L	50	No	J	Y	Y	3.00
CAMO-23-259293	R-50 S2	10/27/2022	Fluoride	0.539	mg/L	1.6	No	n/a	Y	Y	0.0330
CAMO-23-259293	R-50 S2	10/27/2022	Nitrate-Nitrite as Nitrogen	0.624	mg/L	10	No	n/a	Y	Y	0.0170
CAMO-23-259293	R-50 S2	10/27/2022	Sulfate	2.60	mg/L	600	No	n/a	Y	Y	0.133
CAMO-23-259293	R-50 S2	10/27/2022	Total Dissolved Solids	133	mg/L	1000	No	n/a	Y	Y	2.38
CAMO-23-261068	R-50 S2	11/08/2022	Chloride	2.13	mg/L	250	No	n/a	Y	Y	0.0670
CAMO-23-261068	R-50 S2	11/08/2022	Perchlorate	0.280	µg/L	13.8	No	n/a	Y	Y	0.0500
CAMO-23-261068	R-50 S2	11/08/2022	Chromium	4.19	µg/L	50	No	J	Y	Y	3.00
CAMO-23-261068	R-50 S2	11/08/2022	Fluoride	0.529	mg/L	1.6	No	n/a	Y	Y	0.0330
CAMO-23-261068	R-50 S2	11/08/2022	Nitrate-Nitrite as Nitrogen	0.607	mg/L	10	No	n/a	Y	Y	0.0170
CAMO-23-261068	R-50 S2	11/08/2022	Sulfate	2.58	mg/L	600	No	n/a	Y	Y	0.133

Table 2.3-2 (continued)

Field Sample ID	Location ID	Sample Date	Parameter Name	Report Result	Report Unit	Standard or Screening Level	Exceeds Standard or Screening Level	Lab Qualifier	Detect Flag	Filtered	Method Detection Limit
CAMO-23-261068	R-50 S2	11/08/2022	Total Dissolved Solids	137	mg/L	1000	No	n/a	Y	Y	2.38
CAMO-23-261928	R-50 S2	12/13/2022	Chloride	2.15	mg/L	250	No	n/a	Y	Y	0.0670
CAMO-23-261928	R-50 S2	12/13/2022	Perchlorate	0.334	µg/L	13.8	No	n/a	Y	Y	0.0500
CAMO-23-261928	R-50 S2	12/13/2022	Chromium	4.16	µg/L	50	No	J	Y	Y	3.00
CAMO-23-261928	R-50 S2	12/13/2022	Fluoride	0.567	mg/L	1.6	No	n/a	Y	Y	0.0330
CAMO-23-261928	R-50 S2	12/13/2022	Nitrate-Nitrite as Nitrogen	0.651	mg/L	10	No	n/a	Y	Y	0.0170
CAMO-23-261928	R-50 S2	12/13/2022	Sulfate	2.59	mg/L	600	No	n/a	Y	Y	0.133
CAMO-23-261928	R-50 S2	12/13/2022	Total Dissolved Solids	136	mg/L	1000	No	n/a	Y	Y	2.38
CAMO-23-261450	R-62	11/14/2022	Chloride	15.5	mg/L	250	No	n/a	Y	Y	0.335
CAMO-23-261450	R-62	11/14/2022	Perchlorate	0.751	µg/L	13.8	No	n/a	Y	Y	0.0500
CAMO-23-261450	R-62	11/14/2022	Chromium	279	µg/L	50	Yes	n/a	Y	Y	3.00
CAMO-23-261450	R-62	11/14/2022	Fluoride	0.164	mg/L	1.6	No	n/a	Y	Y	0.0330
CAMO-23-261450	R-62	11/14/2022	Nitrate-Nitrite as Nitrogen	2.08	mg/L	10	No	n/a	Y	Y	0.0850
CAMO-23-261450	R-62	11/14/2022	Sulfate	27.0	mg/L	600	No	n/a	Y	Y	0.665
CAMO-23-261450	R-62	11/14/2022	Total Dissolved Solids	181	mg/L	1000	No	n/a	Y	Y	2.38
CAMO-23-259541	SIMR-2	10/12/2022	Chloride	2.16	mg/L	250	No	n/a	Y	Y	0.0670
CAMO-23-259541	SIMR-2	10/12/2022	Perchlorate	0.486	µg/L	13.8	No	n/a	Y	Y	0.0500
CAMO-23-259541	SIMR-2	10/12/2022	Chromium	5.09	µg/L	50	No	J	Y	Y	3.00
CAMO-23-259541	SIMR-2	10/12/2022	Fluoride	0.448	mg/L	1.6	No	n/a	Y	Y	0.0330
CAMO-23-259541	SIMR-2	10/12/2022	Nitrate-Nitrite as Nitrogen	1.11	mg/L	10	No	n/a	Y	Y	0.0170
CAMO-23-259541	SIMR-2	10/12/2022	Sulfate	2.74	mg/L	600	No	n/a	Y	Y	0.133
CAMO-23-259541	SIMR-2	10/12/2022	Total Dissolved Solids	123	mg/L	1000	No	n/a	Y	Y	2.38
CAMO-23-261095	SIMR-2	11/04/2022	Chloride	2.28	mg/L	250	No	n/a	Y	Y	0.0670
CAMO-23-261095	SIMR-2	11/04/2022	Perchlorate	0.453	µg/L	13.8	No	n/a	Y	Y	0.0500
CAMO-23-261095	SIMR-2	11/04/2022	Chromium	4.89	µg/L	50	No	J	Y	Y	3.00
CAMO-23-261095	SIMR-2	11/04/2022	Fluoride	0.190	mg/L	1.6	No	n/a	Y	Y	0.0330

