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Date: FEB 28 2019
Refer To: N3B-19-0046

Ms. Michelle Hunter, Chief
Ground Water Quality Bureau
New Mexico Environment Department
1190 S. St. Francis Drive
Santa Fe, NM 87502

Subject: Submittal of the Quarterly Report for 2018 Quarter 4, Discharge Permit DP-1835, Class V Underground Injection Control Wells

Dear Ms. Hunter:

On August 31, 2016, the New Mexico Environment Department (NMED) issued Discharge Permit (DP) 1835 to the U.S. Department of Energy and Los Alamos National Security, LLC (DOE/LANS) for the discharge of treated groundwater to the regional aquifer through 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 2018, ownership of the discharge permit transferred to Newport News Nuclear BWXT – Los Alamos, LLC (N3B) from LANS. Pursuant to Condition No. 10 of the above-referenced discharge permit, DOE/N3B are required to submit quarterly reports for the previous quarter to document

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

Pursuant to Condition No. 11, 12, and 13 of DP-1835, the quarterly reports shall also contain general information, performance information, and monitoring data of treated effluent from each ion-exchange (IX) treatment system, respectively. During the reporting period for calendar year 2018, October 1 through December 31 (Quarter 4), discharge of treated groundwater to the regional aquifer continued under DP-1835. This treated discharge occurred at three UIC wells: CrIN-3, CrIN-4, and CrIN-5. The "Quarterly Report for the Discharge of Treated Groundwater to the Regional Aquifer – 2018 Quarter 4, DP-1835" (Enclosure 1) 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) 665-5330 (cheryl.rodriguez@em.doe.gov).

Sincerely,

Frazer Lockhart
Program Manager
Regulatory and Stakeholder Interface
N3B – Los Alamos

Sincerely,

David S. Rhodes, Director
Office of Quality and Regulatory Compliance
Environmental Management
Los Alamos Field Office

Enclosure(s): Two hard copies with electronic files (EM2019-0050):

1. Quarterly Report for the Discharge of Treated Groundwater to the Regional Aquifer – 2018 Quarter 4, DP-1835
2. Treated Effluent Analytical Results Summary Tables – 2018 Quarter 4, DP-1835
3. Groundwater Elevation Contour Map – 2018 Quarter 4, DP-1835
4. Groundwater Monitoring Wells Analytical Results Summary Table – 2018 Quarter 4, DP-1835
5. Treated Groundwater Injection and Extraction Summary Tables – 2018 Quarter 4, DP-1835
6. Facility Layout Map – 2018 Quarter 4, DP-1835

Cy: (letter and enclosure[s] emailed)
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ENCLOSURE 1

Quarterly Report for the Discharge of
Treated Groundwater to the Regional Aquifer –
2018 Quarter 4, DP-1835

ENCLOSURE 1
Quarterly Report for the Discharge of Treated Groundwater to the Regional Aquifer – 2018 Quarter 4, DP-1835

Introduction. On August 31, 2016, the New Mexico Environment Department (NMED) issued Discharge Permit (DP) 1835 to the U.S. Department of Energy and Los Alamos National Security, LLC (DOE/LANS) for the discharge of treated groundwater to the regional aquifer through up to six Class V underground injection control (UIC) wells. On July 21, 2017, NMED approved minor updates to DP-1835. During the third quarter of fiscal year 2018, ownership of the discharge permit transferred from LANS to Newport News Nuclear BWXT – Los Alamos, LLC (N3B). Pursuant to Condition No. 10 of the above-referenced discharge permit, DOE/N3B are required to submit quarterly reports.

During the 2018 October 1 through December 31 (Quarter 4) reporting period, discharge of treated groundwater to the regional aquifer occurred at three UIC wells: CrIN-3, CrIN-4, and CrIN-5, under DP-1835. Groundwater originated from three extraction wells: CrEX-1, CrEX-2, and CrEX-3. The groundwater was treated by chromium treatment unit (CTU) A before injection at the UIC wells.

Condition No. 10 of DP-1835 requires submission of a quarterly report to NMED by March 1 for the October 1 through December 31 discharge period. Several conditions within the permit identify information to be submitted in the quarterly report. The following information, with condition references, is required in the quarterly report:

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

Each of the above requirements is addressed in this report and referenced enclosures.

Requirement 1: Influent and discharge volumes for the IX treatment systems. Table E1-1 provides the influent and discharge volumes for IX treatment systems during 2018 Quarter 4 for activities completed under DP-1835. As previously identified, injection occurred at UIC wells CrIN-3, CrIN-4, and CrIN-5 during the quarter. Treated discharge originated from extraction wells CrEX-1, CrEX-2, and CrEX-3 and was treated with treatment unit CTUA.

Table E1-1
Total Influent and Discharge Volumes
for IX Treatment Systems – 2018 Quarter 4

Treatment Unit	Influent Volume[a] (gal.)	Effluent Volume[b] (gal.)
CTUA	20,443,000	20,446,000
CTUB[c]	n/a[d]	n/a
CTUC[c]	n/a	n/a

Note: Individual flow meter accurate to ±5%.

[a] Influent volume based on CrEX-1, CrEX-2 and CrEX-3 extraction volumes.

[b] Effluent volume based on CTUA flow meter reading.

[c] Treatment unit did not treat any groundwater that was subsequently injected during the quarter.

[d] n/a = Not applicable.

Requirement 2: Quarterly treated effluent sampling results from each IX treatment system. Treated effluent analytical results from samples collected during 2018 Quarter 4 for activities completed under DP-1835 are summarized in Enclosure 2. No results for total chromium, perchlorate, sulfate, total dissolved solids, fluoride, or chloride exceeded 90% of the numeric standards of 20.6.2.3103 New Mexico Administrative Code (NMAC) or 90% of the numeric screening levels established for tap water in Table A-1 of the 2017 NMED "Risk Assessment Guidance for Site Investigations and Remediation" for constituents not listed in 20.6.2.3103 NMAC. The 90% values for chromium, perchlorate, sulfate, total dissolved solids, fluoride, and chloride are 45 µg/L, 12.4 µg/L, 540 mg/L, 900 mg/L, 1.44 mg/L, and 225 mg/L, respectively. One sampling result exceeded 90% of the numeric standard of 20.6.2.3103 NMAC for nitrate-nitrogen, which is 9 mg/L. All other nitrate-nitrogen samples were below 90% of the numeric standard.

The nitrate-nitrogen exceedance occurred on October 23, 2018, in CTUA, shown in Table E2-1 of Enclosure 2. The nitrate-nitrogen concentration was 32.2 mg/L. The nitrate-nitrogen concentrations for the treated effluent at CTUA have historically been between 2 and 6 mg/L. The laboratory sampling method was evaluated and a focused data validation was performed on the sample results. During the focused data validation, it was determined that there was a problem with the laboratory process, the matrix spike recovery on the control sample was below the lower acceptance limit. During the laboratory sampling method evaluation, it was determined that the nitrate sample is collected in conjunction with the metals sample. The metals sample is preserved with nitric acid to a pH of less than 2. The nitrate sample could have been contaminated with nitric acid from the metals sample. Additionally, HACH data collected for

nitrate between October 18, 2018, and October 29, 2018, show nitrate concentrations between 2.125 and 3.85 mg/L. Based on the results of the evaluations performed and the HACH data, the nitrate-nitrogen sample taken on October 23, 2018, is determined to be an invalid sample that does not represent the treatment system effluent of CTUA.

The pilot scale molasses and sodium dithionite amendment studies continued during 2018 Quarter 4. NMED determined that no permit was required for the deployment of these amendments and these studies began with NMED conditional approvals during 2017 Quarter 3. In accordance with the NMED conditional approvals, iron, manganese, and arsenic sampling in the treated water from extraction wells CrEX-1, CrEX-2, and CrEX-3 was completed, with the results being submitted in the quarterly monitoring reports under DP-1835. These results for 2018 Quarter 4 are provided in Enclosure 2. No results for iron, manganese, or arsenic exceeded 90% of the numeric standards of 20 6.2.3103 NMAC. The 90% values for iron, manganese, and arsenic are 900 µg/L, 180 µg/L, and 9 µg/L, respectively.

During 2018 Quarter 4, the annual compliance sample for CTUA was obtained for the analytes listed in 20.6.2.3103 NMAC and all toxic pollutants defined in Paragraph (2) of Subsection T of 20.6.2.7 NMAC. These constituents were all either below standards or not detected in this sample. Enclosure 2 provides a summary of the annual compliance sample results. The analytes and standards listed in 20.6.2.3103 NMAC changed as of December 21, 2018. The annual compliance sample for CTUA was taken on November 27, 2018, and is compared to the previous 20.6.2.3103 NMAC analytes and standards dated August 31, 2015.

Requirement 3: Quarterly depth-to-groundwater and groundwater-quality sampling results. Depth-to-groundwater is expressed as the elevation of the groundwater above sea level. Table E1-2 provides the quarterly groundwater elevation measurements. Enclosure 3 provides a groundwater elevation contour map and an explanation of how this map was generated.

Quarterly groundwater analytical results from samples collected during 2018 Quarter 4 for the monitoring wells listed in Condition No. 14 are summarized in Table E1-3. Complete results related to these samples are provided in Enclosure 4.

ENCLOSURE 1
Quarterly Report for the Discharge of Treated Groundwater to the Regional Aquifer – 2018 Quarter 4, DP-1835

Table E1-2
Groundwater Elevations Summary
for Groundwater Monitoring Wells – 2018 Quarter 4

Monitoring Well	Groundwater Elevation[a] (ft)
CrPZ-1 (CrCH-1)	5831.51
CrPZ-2a (CrCH-2a)	5831.67
CrPZ-2b (CrCH-2b)	5831.63
CrPZ-3 (CrCH-3)	5832.89
CrPZ-4 (CrCH-4)	5834.07
CrPZ-5 (CrCH-5)	5833.43
R-11	5832.44
R-13	5830.61
R-43 S1	5833.53
R-43 S2	5832.78
R-44 S1	5831.75
R-44 S2	5831.28
R-45 S1	5831.26
R-45 S2	5831.04
R-50 S1	5833.09
R-50 S2	5832.22
R-61 S1	5833.23
R-61 S2	5833.13
R-62	5836.50
SIMR-2[b]	5831.98

[a] Groundwater elevations provided are based on average November values from transducers.

[b] Third Quarter average August 2018 SIMR-2 data is reported here in accordance with DP-1835 2018 Quarter 3 Report (EM2018-0109). Data was unavailable at the time of that report's preparation in accordance with the memorandum of agreement between San Ildefonso Pueblo and DOE. Data from the current quarter is not available at this time and will be presented in the next quarterly report.