Table 2.3-2 (continued)

Field Sample ID	Location ID	Sample Date	Parameter Name	Report Result	Report Unit	Standard or Screening Level	Exceeds Standard or Screening Level	Lab Qualifier	Detect Flag	Filtered	Method Detection Limit
CAMO-23-261095	SIMR-2	11/04/2022	Nitrate-Nitrite as Nitrogen	0.800	mg/L	10	No	n/a	Y	Y	0.0170
CAMO-23-261095	SIMR-2	11/04/2022	Sulfate	2.72	mg/L	600	No	n/a	Y	Y	0.133
CAMO-23-261095	SIMR-2	11/04/2022	Total Dissolved Solids	123	mg/L	1000	No	n/a	Y	Y	2.38
CAMO-23-262031	SIMR-2	12/08/2022	Chloride	2.10	mg/L	250	No	n/a	Y	Y	0.335
CAMO-23-262031	SIMR-2	12/08/2022	Perchlorate	0.551	µg/L	13.8	No	n/a	Y	Y	0.0500
CAMO-23-262031	SIMR-2	12/08/2022	Chromium	4.87	µg/L	50	No	J	Y	Y	3.00
CAMO-23-262031	SIMR-2	12/08/2022	Fluoride	0.282	mg/L	1.6	No	n/a	Y	Y	0.0330
CAMO-23-262031	SIMR-2	12/08/2022	Nitrate-Nitrite as Nitrogen	0.741	mg/L	10	No	n/a	Y	Y	0.0850
CAMO-23-262031	SIMR-2	12/08/2022	Sulfate	2.69	mg/L	600	No	n/a	Y	Y	0.665
CAMO-23-262031	SIMR-2	12/08/2022	Total Dissolved Solids	120	mg/L	1000	No	n/a	Y	Y	2.38

^a n/a = Not applicable: no qualifiers applied.

^b In the Detect Flag column, Y = detected.

^c In the Filtered column, Y = filtered.

^d In the Filtered column, N = not filtered.

^e U =Analyte is classified as not detected.

^f In the Detect Flag column, N = not detected.

^g J = Analyte is classified as estimated.

^h S1 = Screen 1.

ⁱ S2 = Screen 2.

Long-term water-level data, contaminant transport observations (travel times and direction of migration), and calibrated model results suggest that the water table was relatively flat in the area of the chromium plume before the implementation of CrEX extraction and CrIN injection wells. Steeper gradients are found to the west because of the mountain-front recharge and to the east toward the Rio Grande. The low ambient gradient in the chromium plume area could be related to any or all of the following:

- the relatively high permeability of the Puye Formation and Miocene pumiceous sediments
- anisotropy of the regional aquifer
- localized recharge along the canyons above the regional aquifer, faults, or other lineaments that affect regional-scale hydraulic conductivity
- nearby water-supply pumping

Although it is difficult to infer absolute groundwater flow directions from the relatively flat contours in the chromium plume area, the general flow of groundwater can be determined. Groundwater elevation data and contaminant transport observations indicated that, before operation of the IM, the groundwater flowed generally toward the east-southeast. The current groundwater flows generally toward the southeast, with the influence of IM operations being seen mainly in the vicinity of the extraction wells CrEX-1, CrEX-2, CrEX-3, and CrEX-4. Local flow direction near these wells is inward because of the extraction-induced depression in potentiometric surface.

Water-table elevations in the chromium plume area can vary temporally as a result of transient effects that include injection into, and extraction from, the chromium IM infrastructure wells, and pumping of Los Alamos County's water-supply wells. This is discussed for the case of CY 2022 Quarter 4 below.

In the chromium plume area, effects on flow direction from water-supply pumping are small compared with the local effects of extraction and injection at chromium IM wells. Transience in the water levels at time scales of hours to days observed at the monitoring wells within the plume area does not appear to be substantially affected by the water-supply pumping at the nearby production wells (PM-2, PM-3, PM-4, PM-5, and O-4) (LANL 2009). Impacts of production well pumping are observed over seasonal to yearly time scales and overall have led to a fairly uniform decline in the water table across the plume area, in contrast to IM extraction and injection impacts.

A long-term decline of approximately 0.2 to 0.5 ft/yr in the regional water levels has been observed throughout the aquifer beneath the Pajarito Plateau. The decline could be caused by long-term changes in the aquifer recharge and discharge conditions. Because of the long-term declines and pumping transience described above, the water-level data and the respective water table contour maps are variable over time; each map therefore represents a specific period of time. Figure 2.3-1 depicts the average water-level data and water table contours for November 2022. General flow direction is indicated by the vector.

To generate this quarterly contour map, average water levels are calculated with a default of using values from the middle month of the 3-month reporting period. In quarters where the middle month may not be representative (e.g., due to an IM well pumping hiatus), water-level values from times other than the middle month are selected. Monitoring wells within and surrounding the plume are used, including wells not presented on the map (e.g., R-21, R-31, R-32, R-37, and R-40) or in Table 2.3-1. Water levels in wells surrounding the plume provide useful control points for contouring along the edges of the area of interest for this report.

Simple interpolation methods for water table data from a complex heterogeneous site could produce maps that do not represent physically realistic hydrological systems. This water table map is contoured by incorporating process knowledge of groundwater hydraulics (e.g., flownet conformity rules) as well as conceptual models of groundwater flow in the project area as described above. Key inputs to the conceptual model include knowledge of long-term operations of extraction and injection wells, water-level elevations in monitoring wells near extraction and injection points, and cross-hole tracer data between injection wells and monitoring wells.