Table E1-3
Summary Table of Analytical Results for Groundwater Monitoring Wells – 2018 Quarter 4

Location	Sample Date	Analyte[a]						
		Chloride (mg/L)	Perchlorate (µg/L)	Chromium (µg/L)	Fluoride (mg/L)	Nitrate-Nitrite as Nitrogen (mg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)
R-11	10/29/2018	3.64	0.725	6.26	0.427	5.400	10.30	244
R-11	11/16/2018	3.89	0.878	8.7	0.385	5.380	10.60	200
R-11	12/17/2018	3.67	0.874	9.6	0.341	5.610	10.30	193
R-13	11/07/2018	2.53	0.456	3.9	0.217	0.770	3.50	114
R-43 S1	11/08/2018	8.71	0.930	200.0	0.336	5.150	18.20	184
R-43 S2	11/08/2018	6.59	0.916	25.2	0.289	3.860	9.89	159
R-44 S1	10/29/2018	7.93	0.410	11.7	0.262	1.860	7.69	221
R-44 S1	11/20/2018	9.74	0.406	10.7	0.180	1.630	9.39	133
R-44 S1	12/19/2018	11.50	0.382	9.9	0.202	2.080	11.20	197
R-44 S2	10/29/2018	2.13	0.336	5.4	0.405	0.681	2.60	194
R-44 S2	11/20/2018	2.13	0.330	4.9	0.320	1.250	2.72	117
R-44 S2	12/19/2018	2.11	0.347	5.3	0.270	0.630	2.57	180
R-45 S1	10/30/2018	5.26	0.571	35.5	0.307	3.210	8.06	180
R-45 S1	11/19/2018	5.34	0.662	40.5	0.274	2.870	8.08	126
R-45 S1	12./19/2018	5.11	0.597	36.8	0.241	3.110	7.84	266
R-45 S2	10/30/2018	4.68	0.430	26.0	0.347	1.090	5.49	164
R-45 S2	11/19/2018	4.73	0.467	30.3	0.329	0.940	5.64	124
R-45 S2	12/19/2018	4.64	0.454	27.8	0.333	0.956	5.57	194
R-50 S1	11/01/2018	13.10	0.529	96.5	0.265	2.580	15.90	184
R-50 S1	11/19/2018	13.80	0.543	93.7	0.234	2.340	16.20	153
R-50 S1	12/18/2018	14.70	0.526	83.5	0.220	2.520	17.10	147
R-50 S2	11/01/2018	2.16	0.353	4.3	0.366	0.595	2.67	136
R-50 S2	11/19/2018	2.15	0.390	4.2	0.338	0.541	2.61	80
R-50 S2	12/17/2018	2.10	0.396	4.3	0.332	0.525	2.55	121
R-62	11/09/2018	17.00	0.890	277.0	0.147	1.960	30.40	194
SIMR-2[b]	07/27/2018	2.28	0.415	5.1	0.219	0.710	2.99	131
SIMR-2	08/16/2018	2.14	0.411	4.8	0.243	0.701	2.73	151
SIMR-2	09/13/2018	2.22	0.432	4.6	0.281	0.656	2.90	117

[a] Reported results are dissolved constituents.

[b] SIMR-2 data reported here in accordance with the memorandum of agreement and protocol agreement between San Ildefonso Pueblo and DOE.

Requirement 4: Any operations/maintenance activities performed. Extraction, treatment, and injection operations continued during 2018 Quarter 4. Continuing this quarter, the operation of CrEX-3 has resulted in the plugging of the treatment system influent filters after 3–4 days of

operation. CrEX-3 is currently being operated intermittently and an evaluation of the water quality in this well is underway to assess filter plugging.

Operations and maintenance activities completed during 2018 Quarter 4 are listed in Table E1-4 for the extraction, treatment, and injection system.

Table E1-4
Operations and Maintenance Activity Summary Table – 2018 Quarter 4

Maintenance Date	Elements Impacted	Operation/Maintenance Description
10/1/18 through 10/9/18	CrEX-1, CrEX-2, CrEX-3, CTUA, CrIN-3, CrIN-4, CrIN-5	Extraction, treatment, and injection of treated groundwater occurred per operational plan.
10/3/18	CTUA	All effluent filter bags were replaced because of observed imbalance of flow through CTUA treatment trains.
10/4/18	CTUA	Both influent filter bags were replaced because of system high pressure.
10/9/18 through 10/12/18	CrEX-1, CrEX-2, CrEX-3, CTUA, CrIN-3, CrIN-4, CrIN-5	System shutdown occurred for SCADA* computer reprogramming. Both influent filter bags were replaced because of system high pressure.
10/12/18 through 10/30/18	CrEX-1, CrEX-2, CrEX-3, CTUA, CrIN-3, CrIN-4, CrIN-5	Extraction, treatment, and injection of treated groundwater occurred per operational plan.
10/16/18	CTUA	Both influent filter bags were replaced because of system high pressure.
10/19/18	CTUA	Both influent filter bags were replaced because of system high pressure.
10/22/18	CTUA	Both influent filter bags were replaced because of system high pressure.
10/26/18	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: • 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.
10/30/18	CTUA	Both influent filter bags were replaced because of system high pressure.
10/30/18 through 12/31/18	CrEX-1, CrEX-2, CTUA, CrIN-3, CrIN-4, CrIN-5	CrEX-3 operation was permanently shut down October 31, 2018, because of filter plugging. Extraction, treatment, and injection of treated groundwater occurred per operational plan using CrEX-1 and CrEX-2.
10/31/18	Booster Pumps	Periodic maintenance performed on booster pump motors.
11/5/18	CrEX-1, CrEX-2, CTUA, CrIN-3, CrIN-4, CrIN-5	System shutdown occurred briefly for SCADA computer replacement with backup SCADA computer.

Maintenance Date	Elements Impacted	Operation/Maintenance Description
11/26/18 through 11/27/18	CrEX-3	CrEX-3 was turned on for a 24-hour period to allow for monthly sample collection.
11/29/18	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: 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 were replaced.
12/17/18 through 12/18/18	CrEX-3	CrEX-3 was turned on for a 24-hour period to allow for monthly sample collection.

* SCADA = Supervisory Control and Data Acquisition.

Requirement 5: Any periodic test of mechanical integrity conducted. Periodic testing of mechanical integrity was not conducted or reported to NMED during 2018 Quarter 4. In accordance with Condition No. 3, the next required integrity test of these items will occur within 5 years of the initial test unless a UIC well is reconfigured. Under this scenario, a mechanical integrity test before reinjection of treated effluent at that well will be completed pursuant to Condition No. 3.

Requirement 6: Any replacement of primary or secondary IX vessels or associated treatment system infrastructure. Installation of new primary and secondary IX vessels occurred at various times for treatment unit CTUA (all three treatment trains) during the reporting period as cited in Requirement 4.

Requirement 7: Any well work-overs conducted. Well work-overs did not occur during 2018 Quarter 4.

Requirement 8: Any additional operational changes with the potential to markedly affect the discharge. During the reporting period, the pilot scale molasses amendment and sodium dithionite amendment studies continued. In accordance with NMED's conditional approval for these studies, analytical results from iron, manganese, and arsenic testing of the treated water from the extraction wells during the study are being provided in the quarterly monitoring reports under DP-1835. These results for 2018 Quarter 4 are provided in Enclosure 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 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 Requirement 4, no additional operational changes occurred during the reporting period.

Requirement 9: Monthly average, maximum, and minimum values for flow rate and volume of treated effluent transferred to each UIC well. Table E1-5 provides the monthly average, maximum, and minimum values for flow rate and volume of treated effluent transferred to each well in 2018 Quarter 4.

Table E1-5
Flows and Volumes of Treated Effluent Injected – 2018 Quarter 4

Injection Well	Flow rate (gpm[a])			Daily Volume (gal.)			Total Volume (gal.)
	Average[b]	Maximum	Minimum[c]	Average[b]	Maximum	Minimum[c]	
October 2018							
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	47.5	60.7	12.1	68,342	87,384	17,415	1,981,921
CrIN-4	60.0	64.2	32.5	86,405	92,436	46,738	2,505,754
CrIN-5	58.8	63.0	30.1	84,710	90,733	43,290	2,456,597
CrIN-6[d]	n/a[e]	n/a	n/a	n/a	n/a	n/a	n/a
November 2018							
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	29.6	46.3	21.2	42,600	66,728	30,589	1,277,988
CrIN-4	60.3	62.4	49.4	86,828	89,849	71,085	2,604,845
CrIN-5	61.6	63.0	49.3	88,653	90,717	71,008	2,659,593
CrIN-6[d]	n/a	n/a	n/a	n/a	n/a	n/a	n/a
December 2018							
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	33.1	44.9	29.3	47,658	64,609	42,187	1,477,390
CrIN-4	61.0	63.0	60.0	87,881	90,745	86,343	2,724,325
CrIN-5	61.9	62.1	61.0	89,115	89,447	87,833	2,762,568
CrIN-6[d]	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[a] gpm = gallons per minute.

[b] Average flow rate and daily volume represent arithmetic mean values of results provided during periods when injection of treated groundwater was occurring.

[c] Minimum values represent the minimum daily value which occurred during days when pumping occurred.

[d] UIC well was constructed and injection of treated groundwater did not occur during the quarter in accordance with NMED's correspondence on September 25, 2017.

[e] n/a = Not applicable. Treated groundwater not injected during the month at this location.

Requirement 10: Total monthly volume of treated effluent transferred to each UIC well. Table E1-5 provides total monthly volumes of treated effluent transferred to each well. As previously identified, injection occurred at UIC wells CrIN-3, CrIN-4, and CrIN-5 during the quarter.

Requirement 11: Monthly average, maximum, and minimum values of injection water level (pressure head) above static level for each UIC well. Table E1-6 provides the monthly average, maximum, and minimum values for injection water level above static level for each UIC well. As previously indicated, injection occurred at UIC wells CrIN-3, CrIN-4, and CrIN-5 during the quarter.

Table E1-6
Water-Level Values Above Static Level by UIC Well – 2018 Quarter 4

UIC Well	October			November			December		
	Average[a] (ft)	Maximum (ft)	Minimum (ft)	Average[a] (ft)	Maximum (ft)	Minimum (ft)	Average[a] (ft)	Maximum (ft)	Minimum (ft)
CrIN-1	n/a[b]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CrIN-2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CrIN-3	30.6	36.5	0.2	11.6	22.1	0.5	12.2	21.6	9.2
CrIN-4	9.0	11.4	6.8	9.9	11.1	9.0	10.3	11.9	9.4
CrIN-5	14.5	17.2	10.2	16.5	17.3	15.8	17.1	18.1	16.5
CrIN-6[c]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[a] Average values provided represent arithmetic mean values of maximum daily values during periods when injection of treated groundwater was occurring.

[b] n/a = Not applicable. Treated groundwater not injected during the month at this location.

[c] UIC well was constructed and injection of treated groundwater did not occur during the quarter in accordance with NMED's correspondence on September 25, 2017.

Requirement 12: Daily volume injected at each UIC well. Daily volumes of treated groundwater injected at CrIN-3, CrIN-4, and CrIN-5 during 2018 Quarter 4 are provided in Enclosure 5.

Requirement 13: Daily volume pumped from each extraction well. Daily volumes of groundwater pumped from CrEX-1, CrEX-2, and CrEX-3 during 2018 Quarter 4, which were subsequently treated and injected under this permit, are provided in Enclosure 5.

Requirement 14: Facility layout map. The facility layout map for 2018 Quarter 4 showing the location and number of each well is provided in Enclosure 6.

Requirement 15: Groundwater Elevation Contour Map. Enclosure 3 provides the groundwater elevation contour map and an explanation of how this map was generated.

ENCLOSURE 2

Treated Effluent Analytical
Results Summary Tables –
2018 Quarter 4, DP-1835

Table E2-1
Treated Effluent Analytical Results Summary Table - 2018 Quarter 4, DP-1835

Location ID	Sample ID	Sample Date*	Parameter Name	Result	Report Unit	Lab Qualifier	Detect Flag	Filtered	Lab Method	Method Detection Limit
CTUA	CTUA-19-163382	10/3/2018	Chloride	21.6	mg/L		Y	Y	EPA:300.0	0.268
CTUA	CTUA-19-163383	10/12/2018	Chloride	21.5	mg/L		Y	Y	EPA:300.0	0.335
CTUA	CTUA-19-163384	10/16/2018	Chloride	21.6	mg/L		Y	Y	EPA:300.0	0.268
CTUA	CTUA-19-163385	10/23/2018	Chloride	21.7	mg/L		Y	Y	EPA:300.0	0.335
CTUA	CTUA-19-163386	10/30/2018	Chloride	23	mg/L		Y	Y	EPA:300.0	0.335
CTUA	CTUA-19-163387	11/6/2018	Chloride	17.8	mg/L		Y	Y	EPA:300.0	0.335
CTUA	CTUA-19-163388	11/14/2018	Chloride	18.7	mg/L		Y	Y	EPA:300.0	0.268
CTUA	CTUA-19-163389	11/19/2018	Chloride	19.6	mg/L		Y	Y	EPA:300.0	0.268
CTUA	CTU6A-18-164973	11/27/2018	Chloride	22.2	mg/L		Y	Y	EPA:300.0	0.268
CTUA	CTUA-19-163390	12/5/2018	Chloride	19.7	mg/L		Y	Y	EPA:300.0	0.268
CTUA	CTUA-19-163391	12/12/2018	Chloride	18.3	mg/L		Y	Y	EPA:300.0	0.268
CTUA	CTUA-19-163392	12/19/2018	Chloride	18.4	mg/L		Y	Y	EPA:300.0	0.268
CTUA	CTUA-19-163382	10/3/2018	Chromium	3	µg/L	U	N	Y	SW-846:6020	3
CTUA	CTUA-19-163383	10/12/2018	Chromium	3	µg/L	U	N	Y	SW-846:6020	3
CTUA	CTUA-19-163384	10/16/2018	Chromium	3	µg/L	U	N	Y	SW-846:6020	3
CTUA	CTUA-19-163385	10/23/2018	Chromium	3	µg/L	U	N	Y	SW-846:6020	3
CTUA	CTUA-19-163386	10/30/2018	Chromium	3	µg/L	U	N	Y	SW-846:6020	3
CTUA	CTUA-19-163387	11/6/2018	Chromium	3	µg/L	U	N	Y	SW-846:6020	3
CTUA	CTUA-19-163388	11/14/2018	Chromium	3	µg/L	U	N	Y	SW-846:6020	3
CTUA	CTUA-19-163389	11/19/2018	Chromium	3	µg/L	U	N	Y	SW-846:6020	3
CTUA	CTU6A-18-164973	11/27/2018	Chromium	3	µg/L	U	N	Y	SW-846:6020	3
CTUA	CTUA-19-163390	12/5/2018	Chromium	3	µg/L	U	N	Y	SW-846:6020	3
CTUA	CTUA-19-163391	12/12/2018	Chromium	3	µg/L	U	N	Y	SW-846:6020	3
CTUA	CTUA-19-163392	12/19/2018	Chromium	3	µg/L	U	N	Y	SW-846:6020	3
CTUA	CTUA-19-163382	10/3/2018	Fluoride	0.246	mg/L		Y	Y	EPA:300.0	0.033
CTUA	CTUA-19-163383	10/12/2018	Fluoride	0.321	mg/L		Y	Y	EPA:300.0	0.033

Table E2-1
Treated Effluent Analytical Results Summary Table - 2018 Quarter 4, DP-1835

Location ID	Sample ID	Sample Date*	Parameter Name	Result	Report Unit	Lab Qualifier	Detect Flag	Filtered	Lab Method	Method Detection Limit
CTUA	CTUA-19-163384	10/16/2018	Fluoride	0.255	mg/L		Y	Y	EPA:300.0	0.033
CTUA	CTUA-19-163385	10/23/2018	Fluoride	0.239	mg/L		Y	Y	EPA:300.0	0.033
CTUA	CTUA-19-163386	10/30/2018	Fluoride	0.243	mg/L		Y	Y	EPA:300.0	0.033
CTUA	CTUA-19-163387	11/6/2018	Fluoride	0.264	mg/L		Y	Y	EPA:300.0	0.033
CTUA	CTUA-19-163388	11/14/2018	Fluoride	0.26	mg/L		Y	Y	EPA:300.0	0.033
CTUA	CTUA-19-163389	11/19/2018	Fluoride	0.277	mg/L		Y	Y	EPA:300.0	0.033
CTUA	CTU6A-18-164973	11/27/2018	Fluoride	0.2	mg/L		Y	Y	EPA:300.0	0.033
CTUA	CTUA-19-163390	12/5/2018	Fluoride	0.191	mg/L		Y	Y	EPA:300.0	0.033
CTUA	CTUA-19-163391	12/12/2018	Fluoride	0.188	mg/L		Y	Y	EPA:300.0	0.033
CTUA	CTUA-19-163392	12/19/2018	Fluoride	0.253	mg/L		Y	Y	EPA:300.0	0.033
CTUA	CTUA-19-163382	10/3/2018	Nitrate-Nitrite as Nitrogen	3.12	mg/L		Y	Y	EPA:353.2	0.17
CTUA	CTUA-19-163383	10/12/2018	Nitrate-Nitrite as Nitrogen	3.16	mg/L		Y	Y	EPA:353.2	0.17
CTUA	CTUA-19-163384	10/16/2018	Nitrate-Nitrite as Nitrogen	3.47	mg/L		Y	Y	EPA:353.2	0.17
CTUA	CTUA-19-163385	10/23/2018	Nitrate-Nitrite as Nitrogen	32.2	mg/L		Y	Y	EPA:353.2	0.85
CTUA	CTUA-19-163386	10/30/2018	Nitrate-Nitrite as Nitrogen	5.18	mg/L		Y	Y	EPA:353.2	0.17
CTUA	CTUA-19-163387	11/6/2018	Nitrate-Nitrite as Nitrogen	3.03	mg/L		Y	Y	EPA:353.2	0.17
CTUA	CTUA-19-163388	11/14/2018	Nitrate-Nitrite as Nitrogen	2.62	mg/L		Y	Y	EPA:353.2	0.085
CTUA	CTUA-19-163389	11/19/2018	Nitrate-Nitrite as Nitrogen	2.68	mg/L		Y	Y	EPA:353.2	0.17
CTUA	CTU6A-18-164973	11/27/2018	Nitrate-Nitrite as Nitrogen	3.08	mg/L		Y	Y	EPA:353.2	0.17

Table E2-1
Treated Effluent Analytical Results Summary Table - 2018 Quarter 4, DP-1835

Location ID	Sample ID	Sample Date*	Parameter Name	Result	Report Unit	Lab Qualifier	Detect Flag	Filtered	Lab Method	Method Detection Limit
CTUA	CTUA-19-163390	12/5/2018	Nitrate-Nitrite as Nitrogen	4.28	mg/L		Y	Y	EPA:353.2	0.17
CTUA	CTUA-19-163391	12/12/2018	Nitrate-Nitrite as Nitrogen	2.69	mg/L		Y	Y	EPA:353.2	0.085
CTUA	CTUA-19-163392	12/19/2018	Nitrate-Nitrite as Nitrogen	2.74	mg/L		Y	Y	EPA:353.2	0.085
CTUA	CTUA-19-163382	10/3/2018	Perchlorate	0.596	µg/L		Y	Y	SW-846:6850	0.05
CTUA	CTUA-19-163383	10/12/2018	Perchlorate	0.614	µg/L		Y	Y	SW-846:6850	0.05
CTUA	CTUA-19-163384	10/16/2018	Perchlorate	0.677	µg/L		Y	Y	SW-846:6850	0.05
CTUA	CTUA-19-163385	10/23/2018	Perchlorate	0.711	µg/L		Y	Y	SW-846:6850	0.05
CTUA	CTUA-19-163386	10/30/2018	Perchlorate	0.218	µg/L		Y	Y	SW-846:6850	0.05
CTUA	CTUA-19-163387	11/6/2018	Perchlorate	0.344	µg/L		Y	Y	SW-846:6850	0.05
CTUA	CTUA-19-163388	11/14/2018	Perchlorate	0.346	µg/L		Y	Y	SW-846:6850	0.05
CTUA	CTUA-19-163389	11/19/2018	Perchlorate	0.385	µg/L		Y	Y	SW-846:6850	0.05
CTUA	CTU6A-18-164973	11/27/2018	Perchlorate	0.356	µg/L		Y	Y	SW-846:6850	0.05
CTUA	CTUA-19-163390	12/5/2018	Perchlorate	0.05	µg/L	U	N	Y	SW-846:6850	0.05
CTUA	CTUA-19-163391	12/12/2018	Perchlorate	0.0552	µg/L	J	Y	Y	SW-846:6850	0.05
CTUA	CTUA-19-163392	12/19/2018	Perchlorate	0.05	µg/L	U	N	Y	SW-846:6850	0.05
CTUA	CTUA-19-163382	10/3/2018	Sulfate	30	mg/L		Y	Y	EPA:300.0	0.532
CTUA	CTUA-19-163383	10/12/2018	Sulfate	29.6	mg/L		Y	Y	EPA:300.0	0.665
CTUA	CTUA-19-163384	10/16/2018	Sulfate	29.7	mg/L		Y	Y	EPA:300.0	0.532
CTUA	CTUA-19-163385	10/23/2018	Sulfate	29.9	mg/L		Y	Y	EPA:300.0	0.665
CTUA	CTUA-19-163386	10/30/2018	Sulfate	1.95	mg/L		Y	Y	EPA:300.0	0.133
CTUA	CTUA-19-163387	11/6/2018	Sulfate	25.8	mg/L		Y	Y	EPA:300.0	0.665
CTUA	CTUA-19-163388	11/14/2018	Sulfate	27.3	mg/L		Y	Y	EPA:300.0	0.532
CTUA	CTUA-19-163389	11/19/2018	Sulfate	28.7	mg/L		Y	Y	EPA:300.0	0.532
CTUA	CTU6A-18-164973	11/27/2018	Sulfate	31.8	mg/L		Y	Y	EPA:300.0	0.532