In 2018 and 2019, water table maps for DP-1835 were generated using an interpolation method called thin-plate spline (TPS) (e.g., <https://www.jstor.org/stable/2241837>). TPS is a special case of universal kriging. In 2020, an interpolation method called Bayesian canonical correlation regression (BCCR) (Carson 2020) was implemented. BCCR increased efficiency of map-making by using prior knowledge of water levels to generate an initial water table map of the expected surface given quarterly water levels. Kriging was then used to update the map using residuals between the water levels and the expected surface for a given quarter. In CY 2022 Quarter 4, the interpolation method used reverted to TPS. This change was made because of the greater representation of TPS in the scientific literature. Maps generated with the two methods are analogous because both methods use kriging-based interpolation; the primary difference between the two methods is the incorporation of prior information as an initial estimate of water levels.

Because of the spatial coverage of wells and piezometers and the regional structure of significantly steeper gradients to the east and west of the chromium plume area, the surrounding wells (e.g., R-21, R-31, R-32, R-37, and R-40) and control points based on expert opinion are used to provide estimated water-level elevations in areas that do not have sufficient data to provide constraints (EPA 2008). As additional analysis is performed using historical and developing data sets from existing wells and data that will be collected from proposed wells, the use of these control points is being reanalyzed, adjusted, or discontinued based on additional supporting data and contouring methods.

Over the course of operating the chromium IM system, changes to water table elevation occur depending upon how the system has been operating. A quarter-by-quarter account of the water table elevations is not provided as part of this quarterly report. Each quarterly report previously submitted provides information of the water table elevation near the chromium IM wells along with possible causes for water-level variations for that specific quarter. Information on the quarterly depth to groundwater for CY 2022 Quarter 4 is provided in Figure 2.3-1 and Table 2.3-1.

In the current reporting period of CY 2022 Quarter 4, IM pumping was generally consistent through October. Near the end of October, extraction ceased at IM extraction wells CrEX-1, -2, and -3 due to grounding failures, and injection ceased at injection wells CrIN-1, -2, and -3 to maintain flow balance. Data availability was hindered by equipment breakages or scheduled maintenance; notably, data from R-44, R-45, R-70, and SIMR-2 were not available in 2022 Q4.

Therefore, Figure 2.3-1 should be interpreted cautiously, especially in the central regions where R-42 is located. On previous maps, the contour in the middle of the chromium plume area was closed, meaning water could not flow out. The open contour on the current map may be linked to lack of water-level data. For example, data from R-42 would assist in interpreting trends in the central area of the map where water levels are below 5829 ft. Also, care should be employed in the interpretation of the southeast area of the map where SIMR-2 is located (not plotted in Figure 2.3-1 due to lack of data).

However, comparisons with prior quarters indicate a strong influence of the IM wells, notably in the lack of a closed water-level contour in the central area, and in water levels associated with specific wells. For example, the CrPZ-1 water level increased by 2.8 ft between 2022 Q3 and Q4. This is a considerable

change over one quarter for the area of the chromium plume. The increase appears linked to the pause in extraction at CrEX-2. The pause in IM pumping and paucity of data both increase uncertainty, as compared to water-table maps from previous quarters, and they are likely the main causes of the absent closed contour.

2.4 Any Operations/Maintenance Activities Performed (Requirement 4)

Extraction, treatment, and injection operations continued during CY 2022 Quarter 4. Operations and maintenance activities completed during CY 2022 Quarter 4 are listed in Table 2.4-1 for the extraction, treatment, and injection system.

**Table 2.4-1
Operations and Maintenance Activity Summary Table – CY 2022 Quarter 4**

Maintenance Date	Elements Impacted	Operation/Maintenance Description
10/1/22 through 10/18/22	CrEX-1, CrEX-2, CrEX-3, CrEX-4, CrEX-5, CTUA, CTUC, CrIN-1, CrIN-2, CrIN-3, CrIN-4, CrIN-5	Extraction, treatment, and injection of treated groundwater occurred per operational plan.
10/18/22	CTUA	IX vessel exchanges were completed as follows because of an increase in the amount of hexavalent chromium at the primary IX vessel effluent as determined via Hach instrument analysis: <ul style="list-style-type: none"> • Treatment train A – replaced primary IX vessel with the secondary IX vessel; new secondary IX vessel installed. • Treatment train B – replaced primary IX vessel with the secondary IX vessel; new secondary IX vessel installed. • Treatment train C – replaced primary IX vessel with the secondary IX vessel; new secondary IX vessel installed. Both influent and all three effluent filter bags replaced.
10/18/22 through 10/27/22	CrEX-1, CrEX-2, CrEX-3, CrEX-4, CrEX-5, CTUA, CTUC, CrIN-1, CrIN-2, CrIN-3, CrIN-4, CrIN-5	Extraction, treatment, and injection of treated groundwater occurred per operational plan.
10/27/22	CrEX-3	CrEX-3 turned off due to improper grounding observed during inspection.
10/28/22	CrEX-1, CrEX-2, CrIN-1, CrIN-2, CrIN-3	CrEX-1 and CrEX-2 turned off due to improper grounding observed during inspection at CrEX-1. CrIN-1, CrIN-2, and CrIN-3 turned off to balance flow.
10/28/22 through 11/2/22	CrEX-4, CrEX-5, CTUA, CTUC, CrIN-4, CrIN-5	Extraction, treatment, and injection of treated groundwater occurred per operational plan.
11/2/22	CTUC	IX vessel exchanges were completed as follows because of an increase in the amount of hexavalent chromium at the primary IX vessel effluent as determined via Hach instrument analysis: <ul style="list-style-type: none"> • Treatment train A – replaced primary IX vessel with the secondary IX vessel; new secondary IX vessel installed. • Treatment train B – replaced primary IX vessel with the secondary IX vessel; new secondary IX vessel installed. Both influent filter bags replaced.
11/2/22 through 11/8/22	CrEX-4, CrEX-5, CTUA, CTUC, CrIN-4, CrIN-5	Extraction, treatment, and injection of treated groundwater occurred per operational plan.