Table E2-1
Treated Effluent Analytical Results Summary Table - 2018 Quarter 4, DP-1835

Location ID	Sample ID	Sample Date*	Parameter Name	Result	Report Unit	Lab Qualifier	Detect Flag	Filtered	Lab Method	Method Detection Limit
CTUA	CTUA-19-163390	12/5/2018	Sulfate	19.5	mg/L		Y	Y	EPA:300.0	0.133
CTUA	CTUA-19-163391	12/12/2018	Sulfate	26.2	mg/L		Y	Y	EPA:300.0	0.532
CTUA	CTUA-19-163392	12/19/2018	Sulfate	24.9	mg/L		Y	Y	EPA:300.0	0.532
CTUA	CTUA-19-163382	10/3/2018	Total Dissolved Solids	233	mg/L		Y	Y	EPA:160.1	3.4
CTUA	CTUA-19-163383	10/12/2018	Total Dissolved Solids	231	mg/L		Y	Y	EPA:160.1	3.4
CTUA	CTUA-19-163384	10/16/2018	Total Dissolved Solids	257	mg/L		Y	Y	EPA:160.1	3.4
CTUA	CTUA-19-163385	10/23/2018	Total Dissolved Solids	271	mg/L		Y	Y	EPA:160.1	3.4
CTUA	CTUA-19-163386	10/30/2018	Total Dissolved Solids	221	mg/L		Y	Y	EPA:160.1	3.4
CTUA	CTUA-19-163387	11/6/2018	Total Dissolved Solids	250	mg/L		Y	Y	EPA:160.1	3.4
CTUA	CTUA-19-163388	11/14/2018	Total Dissolved Solids	277	mg/L		Y	Y	EPA:160.1	3.4
CTUA	CTUA-19-163389	11/19/2018	Total Dissolved Solids	166	mg/L		Y	Y	EPA:160.1	3.4
CTUA	CTU6A-18-164973	11/27/2018	Total Dissolved Solids	223	mg/L		Y	Y	EPA:160.1	3.4
CTUA	CTUA-19-163390	12/5/2018	Total Dissolved Solids	193	mg/L		Y	Y	EPA:160.1	3.4
CTUA	CTUA-19-163391	12/12/2018	Total Dissolved Solids	221	mg/L		Y	Y	EPA:160.1	3.4
CTUA	CTUA-19-163392	12/19/2018	Total Dissolved Solids	190	mg/L		Y	Y	EPA:160.1	3.4

* In accordance with permit condition 13 of DP-1835, analysis of the treated effluent from each IX unit is only required once every month for the Quarter 4 reporting period.

Notes:
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J in the Lab Qualifier column means the analyte is classified as estimated.
Y in the Detect Flag column means the analyte was detected.
N in the Detect Flag column means the analyte was not detected.
Y in the Filtered column means the sample was filtered.
N in the Filtered column means the sample was not filtered.
A blank cell under Lab Qualifier indicates the corresponding parameter was detected and no qualifier is applicable to the result.

Table E2-2
Treated Effluent Analytical Results Summary Table Related to Molasses and Sodium Dithionate Pilot Studies NMED Conditional Approval - 2018 Quarter 4, DP-1835

Location ID	Sample ID	Sample Date*	Parameter Name	Result	Report Unit	Lab Qualifier	Detect Flag	Filtered	Lab Method	Method Detection Limit
CTUA	CTUA-19-163382	10/3/2018	Arsenic	2.23	µg/L	J	Y	Y	SW-846:6020	2
CTUA	CTUA-19-163383	10/12/2018	Arsenic	2.14	µg/L	J	Y	Y	SW-846:6020	2
CTUA	CTUA-19-163384	10/16/2018	Arsenic	5.2	µg/L		Y	Y	SW-846:6020	2
CTUA	CTUA-19-163385	10/23/2018	Arsenic	2.57	µg/L	J	Y	Y	SW-846:6020	2
CTUA	CTUA-19-163386	10/30/2018	Arsenic	2.15	µg/L	J	Y	Y	SW-846:6020	2
CTUA	CTUA-19-163387	11/6/2018	Arsenic	2.28	µg/L	J	Y	Y	SW-846:6020	2
CTUA	CTUA-19-163388	11/14/2018	Arsenic	3.56	µg/L	J	Y	Y	SW-846:6020	2
CTUA	CTUA-19-163389	11/19/2018	Arsenic	3.01	µg/L	J	Y	Y	SW-846:6020	2
CTUA	CTU6A-18-164973	11/27/2018	Arsenic	3.16	µg/L	J	Y	Y	SW-846:6020	2
CTUA	CTUA-19-163390	12/5/2018	Arsenic	3.93	µg/L	J	Y	Y	SW-846:6020	2
CTUA	CTUA-19-163391	12/12/2018	Arsenic	4.49	µg/L	J	Y	Y	SW-846:6020	2
CTUA	CTUA-19-163392	12/19/2018	Arsenic	2.4	µg/L	J	Y	Y	SW-846:6020	2
CTUA	CTUA-19-163382	10/3/2018	Iron	30	µg/L	U	N	Y	SW-846:6010C	30
CTUA	CTUA-19-163383	10/12/2018	Iron	30	µg/L	U	N	Y	SW-846:6010C	30
CTUA	CTUA-19-163384	10/16/2018	Iron	30	µg/L	U	N	Y	SW-846:6010C	30
CTUA	CTUA-19-163385	10/23/2018	Iron	30	µg/L	U	N	Y	SW-846:6010C	30
CTUA	CTUA-19-163386	10/30/2018	Iron	30	µg/L	U	N	Y	SW-846:6010C	30
CTUA	CTUA-19-163387	11/6/2018	Iron	30	µg/L	U	N	Y	SW-846:6010C	30
CTUA	CTUA-19-163388	11/14/2018	Iron	30	µg/L	U	N	Y	SW-846:6010C	30
CTUA	CTUA-19-163389	11/19/2018	Iron	30	µg/L	U	N	Y	SW-846:6010C	30
CTUA	CTU6A-18-164973	11/27/2018	Iron	30	µg/L	U	N	Y	SW-846:6010C	30
CTUA	CTUA-19-163390	12/5/2018	Iron	30	µg/L	U	N	Y	SW-846:6010C	30
CTUA	CTUA-19-163391	12/12/2018	Iron	30	µg/L	U	N	Y	SW-846:6010C	30
CTUA	CTUA-19-163392	12/19/2018	Iron	30	µg/L	U	N	Y	SW-846:6010C	30
CTUA	CTUA-19-163382	10/3/2018	Manganese	6.94	µg/L	J	Y	Y	SW-846:6010C	2
CTUA	CTUA-19-163383	10/12/2018	Manganese	50.4	µg/L		Y	Y	SW-846:6010C	2

Table E2-2
Treated Effluent Analytical Results Summary Table Related to Molasses and Sodium Dithionate Pilot Studies NMED Conditional Approval - 2018 Quarter 4, DP-1835

Location ID	Sample ID	Sample Date*	Parameter Name	Result	Report Unit	Lab Qualifier	Detect Flag	Filtered	Lab Method	Method Detection Limit
CTUA	CTUA-19-163384	10/16/2018	Manganese	4.77	µg/L	J	Y	Y	SW-846:6010C	2
CTUA	CTUA-19-163385	10/23/2018	Manganese	4.49	µg/L	J	Y	Y	SW-846:6010C	2
CTUA	CTUA-19-163386	10/30/2018	Manganese	4.49	µg/L	J	Y	Y	SW-846:6010C	2
CTUA	CTUA-19-163387	11/6/2018	Manganese	2	µg/L	U	N	Y	SW-846:6010C	2
CTUA	CTUA-19-163388	11/14/2018	Manganese	2	µg/L	U	N	Y	SW-846:6010C	2
CTUA	CTUA-19-163389	11/19/2018	Manganese	2	µg/L	U	N	Y	SW-846:6010C	2
CTUA	CTU6A-18-164973	11/27/2018	Manganese	5.71	µg/L	J	Y	Y	SW-846:6010C	2
CTUA	CTUA-19-163390	12/5/2018	Manganese	2	µg/L	U	N	Y	SW-846:6010C	2
CTUA	CTUA-19-163391	12/12/2018	Manganese	2	µg/L	U	N	Y	SW-846:6010C	2
CTUA	CTUA-19-163392	12/19/2018	Manganese	2	µg/L	U	N	Y	SW-846:6010C	2

*In accordance with permit condition 13 of DP-1835, analysis of the treated effluent from each IX unit is only required once every month for the Quarter 4 reporting period.

Notes:

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Y in the Detect Flag column means the analyte was detected.
N in the Detect Flag column means the analyte was not detected.
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N in the Filtered column means the sample was not filtered.
A blank cell under Lab Qualifier indicates the corresponding parameter was detected and no qualifier is applicable to the result.

Table E2-3
Treated Effluent Analytical Results Summary Table - CTUA Annual Sample - 2018 Quarter 4, DP-1835