Maintenance Date	Elements Impacted	Operation/Maintenance Description
11/8/22	CTUC	CTUC turned off due to reduced flow rates with CrEX-1, CrEX-2, and CrEX-3 turned off.
11/8/22 through 11/23/22	CrEX-4, CrEX-5, CTUA, CrIN-4, CrIN-5	Extraction, treatment, and injection of treated groundwater occurred per operational plan.
11/23/22	CTUA	IX vessel exchanges were completed as follows because of an increase in the amount of hexavalent chromium at the primary IX vessel effluent as determined via Hach instrument analysis: Treatment train A – replaced primary IX vessel with the secondary IX vessel; new secondary IX vessel installed.
11/23/22 through 12/1/22	CrEX-4, CrEX-5, CTUA, CrIN-4, CrIN-5	Extraction, treatment, and injection of treated groundwater occurred per operational plan.
12/1/22	CTUA	IX vessel exchanges were completed as follows because of an increase in the amount of hexavalent chromium at the primary IX vessel effluent as determined via Hach instrument analysis: <ul style="list-style-type: none"> • Treatment train B – replaced primary IX vessel with the secondary IX vessel; new secondary IX vessel installed. • Treatment train C – replaced primary IX vessel with the secondary IX vessel; new secondary IX vessel installed. Both influent and all three effluent filter bags replaced.
12/1/22 through 12/31/22	CrEX-4, CrEX-5, CTUA, CrIN-4, CrIN-5	Extraction, treatment, and injection of treated groundwater occurred per operational plan.

2.5 Any Periodic Test of Mechanical Integrity Conducted (Requirement 5)

Periodic testing of mechanical integrity was not conducted or reported to NMED during CY 2022 Quarter 4. Mechanical integrity testing was performed and reported to NMED during the CY 2019 Quarter 4 reporting period. In accordance with Condition No. 3, mechanical integrity testing will occur at least once every 5 yr unless a UIC well is reconfigured. Under this scenario, a mechanical integrity test before reinjection of treated effluent at a specific reconfigured well will be completed pursuant to Condition No. 3.

2.6 Any Replacement of Primary or Secondary IX Vessels or Associated Treatment System Infrastructure (Requirement 6)

The primary IX vessels were replaced by the secondary IX vessels, and new secondary IX vessels were installed, at various times for all three treatment trains in CTUA and for both treatment trains in CTUC during the reporting period, as cited in Table 2.4-1.

2.7 Any Well Workovers Conducted (Requirement 7)

No well workovers were conducted during CY 2022 Quarter 4.

2.8 Any Additional Operational Changes with the Potential to Markedly Affect the Discharge (Requirement 8)

During the reporting period, the pilot-scale molasses amendment and sodium dithionite amendment studies continued. In accordance with NMED's conditional approval of these studies, analytical results from iron, manganese, and arsenic testing of the treated water from the extraction wells during the study are provided in the quarterly monitoring reports under DP-1835. These results for CY 2022 Quarter 4 are provided in Table 2.2-2.

No results for arsenic, iron, or manganese exceeded 90% of the numeric standards of 20.6.2.3103 NMAC or 90% of the numeric standards established for tap water in Table A-1 of the 2022 NMED risk assessment guidance (NMED 2022) for constituents not listed in 20.6.2.3103 NMAC. The 90% values for arsenic, iron, and manganese are 9 µg/L, 900 µg/L, and 180 µg/L, respectively.

Other than the activities cited in section 2.4, no additional operational changes occurred during the reporting period.

2.9 Monthly Average, Maximum, and Minimum Values for Flow Rate and Volume of Treated Effluent Transferred to Each UIC Well (Requirement 9)

Table 2.9-1 provides the monthly average, maximum, and minimum values for flow rate and volume of treated effluent transferred to each well in CY 2022 Quarter 4. As noted in Table 2.4-1, CrIN-3, CrIN-4, and CrIN-5 were turned off on October 28, 2022 to balance the injection flow after extraction wells CrEX-1, CrEX-2, and CrEX-3 were shut down due to grounding failures.

**Table 2.9-1
Flows and Volumes of Treated Effluent Injected – CY 2022 Quarter 4, DP-1835**

Injection Well	Flow rate (gpm ^a)			Daily Volume (gal.)			Total Volume (gal.)
	Average ^b	Maximum	Minimum ^c	Average	Maximum	Minimum	
October 2022							
CrIN-1	54.8	60.8	23.5	78,872	87,616	33,776	2,208,402
CrIN-2	57.9	64.7	25.2	83,408	93,230	36,329	2,335,420
CrIN-3	39.2	49.0	16.9	56,468	70,494	24,342	1,581,093
CrIN-4	60.9	73.2	56.0	87,703	105,405	80,649	2,718,797
CrIN-5	60.5	73.5	55.9	87,130	105,797	80,525	2,701,022
November 2022							
CrIN-1	0.0	0.0	0.0	0	0	0	0
CrIN-2	0.0	0.0	0.0	0	0	0	0
CrIN-3	0.0	0.0	0.0	0	0	0	0
CrIN-4	69.5	75.1	65.2	100,068	108,169	93,859	3,002,042
CrIN-5	71.2	74.5	67.5	102,475	107,319	97,165	3,074,240

Table 2.9-1 (continued)

Injection Well	Flow rate (gpm ^a)			Daily Volume (gal.)			Total Volume (gal.)
	Average ^b	Maximum	Minimum ^c	Average	Maximum	Minimum	
December 2022							
CrIN-1	0.0	0.0	0.0	0	0	0	0
CrIN-2	0.0	0.0	0.0	0	0	0	0
CrIN-3	0.0	0.0	0.0	0	0	0	0
CrIN-4	73.1	76.8	68.0	105,239	110,521	97,868	3,262,405
CrIN-5	70.3	74.0	67.2	101,202	106,573	96,761	3,137,260

^a gpm = Gallons per minute.

^b Average flow rate and daily volume represent arithmetic mean values of results provided during periods when treated groundwater was being injected.

^c Minimum values represent the minimum daily value recorded during days when pumping occurred.

2.10 Total Monthly Volume of Treated Effluent Transferred to Each UIC Well (Requirement 10)

Table 2.9-1 provides total monthly volumes of treated effluent transferred to each well. As previously identified, injection occurred at UIC wells CrIN-1 through CrIN-5 during CY 2022 Quarter 4.

2.11 Monthly Average, Maximum, and Minimum Values of Injection Water Level (Pressure Head) Above Static Level for Each UIC Well (Requirement 11)

Table 2.11-1 provides the monthly average, maximum, and minimum values for injection water level above static level for each UIC well.

**Table 2.11-1
Water-Level Values Above Static Level by UIC Well – CY 2022 Quarter 4, DP-1835**

UIC Well	October 2022			November 2022			December 2022		
	Average ^a (ft)	Maximum (ft)	Minimum (ft)	Average (ft)	Maximum (ft)	Minimum (ft)	Average (ft)	Maximum (ft)	Minimum (ft)
CrIN-1	8.5	9.6	0.7	n/a ^b	n/a	n/a	n/a	n/a	n/a
CrIN-2	11.2	13.2	0.0	n/a	n/a	n/a	n/a	n/a	n/a
CrIN-3	3.1	3.8	0.2	n/a	n/a	n/a	n/a	n/a	n/a
CrIN-4	16.3	20.7	6.8	19.2	21.5	16.2	20.2	22.1	9.4
CrIN-5	22.2	28.6	5.3	27.4	30.6	6.7	27.9	30.8	4.5

^a Average values provided represent arithmetic mean values of maximum daily values during periods when treated groundwater was being injected.

^b n/a – not applicable (treated groundwater was not injected during the month at this location).

2.12 Daily Volume Injected at Each UIC Well (Requirement 12)

Daily volumes of groundwater injected (following treatment) during CY 2022 Quarter 4 are presented in Table 2.12-1.

Table 2.12-1
Daily Injection Summary Table – CY 2021 Quarter 4, DP-1835

Date	CrIN-1 (gal.)	CrIN-2 (gal.)	CrIN-3 (gal.)	CrIN-4 (gal.)	CrIN-5 (gal.)	Total (gal.)
10/1/2022	84,552	86,377	60,406	89,074	86,280	406,690
10/2/2022	83,453	86,406	59,395	89,381	86,409	405,044
10/3/2022	86,250	86,305	59,984	89,271	86,393	408,204
10/4/2022	85,992	86,484	60,473	89,287	82,560	404,796
10/5/2022	87,616	85,265	70,494	87,860	84,848	416,083
10/6/2022	82,861	87,567	64,737	87,546	80,525	403,235
10/7/2022	82,602	89,199	59,692	87,070	82,278	400,840
10/8/2022	86,935	88,623	58,858	86,407	84,978	405,801
10/9/2022	82,907	89,312	58,493	86,044	85,414	402,170
10/10/2022	80,011	89,153	57,934	86,799	85,719	399,615
10/11/2022	82,786	87,342	59,929	86,351	85,890	402,298
10/12/2022	84,938	87,970	59,724	86,012	85,533	404,177
10/13/2022	82,008	88,384	60,098	86,423	85,921	402,834
10/14/2022	79,983	87,381	60,504	86,237	86,288	400,392
10/15/2022	81,562	89,214	59,416	86,598	85,895	402,686
10/16/2022	82,315	88,165	59,345	88,313	85,802	403,941
10/17/2022	36,843	38,133	26,294	87,453	85,375	274,097
10/18/2022	39,871	42,572	28,827	84,883	83,587	279,739
10/19/2022	81,395	84,982	61,438	84,982	84,925	397,722
10/20/2022	85,217	85,102	61,055	83,720	83,038	398,131
10/21/2022	87,091	91,045	59,288	82,135	81,379	400,938
10/22/2022	86,530	91,588	57,491	82,164	81,480	399,253
10/23/2022	83,493	93,230	57,475	82,391	83,365	399,954
10/24/2022	84,345	92,740	59,195	82,000	86,452	404,731
10/25/2022	84,290	92,141	58,610	81,395	86,513	402,948
10/26/2022	84,438	92,333	58,153	80,771	86,423	402,119
10/27/2022	84,343	92,081	59,441	80,649	87,328	403,842
10/28/2022	33,776	36,329	24,342	94,673	95,934	285,054
10/29/2022	0	0	0	105,405	103,488	208,893
10/30/2022	0	0	0	103,780	105,207	208,987
10/31/2022	0	0	0	103,722	105,797	209,519
11/1/2022	0	0	0	103,635	105,927	209,562
11/2/2022	0	0	0	103,436	106,409	209,844
11/3/2022	0	0	0	101,465	106,333	207,798
11/4/2022	0	0	0	99,343	97,165	196,508
11/5/2022	0	0	0	99,121	97,890	197,010
11/6/2022	0	0	0	99,688	97,897	197,585

Table 2.12-1 (continued)