Location ID	Sample ID	Sample Date	Parameter Name	Result	Report Unit	Lab Qualifier	Detect Flag	Filtered	Lab Method	Method Detection Limit
CTUA	CTU6A-18-164973	11/27/18	Antimony	1	µg/L	U	N	Y	SW-846:6020	1
CTUA	CTU6A-18-164973	11/27/18	Arsenic	3.16	µg/L	J	Y	Y	SW-846:6020	2
CTUA	CTU6A-18-164973	11/27/18	Barium	45.4	µg/L		Y	Y	SW-846:6010C	1
CTUA	CTU6A-18-164973	11/27/18	Beryllium	1	µg/L	U	N	Y	SW-846:6010C	1
CTUA	CTU6A-18-164973	11/27/18	Cadmium	0.3	µg/L	U	N	Y	SW-846:6020	0.3
CTUA	CTU6A-18-164973	11/27/18	Chromium	3	µg/L	U	N	Y	SW-846:6020	3
CTUA	CTU6A-18-164972	11/27/18	Cyanide (Total)	0.00167	mg/L	U	N	N	EPA:335.4	1.67
CTUA	CTU6A-18-164973	11/27/18	Fluoride	0.2	mg/L		Y	Y	EPA:300.0	0.033
CTUA	CTU6A-18-164973	11/27/18	Lead	0.5	µg/L	U	N	Y	SW-846:6020	0.5
CTUA	CTU6A-18-164972	11/27/18	Mercury	0.067	µg/L	U	N	N	EPA:245.2	0.067
CTUA	CTU6A-18-164973	11/27/18	Nitrate as Nitrogen	3.08	mg/L		Y	Y	EPA:353.2	0.17
CTUA	CTU6A-18-164973	11/27/18	Selenium	2	µg/L	U	N	Y	SW-846:6020	2
CTUA	CTU6A-18-164973	11/27/18	Silver	0.3	µg/L	U	N	Y	SW-846:6020	0.3
CTUA	CTU6A-18-164973	11/27/18	Thallium	0.6	µg/L	U	N	Y	SW-846:6020	0.6
CTUA	CTU6A-18-164973	11/27/18	Uranium	0.067	µg/L	U	N	Y	SW-846:6020	0.067
CTUA	CTU6A-18-164972	11/27/18	Radium-226	1.52	pCi/L		Y	N	EPA:903.1	0
CTUA	CTU6A-18-164972	11/27/18	Radium-228	0.00227	pCi/L	U	N	N	EPA:904	0
CTUA	CTU6A-18-164972	11/27/18	Benzene	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Aroclor-1260	0.0343	µg/L	U	N	N	SW-846:8082	0.0343
CTUA	CTU6A-18-164972	11/27/18	Aroclor-1254	0.0343	µg/L	U	N	N	SW-846:8082	0.0343
CTUA	CTU6A-18-164972	11/27/18	Aroclor-1221	0.0343	µg/L	U	N	N	SW-846:8082	0.0343
CTUA	CTU6A-18-164972	11/27/18	Aroclor-1232	0.0343	µg/L	U	N	N	SW-846:8082	0.0343
CTUA	CTU6A-18-164972	11/27/18	Aroclor-1248	0.0343	µg/L	U	N	N	SW-846:8082	0.0343
CTUA	CTU6A-18-164972	11/27/18	Aroclor-1016	0.0343	µg/L	U	N	N	SW-846:8082	0.0343
CTUA	CTU6A-18-164972	11/27/18	Aroclor-1262	0.0343	µg/L	U	N	N	SW-846:8082	0.0343
CTUA	CTU6A-18-164972	11/27/18	Aroclor-1242	0.0343	µg/L	U	N	N	SW-846:8082	0.0343

Table E2-3
Treated Effluent Analytical Results Summary Table - CTUA Annual Sample - 2018 Quarter 4, DP-1835

Location ID	Sample ID	Sample Date	Parameter Name	Result	Report Unit	Lab Qualifier	Detect Flag	Filtered	Lab Method	Method Detection Limit
CTUA	CTU6A-18-164972	11/27/18	Toluene	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Carbon Tetrachloride	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dichloroethane[1,2-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dichloroethene[1,1-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Tetrachloroethene	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Trichloroethene	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Ethylbenzene	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Xylene[1,3-]+Xylene[1,4-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Methylene Chloride	1	µg/L	U	N	N	SW-846:8260B	1
CTUA	CTU6A-18-164972	11/27/18	Chloroform	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dichloroethane[1,1-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dibromoethane[1,2-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Trichloroethane[1,1,1-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Trichloroethane[1,1,2-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Tetrachloroethane[1,1,2,2-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Vinyl Chloride	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Naphthalene	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Benzo(a)pyrene	0.3	µg/L	U	N	N	SW-846:8270D	0.3
CTUA	CTU6A-18-164972	11/27/18	Dichloroethene[cis-1,2-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dichloroethene[trans-1,2-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dichloropropane[1,2-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Styrene	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dichlorobenzene[1,2-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dichlorobenzene[1,4-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Trichlorobenzene[1,2,4-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Pentachlorophenol	3	µg/L	U	N	N	SW-846:8270D	3

Table E2-3
Treated Effluent Analytical Results Summary Table - CTUA Annual Sample - 2018 Quarter 4, DP-1835

Location ID	Sample ID	Sample Date	Parameter Name	Result	Report Unit	Lab Qualifier	Detect Flag	Filtered	Lab Method	Method Detection Limit
CTUA	CTU6A-18-164972	11/27/18	Atrazine	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164973	11/27/18	Chloride	22.2	mg/L		Y	Y	EPA:300.0	0.268
CTUA	CTU6A-18-164973	11/27/18	Copper	3	µg/L	U	N	Y	SW-846:6010C	3
CTUA	CTU6A-18-164973	11/27/18	Iron	30	µg/L	U	N	Y	SW-846:6010C	30
CTUA	CTU6A-18-164973	11/27/18	Manganese	5.71	µg/L	J	Y	Y	SW-846:6010C	2
CTUA	CTU6A-18-164972	11/27/18	Phenol	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164973	11/27/18	Sulfate	31.8	mg/L		Y	Y	EPA:300.0	0.532
CTUA	CTU6A-18-164973	11/27/18	Total Dissolved Solids	223	mg/L		Y	Y	EPA:160.1	3.4
CTUA	CTU6A-18-164973	11/27/18	Zinc	54.2	µg/L		Y	Y	SW-846:6010C	3.3
CTUA	CTU6A-18-164973	11/27/18	pH	7.96	SU	H	Y	Y	EPA:150.1	0.01
CTUA	CTU6A-18-164972	11/27/18	Methyl tert-Butyl Ether	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164973	11/27/18	Aluminum	68	µg/L	U	N	Y	SW-846:6010C	68
CTUA	CTU6A-18-164973	11/27/18	Boron	15	µg/L	U	N	Y	SW-846:6010C	15
CTUA	CTU6A-18-164973	11/27/18	Cobalt	1	µg/L	U	N	Y	SW-846:6010C	1
CTUA	CTU6A-18-164973	11/27/18	Molybdenum	1.09	µg/L		Y	Y	SW-846:6020	0.2
CTUA	CTU6A-18-164973	11/27/18	Nickel	4.48	µg/L		Y	Y	SW-846:6020	0.6
CTUA	CTU6A-18-164972	11/27/18	Acrolein	1.5	µg/L	U	N	N	SW-846:8260B	1.5
CTUA	CTU6A-18-164972	11/27/18	Acrylonitrile	1.5	µg/L	U	N	N	SW-846:8260B	1.5
CTUA	CTU6A-18-164972	11/27/18	Benzene	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Toluene	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Ethylbenzene	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Styrene	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Chlorobenzene	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dichlorobenzene[1,2-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dichlorobenzene[1,4-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Trichlorobenzene[1,2,4-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3

Table E2-3
Treated Effluent Analytical Results Summary Table - CTUA Annual Sample - 2018 Quarter 4, DP-1835

Location ID	Sample ID	Sample Date	Parameter Name	Result	Report Unit	Lab Qualifier	Detect Flag	Filtered	Lab Method	Method Detection Limit
CTUA	CTU6A-18-164972	11/27/18	Tetrachlorobenzene[1,2,4,5]	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Pentachlorobenzene	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Hexachlorobenzene	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Dichlorophenol[2,4-]	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Trichlorophenol[2,4,5-]	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Trichlorophenol[2,4,6-]	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Pentachlorophenol	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Bis(2-chloroethyl)ether	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Oxybis(1-chloropropane)[2,2'-]	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Dichloropropane[1,2-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dichloropropene[cis-1,3-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dichloropropene[trans-1,3-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dichloropropene[1,1-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dioxane[1,4-]	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Dibromoethane[1,2-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dichloroethane[1,1-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dichloroethane[1,2-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Trichloroethane[1,1,1-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Trichloroethane[1,1,2-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Tetrachloroethane[1,1,2,2-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Hexachloroethane	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Vinyl Chloride	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dichloroethene[1,1-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dichloroethene[cis-1,2-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dichloroethene[trans-1,2-]	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Trichloroethene	0.3	µg/L	U	N	N	SW-846:8260B	0.3

Table E2-3
Treated Effluent Analytical Results Summary Table - CTUA Annual Sample - 2018 Quarter 4, DP-1835

Location ID	Sample ID	Sample Date	Parameter Name	Result	Report Unit	Lab Qualifier	Detect Flag	Filtered	Lab Method	Method Detection Limit
CTUA	CTU6A-18-164972	11/27/18	Tetrachloroethene	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Bromodichloromethane	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Bromomethane	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Chloromethane	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Dichlorodifluoromethane	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Methylene Chloride	1	µg/L	U	N	N	SW-846:8260B	1
CTUA	CTU6A-18-164972	11/27/18	Bromoform	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Chloroform	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Carbon Tetrachloride	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Trichlorofluoromethane	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Hexachlorobutadiene	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Isophorone	3.5	µg/L	U	N	N	SW-846:8270D	3.5
CTUA	CTU6A-18-164972	11/27/18	Methyl tert-Butyl Ether	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Nitrobenzene	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Dinitrotoluene[2,4-]	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Dinitrotoluene[2,6-]	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	HMX	0.0842	µg/L	U	N	N	SW-846:8330B	0.0842
CTUA	CTU6A-18-164972	11/27/18	RDX	0.0842	µg/L	U	N	N	SW-846:8330B	0.0842
CTUA	CTU6A-18-164972	11/27/18	Trinitrotoluene[2,4,6-]	0.0842	µg/L	U	N	N	SW-846:8330B	0.0842
CTUA	CTU6A-18-164972	11/27/18	Dinitro-2-methylphenol[4,6-]	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Dinitrophenol[2,4-]	5	µg/L	U	N	N	SW-846:8270D	5
CTUA	CTU6A-18-164972	11/27/18	Nitrosodiethylamine[N-]	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Nitrosodimethylamine[N-]	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Nitroso-di-n-butylamine[N-]	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Nitrosopyrrolidine[N-]	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164973	11/27/18	Perchlorate	0.356	µg/L		Y	Y	SW-846:6850	0.05

Table E2-3
Treated Effluent Analytical Results Summary Table - CTUA Annual Sample - 2018 Quarter 4, DP-1835