Date	CrIN-1 (gal.)	CrIN-2 (gal.)	CrIN-3 (gal.)	CrIN-4 (gal.)	CrIN-5 (gal.)	Total (gal.)
11/7/2022	0	0	0	99,365	97,701	197,066
11/8/2022	0	0	0	94,037	99,207	193,244
11/9/2022	0	0	0	95,623	102,173	197,797
11/10/2022	0	0	0	97,670	107,319	204,989
11/11/2022	0	0	0	97,786	105,537	203,323
11/12/2022	0	0	0	98,100	105,557	203,657
11/13/2022	0	0	0	97,879	105,417	203,297
11/14/2022	0	0	0	97,946	105,374	203,320
11/15/2022	0	0	0	100,781	105,349	206,130
11/16/2022	0	0	0	103,192	105,237	208,429
11/17/2022	0	0	0	101,874	105,137	207,012
11/18/2022	0	0	0	102,162	105,033	207,195
11/19/2022	0	0	0	102,026	104,938	206,964
11/20/2022	0	0	0	102,105	105,533	207,638
11/21/2022	0	0	0	102,231	106,037	208,268
11/22/2022	0	0	0	94,586	98,290	192,876
11/23/2022	0	0	0	93,859	97,460	191,318
11/24/2022	0	0	0	99,386	105,706	205,093
11/25/2022	0	0	0	99,489	103,063	202,552
11/26/2022	0	0	0	100,012	97,532	197,544
11/27/2022	0	0	0	97,457	98,991	196,448
11/28/2022	0	0	0	101,570	99,818	201,388
11/29/2022	0	0	0	108,169	98,593	206,762
11/30/2022	0	0	0	108,049	97,616	205,665
12/1/2022	0	0	0	101,071	96,761	197,832
12/2/2022	0	0	0	97,942	98,687	196,629
12/3/2022	0	0	0	97,868	98,636	196,503
12/4/2022	0	0	0	108,431	100,226	208,657
12/5/2022	0	0	0	104,439	104,323	208,762
12/6/2022	0	0	0	108,628	98,416	207,044
12/7/2022	0	0	0	109,553	99,375	208,928
12/8/2022	0	0	0	110,521	99,377	209,898
12/9/2022	0	0	0	110,395	99,335	209,730
12/10/2022	0	0	0	109,987	99,419	209,406
12/11/2022	0	0	0	110,067	99,335	209,402
12/12/2022	0	0	0	109,860	99,302	209,162
12/13/2022	0	0	0	107,855	101,875	209,731
12/14/2022	0	0	0	106,578	103,388	209,966
12/15/2022	0	0	0	105,269	104,929	210,198

Table 2.12-1 (continued)

Date	CrIN-1 (gal.)	CrIN-2 (gal.)	CrIN-3 (gal.)	CrIN-4 (gal.)	CrIN-5 (gal.)	Total (gal.)
12/16/2022	0	0	0	105,116	104,109	209,226
12/17/2022	0	0	0	105,036	103,797	208,833
12/18/2022	0	0	0	105,138	98,771	203,909
12/19/2022	0	0	0	105,285	98,263	203,547
12/20/2022	0	0	0	105,030	106,573	211,604
12/21/2022	0	0	0	103,318	105,312	208,630
12/22/2022	0	0	0	102,053	105,843	207,897
12/23/2022	0	0	0	102,573	105,604	208,177
12/24/2022	0	0	0	106,361	101,213	207,574
12/25/2022	0	0	0	106,591	101,591	208,182
12/26/2022	0	0	0	106,570	101,519	208,089
12/27/2022	0	0	0	106,535	101,486	208,021
12/28/2022	0	0	0	106,583	102,012	208,596
12/29/2022	0	0	0	101,898	100,185	202,082
12/30/2022	0	0	0	97,880	98,854	196,735
12/31/2022	0	0	0	97,974	98,743	196,717
Total 24,020,682						

2.13 Daily Volume Pumped from Each Extraction Well (Requirement 13)

Daily volumes of groundwater pumped from extraction wells during 2021 Quarter 4 are presented in Table 2.13-1. As noted in Table 2.4-1, CrEX-3 was shut down on October 27, 2022, and CrEX-1 and CrEX-2 were turned off on October 28, 2022, due to grounding failures.

**Table 2.13-1
Daily Extraction Summary Table – CY 2022 Quarter 4, DP-1835**

Date	CrEX-1 (gal.)	CrEX-2 (gal.)	CrEX-3 (gal.)	CrEX-4 (gal.)	CrEX-5 (gal.)	Total (gal.)
10/1/2022	100,698	89,141	35,414	78,289	96,894	400,436
10/2/2022	100,826	89,254	38,881	77,624	96,637	403,222
10/3/2022	100,823	88,457	40,601	79,415	96,543	405,839
10/4/2022	100,652	88,387	40,994	82,055	96,475	408,563
10/5/2022	100,991	88,470	39,345	82,121	96,521	407,448
10/6/2022	100,672	88,044	39,455	82,062	96,389	406,622
10/7/2022	100,728	88,668	37,758	82,094	92,441	401,689
10/8/2022	105,598	88,484	36,087	82,196	85,948	398,313
10/9/2022	107,979	87,823	35,925	82,029	86,430	400,185
10/10/2022	107,966	87,809	35,096	81,742	86,369	398,982
10/11/2022	108,103	87,915	34,614	81,870	86,384	398,887
10/12/2022	107,884	87,122	34,551	81,410	90,026	400,993
10/13/2022	107,645	86,432	34,577	80,281	94,806	403,741

Table 2.13-1 (continued)

Date	CrEX-1 (gal.)	CrEX-2 (gal.)	CrEX-3 (gal.)	CrEX-4 (gal.)	CrEX-5 (gal.)	Total (gal.)
10/14/2022	107,888	87,246	34,650	76,852	92,409	399,046
10/15/2022	107,918	87,310	34,544	77,439	90,633	397,843
10/16/2022	107,868	86,767	34,497	79,310	90,606	399,049
10/17/2022	48,783	39,153	15,888	80,245	90,451	274,519
10/18/2022	53,514	42,674	18,692	80,318	86,594	281,792
10/19/2022	109,466	89,209	37,607	78,100	83,369	397,751
10/20/2022	110,414	89,178	31,759	79,181	83,575	394,106
10/21/2022	109,906	89,175	30,250	78,310	89,067	396,708
10/22/2022	109,451	89,278	30,243	77,787	92,268	399,027
10/23/2022	109,433	89,195	29,950	77,821	92,486	398,885
10/24/2022	109,486	89,144	29,069	77,806	92,788	398,293
10/25/2022	109,405	88,923	29,323	77,734	92,324	397,708
10/26/2022	108,578	88,201	34,463	80,612	91,586	403,440
10/27/2022	110,079	87,761	20,658	86,466	99,228	404,193
10/28/2022	44,873	34,893	0	89,658	112,047	281,472
10/29/2022	0	0	0	90,050	113,944	203,994
10/30/2022	0	0	0	92,168	113,793	205,961
10/31/2022	0	0	0	94,121	113,752	207,873
11/1/2022	0	0	0	96,090	113,446	209,536
11/2/2022	0	0	0	96,473	113,728	210,201
11/3/2022	0	0	0	96,322	113,778	210,100
11/4/2022	0	0	0	91,517	109,250	200,767
11/5/2022	0	0	0	88,515	106,624	195,138
11/6/2022	0	0	0	88,493	106,599	195,092
11/7/2022	0	0	0	88,421	106,619	195,040
11/8/2022	0	0	0	84,584	107,190	191,774
11/9/2022	0	0	0	87,654	110,304	197,957
11/10/2022	0	0	0	92,178	111,226	203,404
11/11/2022	0	0	0	92,177	111,463	203,640
11/12/2022	0	0	0	92,102	111,387	203,489
11/13/2022	0	0	0	92,198	111,255	203,453
11/14/2022	0	0	0	92,179	111,244	203,423
11/15/2022	0	0	0	92,182	112,140	204,322
11/16/2022	0	0	0	92,096	115,092	207,188
11/17/2022	0	0	0	92,162	115,191	207,354
11/18/2022	0	0	0	92,204	115,254	207,457
11/19/2022	0	0	0	92,145	115,154	207,299
11/20/2022	0	0	0	92,147	115,150	207,297
11/21/2022	0	0	0	92,086	114,701	206,787
11/22/2022	0	0	0	84,702	104,641	189,343

Table 2.13-1 (continued)

Date	CrEX-1 (gal.)	CrEX-2 (gal.)	CrEX-3 (gal.)	CrEX-4 (gal.)	CrEX-5 (gal.)	Total (gal.)
11/23/2022	0	0	0	82,087	107,939	190,026
11/24/2022	0	0	0	87,644	116,842	204,486
11/25/2022	0	0	0	89,265	116,608	205,873
11/26/2022	0	0	0	86,926	114,931	201,857
11/27/2022	0	0	0	86,158	112,787	198,945
11/28/2022	0	0	0	89,051	109,893	198,943
11/29/2022	0	0	0	92,702	111,788	204,491
11/30/2022	0	0	0	92,733	112,946	205,679
12/1/2022	0	0	0	88,060	106,345	194,405
12/2/2022	0	0	0	91,451	110,959	202,410
12/3/2022	0	0	0	87,936	111,206	199,142
12/4/2022	0	0	0	87,885	111,308	199,193
12/5/2022	0	0	0	88,895	112,293	201,188
12/6/2022	0	0	0	92,137	114,888	207,024
12/7/2022	0	0	0	93,959	116,957	210,916
12/8/2022	0	0	0	95,920	118,026	213,947
12/9/2022	0	0	0	96,194	117,954	214,147
12/10/2022	0	0	0	96,390	112,844	209,234
12/11/2022	0	0	0	96,531	110,872	207,404
12/12/2022	0	0	0	96,436	110,816	207,252
12/13/2022	0	0	0	96,492	113,152	209,645
12/14/2022	0	0	0	96,436	114,513	210,949
12/15/2022	0	0	0	95,099	114,719	209,818
12/16/2022	0	1	0	95,271	114,638	209,911
12/17/2022	0	0	0	95,228	114,760	209,988
12/18/2022	0	0	0	95,448	114,457	209,905
12/19/2022	0	0	0	83,597	115,452	199,048
12/20/2022	0	0	0	87,314	115,276	202,590
12/21/2022	0	0	0	90,331	115,031	205,362
12/22/2022	0	0	0	90,872	116,679	207,551
12/23/2022	0	0	0	90,745	118,122	208,867
12/24/2022	0	0	0	90,750	118,135	208,885
12/25/2022	0	0	0	90,673	118,042	208,715
12/26/2022	0	0	0	90,742	118,117	208,859
12/27/2022	0	0	0	91,017	118,056	209,073
12/28/2022	0	0	0	92,063	118,128	210,191
12/29/2022	0	0	0	86,896	116,103	202,999
12/30/2022	0	0	0	82,049	114,472	196,521
12/31/2022	0	0	0	82,116	114,315	196,431
Total						23,938,509

2.14 Facility Layout Map (Requirement 14)

Figure 2.14-1 is the facility layout map for CY 2022 Quarter 4, showing the location and number of each well.

2.15 Groundwater Elevation Contour Map (Requirement 15)

Figure 2.3-1 is the groundwater elevation contour map. Section 2.3 provides an explanation of how this map was generated.