Location ID	Sample ID	Sample Date	Parameter Name	Result	Report Unit	Lab Qualifier	Detect Flag	Filtered	Lab Method	Method Detection Limit
CTUA	CTU6A-18-164972	11/27/18	Aldrin	0.00686	µg/L	U	N	N	SW-846:8081B	0.00686
CTUA	CTU6A-18-164972	11/27/18	Atrazine	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Chlordane[alpha-]	0.00686	µg/L	U	N	N	SW-846:8081B	0.00686
CTUA	CTU6A-18-164972	11/27/18	Chlordane[gamma-]	0.00686	µg/L	U	N	N	SW-846:8081B	0.00686
CTUA	CTU6A-18-164972	11/27/18	DDT[4,4'-]	0.0103	µg/L	U	N	N	SW-846:8081B	0.0103
CTUA	CTU6A-18-164972	11/27/18	Dieldrin	0.0103	µg/L	U	N	N	SW-846:8081B	0.0103
CTUA	CTU6A-18-164972	11/27/18	Endosulfan II	0.0103	µg/L	U	N	N	SW-846:8081B	0.0103
CTUA	CTU6A-18-164972	11/27/18	Endosulfan I	0.00686	µg/L	U	N	N	SW-846:8081B	0.00686
CTUA	CTU6A-18-164972	11/27/18	Endrin	0.0103	µg/L	U	N	N	SW-846:8081B	0.0103
CTUA	CTU6A-18-164972	11/27/18	Heptachlor	0.00686	µg/L	U	N	N	SW-846:8081B	0.00686
CTUA	CTU6A-18-164972	11/27/18	BHC[alpha-]	0.00686	µg/L	U	N	N	SW-846:8081B	0.00686
CTUA	CTU6A-18-164972	11/27/18	BHC[beta-]	0.00686	µg/L	U	N	N	SW-846:8081B	0.00686
CTUA	CTU6A-18-164972	11/27/18	BHC[gamma-]	0.00686	µg/L	U	N	N	SW-846:8081B	0.00686
CTUA	CTU6A-18-164972	11/27/18	BHC[delta-]	0.00686	µg/L	U	N	N	SW-846:8081B	0.00686
CTUA	CTU6A-18-164972	11/27/18	Hexachlorocyclopentadiene	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Toxaphene (Technical Grade)	0.155	µg/L	U	N	N	SW-846:8081B	0.155
CTUA	CTU6A-18-164972	11/27/18	Phenol	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Di-n-butylphthalate	0.3	µg/L	U	N	N	SW-846:8270D	0.3
CTUA	CTU6A-18-164972	11/27/18	Bis(2-ethylhexyl)phthalate	0.3	µg/L	U	N	N	SW-846:8270D	0.3
CTUA	CTU6A-18-164972	11/27/18	Diethylphthalate	0.3	µg/L	U	N	N	SW-846:8270D	0.3
CTUA	CTU6A-18-164972	11/27/18	Dimethyl Phthalate	0.3	µg/L	U	N	N	SW-846:8270D	0.3
CTUA	CTU6A-18-164972	11/27/18	Benzidine	3.9	µg/L	U	N	N	SW-846:8270D	3.9
CTUA	CTU6A-18-164972	11/27/18	Dichlorobenzidine[3,3'-]	3	µg/L	U	N	N	SW-846:8270D	3
CTUA	CTU6A-18-164972	11/27/18	Anthracene	0.3	µg/L	U	N	N	SW-846:8270D	0.3
CTUA	CTU6A-18-164972	11/27/18	Benzo(a)pyrene	0.3	µg/L	U	N	N	SW-846:8270D	0.3
CTUA	CTU6A-18-164972	11/27/18	Benzo(b)fluoranthene	0.3	µg/L	U	N	N	SW-846:8270D	0.3

Table E2-3
Treated Effluent Analytical Results Summary Table - CTUA Annual Sample - 2018 Quarter 4, DP-1835

Location ID	Sample ID	Sample Date	Parameter Name	Result	Report Unit	Lab Qualifier	Detect Flag	Filtered	Lab Method	Method Detection Limit
CTUA	CTU6A-18-164972	11/27/18	Benzo(k)fluoranthene	0.3	µg/L	U	N	N	SW-846:8270D	0.3
CTUA	CTU6A-18-164972	11/27/18	Fluoranthene	0.3	µg/L	U	N	N	SW-846:8270D	0.3
CTUA	CTU6A-18-164972	11/27/18	Fluorene	0.3	µg/L	U	N	N	SW-846:8270D	0.3
CTUA	CTU6A-18-164972	11/27/18	Naphthalene	0.3	µg/L	U	N	N	SW-846:8260B	0.3
CTUA	CTU6A-18-164972	11/27/18	Methylnaphthalene[1-]	0.3	µg/L	U	N	N	SW-846:8270D	0.3
CTUA	CTU6A-18-164972	11/27/18	Methylnaphthalene[2-]	0.3	µg/L	U	N	N	SW-846:8270D	0.3
CTUA	CTU6A-18-164972	11/27/18	Phenanthrene	0.3	µg/L	U	N	N	SW-846:8270D	0.3
CTUA	CTU6A-18-164972	11/27/18	Pyrene	0.3	µg/L	U	N	N	SW-846:8270D	0.3

Notes:
SU in the Report Unit column means standardized units.
U in the Lab Qualifier column means analyte is classified as not detected.
J in the Lab Qualifier column means the analyte is classified as estimated.
H in the Lab Qualifier column means the analytical holding time was exceeded.
Y in the Detect Flag column means the analyte was detected.
N in the Detect Flag column means the analyte was not detected.
Y in the Filtered column means the sample was filtered.
N in the Filtered column means the sample was not filtered.
A blank cell under Lab Qualifier indicates the corresponding parameter was detected and no qualifier is applicable to the result.

ENCLOSURE 3

Groundwater Elevation Contour Map –
2018 Quarter 4, DP-1835

ENCLOSURE 3
Groundwater Elevation Contour Map –
2018 Quarter 4, DP-1835

Explanation of groundwater elevation contour map. The regional aquifer beneath Los Alamos National Laboratory (LANL) is a complex hydrogeological system. The shape of the regional water table beneath the Pajarito Plateau is predominantly controlled by the areas of recharge to the west (i.e., the flanks of the Sierra de los Valles and the Pajarito fault zone) and discharge to the east (i.e., the Rio Grande and the White Rock Canyon Springs). At more local scales such as the chromium area, the structure of the regional water table and groundwater flow is also expected to be influenced by (1) local infiltration zones and recharge areas (e.g., beneath canyons), (2) heterogeneity and anisotropy in the aquifer properties, and (3) extraction and injection locations (municipal water-supply wells and extraction/injection wells within the chromium project area).

Long-term water-level data, contaminant transport observations (travel times and direction of migration), and calibrated model results are all lines of evidence that 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 towards the Rio Grande. The low ambient gradient in the chromium site area could be related to 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, and nearby water-supply pumping. Although it is difficult to infer absolute groundwater flow directions from the relatively flat contours in the chromium plume area, groundwater elevation data and contaminant transport observations indicate that flow direction is generally to the east-southeast. Any southerly component to the inferred groundwater flow direction may be related to the effects of stratigraphy.

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 interim measure infrastructure wells and pumping of Los Alamos County's water-supply wells. This is discussed for the case of 2018 Quarter 4 below.

Effects on flow direction from water-supply pumping are small compared with the local effects caused by extraction and injection at project wells. Observations of transients in the water levels observed at the monitoring wells within the plume area do not appear to be substantially affected by the water-supply pumping at the nearby production wells (PM-3, PM-5, PM-2, PM-4, and O-4) (LANL 2009).

A long-term decline of approximately 0.5 to 1 ft/yr has been observed in the regional water levels 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 transients described above, the water-level data and the respective water table contour maps are variable over time and, therefore, each map is representative of specific periods of time. Figure E3-1 depicts the average water-level data and water table contour map for November 2018. General flow direction is indicated by vectors on Figure E3-1, with potential variability indicated by the angle between the vectors.

ENCLOSURE 3
Groundwater Elevation Contour Map –
2018 Quarter 4, DP-1835

To generate this contour map, average water levels are calculated using values from the middle month of the 3-mo reporting period. Monitoring wells within and surrounding the plume are used, including wells not presented on the map. Those surrounding wells provide useful control points for contouring along the edges of the area of interest for this report. Only well screens near the water table are used for contouring. Most of the well screens selected are less than 75 ft below the water table, with the exception of R-13, R-21, R-31 screen 2, R-32, R-37 screen 2, and R-40 screen 2. At locations with a history of water-level data for which there are no data for the present quarter, values can be estimated using linear regression based on relationships with other nearby wells. For 2018 Quarter 4, no wells used for estimating the contours had missing data. Therefore, imputation for missing data was not used.

During this reporting period, transient groundwater elevation changes were observed because of injection and extraction at the chromium interim measure infrastructure wells. The following infrastructure wells were consistently operated: CrEX-1, CrEX-2, CrIN-3, CrIN-4, and CrIN-5. CrEX-3 was operated briefly as described in Enclosure 1. Regular pumping at these wells began on May 23, 2018, and therefore may have started to have had a minor influence upon water levels as early as 2018 Quarter 2. During 2018 Quarter 3, an influence is readily recognized and is demonstrated by a cone of depression in the area of the extraction wells. In 2018 Quarter 4, the trend continues, with the cone of depression expanding slightly since the previous quarter (Figure E3-1).

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.

Because of the spatial coverage of wells and piezometers available as control points and because of the regional structure of significantly steeper gradients to the east and west of the chromium plume area, additional control points are used to provide estimated water-level elevations in areas that do not have sufficient data to provide constraints. As additional analysis is performed using historical and developing data sets from both existing wells and data from anticipated proposed wells, the use of these control points will be reanalyzed, adjusted, or discontinued based on additional supporting data.

Reference

LANL (Los Alamos National Laboratory), October 2009. "Investigation Report for Sandia Canyon," Los Alamos National Laboratory document LA-UR-09-6450, Los Alamos, New Mexico.

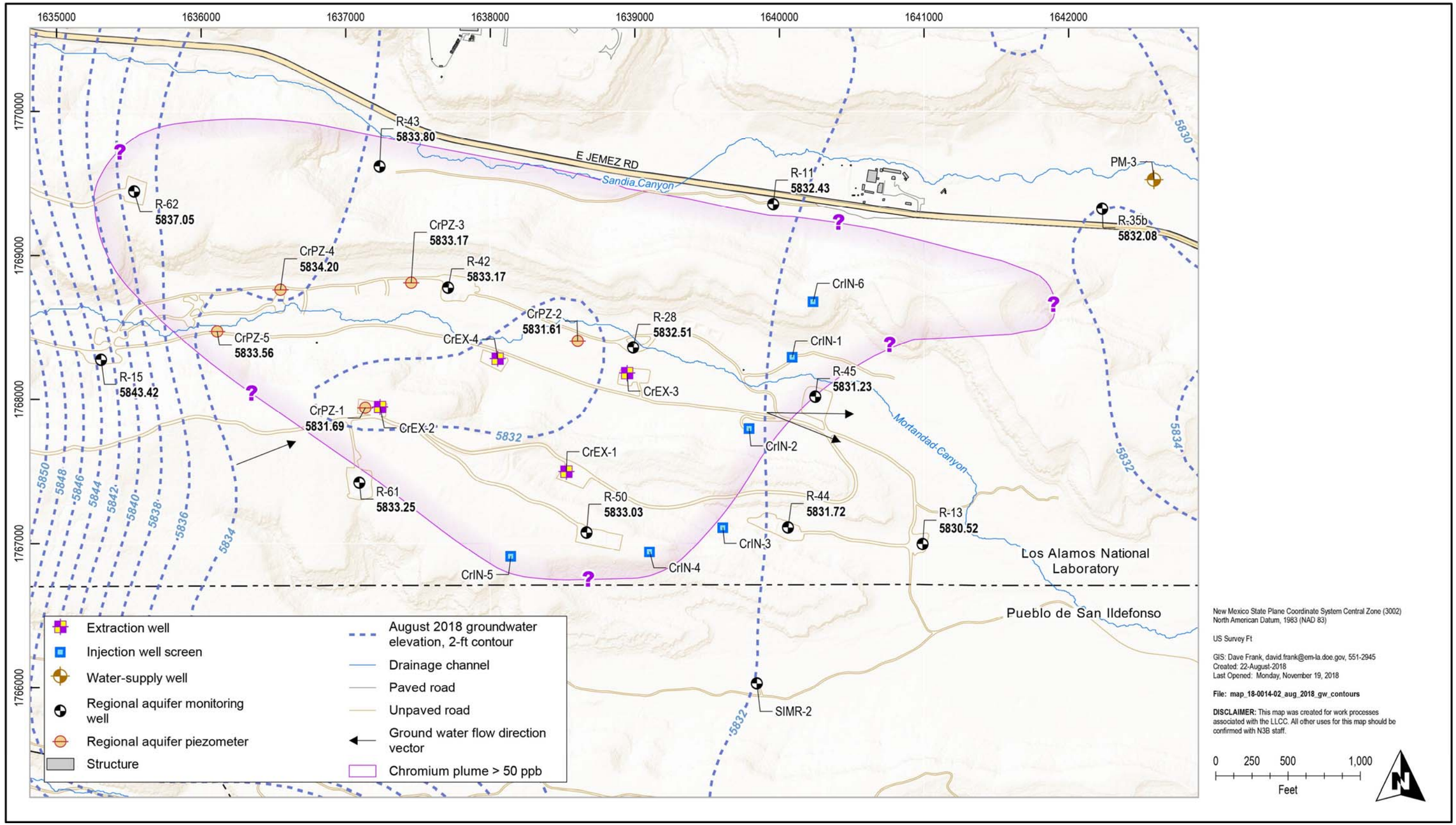


Figure E3-1 Groundwater elevation counter map – 2018 Quarter 4, DP-1835

ENCLOSURE 4

Groundwater Monitoring Wells
Analytical Results Summary Table –
2018 Quarter 4, DP-1835

Table E4-1
Groundwater Monitoring Wells Analytical Results Summary Table - 2018 Quarter 4, DP-1835

Field Sample ID	Location ID	Sample Date	Parameter Name	Report Result	Report Units	Lab Qualifier	Detect Flag	Filtered	Lab Method	Report Detection Limit
CASA-19-163698	R-11	10/29/2018	Chloride	3.64	mg/L		Y	Y	EPA:300.0	0.067
CASA-19-163698	R-11	10/29/2018	Perchlorate	0.725	µg/L		Y	Y	SW-846:6850	0.050
CASA-19-163698	R-11	10/29/2018	Chromium	6.26	µg/L	J	Y	Y	SW-846:6020	3.00
CASA-19-163698	R-11	10/29/2018	Fluoride	0.427	mg/L		Y	Y	EPA:300.0	0.033
CASA-19-163698	R-11	10/29/2018	Nitrate-Nitrite as Nitrogen	5.40	mg/L		Y	Y	EPA:353.2	0.850
CASA-19-163698	R-11	10/29/2018	Sulfate	10.3	mg/L		Y	Y	EPA:300.0	0.133
CASA-19-163698	R-11	10/29/2018	Total Dissolved Solids	244	mg/L		Y	Y	EPA:160.1	3.40
CASA-19-164017	R-11	11/16/2018	Chloride	3.89	mg/L		Y	Y	EPA:300.0	0.067
CASA-19-164017	R-11	11/16/2018	Perchlorate	0.878	µg/L		Y	Y	SW-846:6850	0.050
CASA-19-164017	R-11	11/16/2018	Chromium	8.68	µg/L	J	Y	Y	SW-846:6020	3.00
CASA-19-164017	R-11	11/16/2018	Fluoride	0.385	mg/L		Y	Y	EPA:300.0	0.033
CASA-19-164017	R-11	11/16/2018	Nitrate-Nitrite as Nitrogen	5.38	mg/L		Y	Y	EPA:353.2	0.170
CASA-19-164017	R-11	11/16/2018	Sulfate	10.6	mg/L		Y	Y	EPA:300.0	0.133
CASA-19-164017	R-11	11/16/2018	Total Dissolved Solids	200	mg/L		Y	Y	EPA:160.1	3.40
CASA-19-164840	R-11	12/17/2018	Chloride	3.67	mg/L		Y	Y	EPA:300.0	0.067
CASA-19-164840	R-11	12/17/2018	Perchlorate	0.874	µg/L		Y	Y	SW-846:6850	0.050
CASA-19-164840	R-11	12/17/2018	Chromium	9.59	µg/L	J	Y	Y	SW-846:6020	3.00
CASA-19-164840	R-11	12/17/2018	Fluoride	0.341	mg/L		Y	Y	EPA:300.0	0.033
CASA-19-164840	R-11	12/17/2018	Nitrate-Nitrite as Nitrogen	5.61	mg/L		Y	Y	EPA:353.2	0.170
CASA-19-164840	R-11	12/17/2018	Sulfate	10.3	mg/L		Y	Y	EPA:300.0	0.133
CASA-19-164840	R-11	12/17/2018	Total Dissolved Solids	193	mg/L		Y	Y	EPA:160.1	3.40
CAMO-19-163976	R-13	11/07/2018	Chloride	2.53	mg/L		Y	Y	EPA:300.0	0.067
CAMO-19-163976	R-13	11/07/2018	Perchlorate	0.456	µg/L		Y	Y	SW-846:6850	0.050

Field Sample ID	Location ID	Sample Date	Parameter Name	Report Result	Report Units	Lab Qualifier	Detect Flag	Filtered	Lab Method	Report Detection Limit
CAMO-19-163976	R-13	11/07/2018	Chromium	3.9	µg/L	J	Y	Y	SW-846:6020	3.00
CAMO-19-163976	R-13	11/07/2018	Fluoride	0.217	mg/L		Y	Y	EPA:300.0	0.033
CAMO-19-163976	R-13	11/07/2018	Nitrate-Nitrite as Nitrogen	0.770	mg/L		Y	Y	EPA:353.2	0.017
CAMO-19-163976	R-13	11/07/2018	Sulfate	3.50	mg/L		Y	Y	EPA:300.0	0.133
CAMO-19-163976	R-13	11/07/2018	Total Dissolved Solids	114	mg/L		Y	Y	EPA:160.1	3.40
CASA-19-164028	R-43 S1	11/08/2018	Chloride	8.71	mg/L		Y	Y	EPA:300.0	0.067
CASA-19-164028	R-43 S1	11/08/2018	Perchlorate	0.93	µg/L		Y	Y	SW-846:6850	0.050
CASA-19-164028	R-43 S1	11/08/2018	Chromium	200	µg/L		Y	Y	SW-846:6020	3.00
CASA-19-164028	R-43 S1	11/08/2018	Fluoride	0.336	mg/L		Y	Y	EPA:300.0	0.033
CASA-19-164028	R-43 S1	11/08/2018	Nitrate-Nitrite as Nitrogen	5.15	mg/L		Y	Y	EPA:353.2	0.085
CASA-19-164028	R-43 S1	11/08/2018	Sulfate	18.2	mg/L		Y	Y	EPA:300.0	0.133
CASA-19-164028	R-43 S1	11/08/2018	Total Dissolved Solids	184	mg/L		Y	Y	EPA:160.1	3.40
CASA-19-164030	R-43 S2	11/08/2018	Chloride	6.59	mg/L		Y	Y	EPA:300.0	0.067
CASA-19-164030	R-43 S2	11/08/2018	Perchlorate	0.916	µg/L		Y	Y	SW-846:6850	0.050
CASA-19-164030	R-43 S2	11/08/2018	Chromium	25.2	µg/L		Y	Y	SW-846:6020	3.00
CASA-19-164030	R-43 S2	11/08/2018	Fluoride	0.289	mg/L		Y	Y	EPA:300.0	0.033
CASA-19-164030	R-43 S2	11/08/2018	Nitrate-Nitrite as Nitrogen	3.86	mg/L		Y	Y	EPA:353.2	0.085
CASA-19-164030	R-43 S2	11/08/2018	Sulfate	9.89	mg/L		Y	Y	EPA:300.0	0.133
CASA-19-164030	R-43 S2	11/08/2018	Total Dissolved Solids	159	mg/L		Y	Y	EPA:160.1	3.40
CAMO-19-163710	R-44 S1	10/29/2018	Chloride	7.93	mg/L		Y	Y	EPA:300.0	0.067
CAMO-19-163710	R-44 S1	10/29/2018	Perchlorate	0.41	µg/L		Y	Y	SW-846:6850	0.050
CAMO-19-163710	R-44 S1	10/29/2018	Chromium	11.7	µg/L		Y	Y	SW-846:6020	3.00
CAMO-19-163710	R-44 S1	10/29/2018	Fluoride	0.262	mg/L		Y	Y	EPA:300.0	0.033
CAMO-19-163710	R-44 S1	10/29/2018	Nitrate-Nitrite as Nitrogen	1.86	mg/L		Y	Y	EPA:353.2	0.085
CAMO-19-163710	R-44 S1	10/29/2018	Sulfate	7.69	mg/L		Y	Y	EPA:300.0	0.133
CAMO-19-163710	R-44 S1	10/29/2018	Total Dissolved Solids	221	mg/L		Y	Y	EPA:160.1	3.40
CAMO-19-163986	R-44 S1	11/20/2018	Chloride	9.74	mg/L		Y	Y	EPA:300.0	0.067