3.0 REFERENCES

Carson, J., A. Jordan, A. Rice, P. Black, T. Stockton, D. Katzman, and L. Foster. "Bayesian Approach to Estimation of Water Table Elevations Using Historical Rasters as Prior Information," paper presented at WM2020 Conference, March 8–12, 2020, Phoenix, Arizona (Carson 2020).

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NMED (New Mexico Environment Department) June 27, 2017. "Response to Notice of Intent to Discharge; Discharge Permit Not Required for Los Alamos National Laboratory Pilot Scale Molasses Amendment Study in Regional Aquifer Monitoring Well R-28, AI:856 PRD20170003," New Mexico Environment Department letter to J.C. Bretzke (LANL) and A.Q. Duran (EM-LA) from M. Hunter (NMED-GWQB), Santa Fe, New Mexico (NMED 2017a).

NMED (New Mexico Environment Department) July 18, 2017. "Response to Notice of Intent to Discharge; Discharge Permit Not Required for Los Alamos National Laboratory Pilot Scale Sodium Dithionite Amendment Study in Regional Aquifer Monitoring Well R-42, AI:856 PRD20170003," New Mexico Environment Department letter to J.C. Bretzke (LANL) and A.Q. Duran (EM-LA) from M. Hunter (NMED-GWQB), Santa Fe, New Mexico (NMED 2017b).

NMED (New Mexico Environment Department) June 2022. "Risk Assessment Guidance for Site Investigations and Remediation, Volume 1, Soil Screening Guidance for Human Health Risk Assessments," Hazardous Waste Bureau and Ground Water Quality Bureau, Santa Fe, New Mexico (NMED 2022).

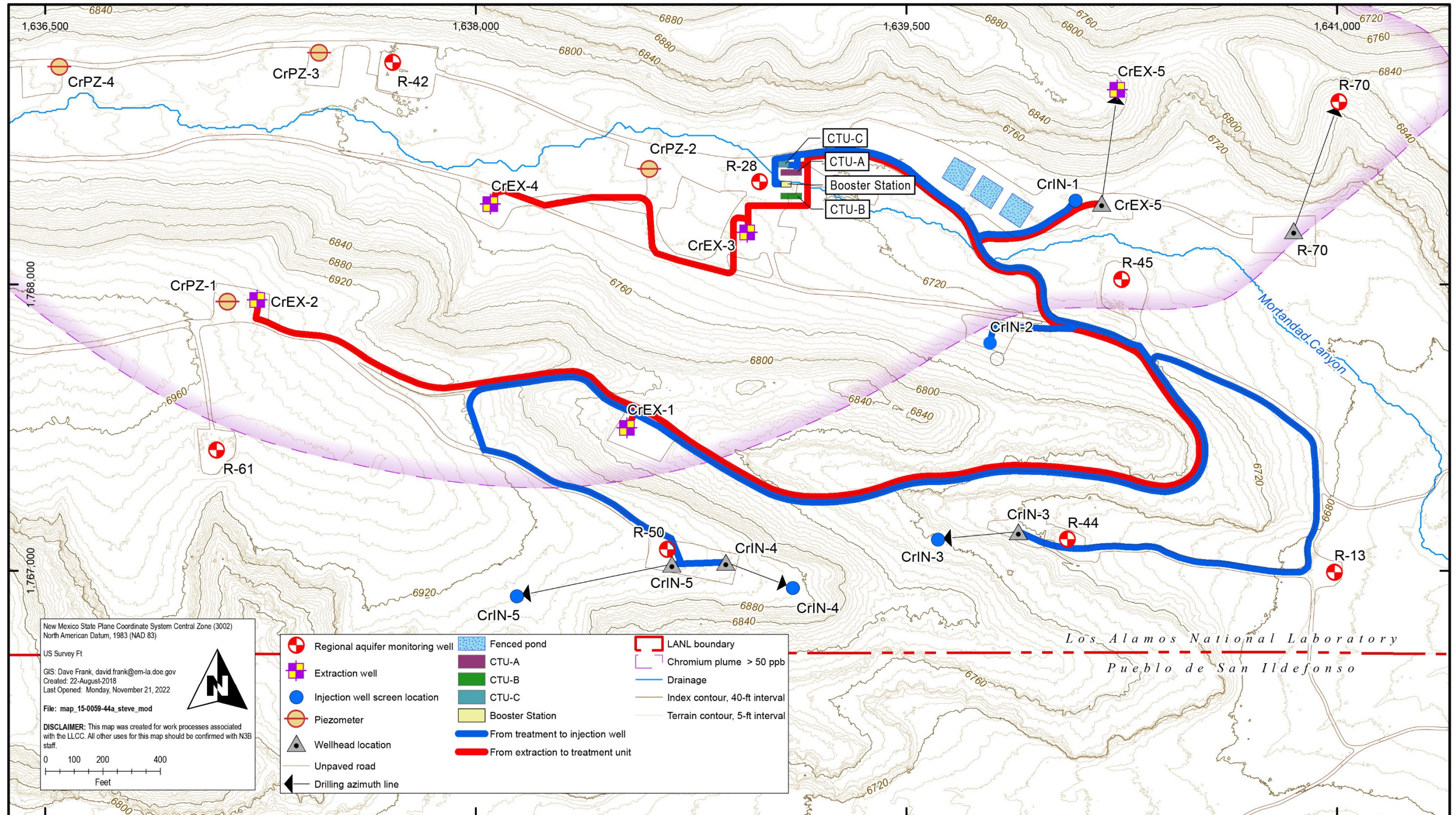


Figure 2.14-1 Facility layout map – CY 2022 Quarter 4, DP-1835