Field Sample ID	Location ID	Sample Date	Parameter Name	Report Result	Report Units	Lab Qualifier	Detect Flag	Filtered	Lab Method	Report Detection Limit
CAMO-19-163986	R-44 S1	11/20/2018	Perchlorate	0.406	µg/L		Y	Y	SW-846:6850	0.050
CAMO-19-163986	R-44 S1	11/20/2018	Chromium	10.7	µg/L		Y	Y	SW-846:6020	3.00
CAMO-19-163986	R-44 S1	11/20/2018	Fluoride	0.180	mg/L		Y	Y	EPA:300.0	0.033
CAMO-19-163986	R-44 S1	11/20/2018	Nitrate-Nitrite as Nitrogen	1.63	mg/L		Y	Y	EPA:353.2	0.170
CAMO-19-163986	R-44 S1	11/20/2018	Sulfate	9.39	mg/L		Y	Y	EPA:300.0	0.133
CAMO-19-163986	R-44 S1	11/20/2018	Total Dissolved Solids	133	mg/L		Y	Y	EPA:160.1	3.40
CAMO-19-164852	R-44 S1	12/19/2018	Chloride	11.5	mg/L		Y	Y	EPA:300.0	0.134
CAMO-19-164852	R-44 S1	12/19/2018	Perchlorate	0.382	µg/L		Y	Y	SW-846:6850	0.050
CAMO-19-164852	R-44 S1	12/19/2018	Chromium	9.94	µg/L	J	Y	Y	SW-846:6020	3.00
CAMO-19-164852	R-44 S1	12/19/2018	Fluoride	0.202	mg/L		Y	Y	EPA:300.0	0.033
CAMO-19-164852	R-44 S1	12/19/2018	Nitrate-Nitrite as Nitrogen	2.08	mg/L		Y	Y	EPA:353.2	0.085
CAMO-19-164852	R-44 S1	12/19/2018	Sulfate	11.2	mg/L		Y	Y	EPA:300.0	0.133
CAMO-19-164852	R-44 S1	12/19/2018	Total Dissolved Solids	197	mg/L		Y	Y	EPA:160.1	3.40
CAMO-19-163713	R-44 S2	10/29/2018	Chloride	2.13	mg/L		Y	Y	EPA:300.0	0.067
CAMO-19-163713	R-44 S2	10/29/2018	Perchlorate	0.336	µg/L		Y	Y	SW-846:6850	0.050
CAMO-19-163713	R-44 S2	10/29/2018	Chromium	5.38	µg/L	J	Y	Y	SW-846:6020	3.00
CAMO-19-163713	R-44 S2	10/29/2018	Fluoride	0.405	mg/L		Y	Y	EPA:300.0	0.033
CAMO-19-163713	R-44 S2	10/29/2018	Nitrate-Nitrite as Nitrogen	0.681	mg/L		Y	Y	EPA:353.2	0.017
CAMO-19-163713	R-44 S2	10/29/2018	Sulfate	2.60	mg/L		Y	Y	EPA:300.0	0.133
CAMO-19-163713	R-44 S2	10/29/2018	Total Dissolved Solids	194	mg/L		Y	Y	EPA:160.1	3.40
CAMO-19-163989	R-44 S2	11/20/2018	Chloride	2.13	mg/L		Y	Y	EPA:300.0	0.067
CAMO-19-163989	R-44 S2	11/20/2018	Perchlorate	0.33	µg/L		Y	Y	SW-846:6850	0.050
CAMO-19-163989	R-44 S2	11/20/2018	Chromium	4.88	µg/L	J	Y	Y	SW-846:6020	3.00
CAMO-19-163989	R-44 S2	11/20/2018	Fluoride	0.320	mg/L		Y	Y	EPA:300.0	0.033
CAMO-19-163989	R-44 S2	11/20/2018	Nitrate-Nitrite as Nitrogen	1.25	mg/L		Y	Y	EPA:353.2	0.017
CAMO-19-163989	R-44 S2	11/20/2018	Sulfate	2.72	mg/L		Y	Y	EPA:300.0	0.133
CAMO-19-163989	R-44 S2	11/20/2018	Total Dissolved Solids	117	mg/L		Y	Y	EPA:160.1	3.40

Field Sample ID	Location ID	Sample Date	Parameter Name	Report Result	Report Units	Lab Qualifier	Detect Flag	Filtered	Lab Method	Report Detection Limit
CAMO-19-164855	R-44 S2	12/19/2018	Chloride	2.11	mg/L		Y	Y	EPA:300.0	0.067
CAMO-19-164855	R-44 S2	12/19/2018	Perchlorate	0.347	µg/L		Y	Y	SW-846:6850	0.050
CAMO-19-164855	R-44 S2	12/19/2018	Chromium	5.28	µg/L	J	Y	Y	SW-846:6020	3.00
CAMO-19-164855	R-44 S2	12/19/2018	Fluoride	0.270	mg/L		Y	Y	EPA:300.0	0.033
CAMO-19-164855	R-44 S2	12/19/2018	Nitrate-Nitrite as Nitrogen	0.630	mg/L		Y	Y	EPA:353.2	0.017
CAMO-19-164855	R-44 S2	12/19/2018	Sulfate	2.57	mg/L		Y	Y	EPA:300.0	0.133
CAMO-19-164855	R-44 S2	12/19/2018	Total Dissolved Solids	180	mg/L		Y	Y	EPA:160.1	3.40
CAMO-19-163716	R-45 S1	10/30/2018	Chloride	5.26	mg/L		Y	Y	EPA:300.0	0.067
CAMO-19-163716	R-45 S1	10/30/2018	Perchlorate	0.571	µg/L		Y	Y	SW-846:6850	0.050
CAMO-19-163716	R-45 S1	10/30/2018	Chromium	35.5	µg/L		Y	Y	SW-846:6020	3.00
CAMO-19-163716	R-45 S1	10/30/2018	Fluoride	0.307	mg/L		Y	Y	EPA:300.0	0.033
CAMO-19-163716	R-45 S1	10/30/2018	Nitrate-Nitrite as Nitrogen	3.21	mg/L		Y	Y	EPA:353.2	0.170
CAMO-19-163716	R-45 S1	10/30/2018	Sulfate	8.06	mg/L		Y	Y	EPA:300.0	0.133
CAMO-19-163716	R-45 S1	10/30/2018	Total Dissolved Solids	180	mg/L		Y	Y	EPA:160.1	3.40
CAMO-19-163992	R-45 S1	11/19/2018	Chloride	5.34	mg/L		Y	Y	EPA:300.0	0.067
CAMO-19-163992	R-45 S1	11/19/2018	Perchlorate	0.662	µg/L		Y	Y	SW-846:6850	0.050
CAMO-19-163992	R-45 S1	11/19/2018	Chromium	40.5	µg/L		Y	Y	SW-846:6020	3.00
CAMO-19-163992	R-45 S1	11/19/2018	Fluoride	0.274	mg/L		Y	Y	EPA:300.0	0.033
CAMO-19-163992	R-45 S1	11/19/2018	Nitrate-Nitrite as Nitrogen	2.87	mg/L		Y	Y	EPA:353.2	0.085
CAMO-19-163992	R-45 S1	11/19/2018	Sulfate	8.08	mg/L		Y	Y	EPA:300.0	0.133
CAMO-19-163992	R-45 S1	11/19/2018	Total Dissolved Solids	126	mg/L		Y	Y	EPA:160.1	3.40
CAMO-19-164858	R-45 S1	12/19/2018	Chloride	5.11	mg/L		Y	Y	EPA:300.0	0.067
CAMO-19-164858	R-45 S1	12/19/2018	Perchlorate	0.597	µg/L		Y	Y	SW-846:6850	0.050
CAMO-19-164858	R-45 S1	12/19/2018	Chromium	36.8	µg/L		Y	Y	SW-846:6020	3.00
CAMO-19-164858	R-45 S1	12/19/2018	Fluoride	0.241	mg/L		Y	Y	EPA:300.0	0.033
CAMO-19-164858	R-45 S1	12/19/2018	Nitrate-Nitrite as Nitrogen	3.11	mg/L		Y	Y	EPA:353.2	0.085
CAMO-19-164858	R-45 S1	12/19/2018	Sulfate	7.84	mg/L		Y	Y	EPA:300.0	0.133

Field Sample ID	Location ID	Sample Date	Parameter Name	Report Result	Report Units	Lab Qualifier	Detect Flag	Filtered	Lab Method	Report Detection Limit
CAMO-19-164858	R-45 S1	12/19/2018	Total Dissolved Solids	266	mg/L		Y	Y	EPA:160.1	3.40
CAMO-19-163719	R-45 S2	10/30/2018	Chloride	4.68	mg/L		Y	Y	EPA:300.0	0.067
CAMO-19-163719	R-45 S2	10/30/2018	Perchlorate	0.43	µg/L		Y	Y	SW-846:6850	0.050
CAMO-19-163719	R-45 S2	10/30/2018	Chromium	26	µg/L		Y	Y	SW-846:6020	3.00
CAMO-19-163719	R-45 S2	10/30/2018	Fluoride	0.347	mg/L		Y	Y	EPA:300.0	0.033
CAMO-19-163719	R-45 S2	10/30/2018	Nitrate-Nitrite as Nitrogen	1.09	mg/L		Y	Y	EPA:353.2	0.085
CAMO-19-163719	R-45 S2	10/30/2018	Sulfate	5.49	mg/L		Y	Y	EPA:300.0	0.133
CAMO-19-163719	R-45 S2	10/30/2018	Total Dissolved Solids	164	mg/L		Y	Y	EPA:160.1	3.40
CAMO-19-163995	R-45 S2	11/19/2018	Chloride	4.73	mg/L		Y	Y	EPA:300.0	0.067
CAMO-19-163995	R-45 S2	11/19/2018	Perchlorate	0.467	µg/L		Y	Y	SW-846:6850	0.050
CAMO-19-163995	R-45 S2	11/19/2018	Chromium	30.3	µg/L		Y	Y	SW-846:6020	3.00
CAMO-19-163995	R-45 S2	11/19/2018	Fluoride	0.329	mg/L		Y	Y	EPA:300.0	0.033
CAMO-19-163995	R-45 S2	11/19/2018	Nitrate-Nitrite as Nitrogen	0.940	mg/L		Y	Y	EPA:353.2	0.017
CAMO-19-163995	R-45 S2	11/19/2018	Sulfate	5.64	mg/L		Y	Y	EPA:300.0	0.133
CAMO-19-163995	R-45 S2	11/19/2018	Total Dissolved Solids	124	mg/L		Y	Y	EPA:160.1	3.40
CAMO-19-164861	R-45 S2	12/19/2018	Chloride	4.64	mg/L		Y	Y	EPA:300.0	0.067
CAMO-19-164861	R-45 S2	12/19/2018	Perchlorate	0.454	µg/L		Y	Y	SW-846:6850	0.050
CAMO-19-164861	R-45 S2	12/19/2018	Chromium	27.8	µg/L		Y	Y	SW-846:6020	3.00
CAMO-19-164861	R-45 S2	12/19/2018	Fluoride	0.333	mg/L		Y	Y	EPA:300.0	0.033
CAMO-19-164861	R-45 S2	12/19/2018	Nitrate-Nitrite as Nitrogen	0.956	mg/L		Y	Y	EPA:353.2	0.017
CAMO-19-164861	R-45 S2	12/19/2018	Sulfate	5.57	mg/L		Y	Y	EPA:300.0	0.133
CAMO-19-164861	R-45 S2	12/19/2018	Total Dissolved Solids	194	mg/L		Y	Y	EPA:160.1	3.40
CAMO-19-163722	R-50 S1	11/01/2018	Chloride	13.1	mg/L		Y	Y	EPA:300.0	0.134
CAMO-19-163722	R-50 S1	11/01/2018	Perchlorate	0.529	µg/L		Y	Y	SW-846:6850	0.050
CAMO-19-163722	R-50 S1	11/01/2018	Chromium	96.5	µg/L		Y	Y	SW-846:6020	6.00
CAMO-19-163722	R-50 S1	11/01/2018	Fluoride	0.265	mg/L		Y	Y	EPA:300.0	0.033
CAMO-19-163722	R-50 S1	11/01/2018	Nitrate-Nitrite as Nitrogen	2.58	mg/L		Y	Y	EPA:353.2	0.085

Field Sample ID	Location ID	Sample Date	Parameter Name	Report Result	Report Units	Lab Qualifier	Detect Flag	Filtered	Lab Method	Report Detection Limit
CAMO-19-163722	R-50 S1	11/01/2018	Sulfate	15.9	mg/L		Y	Y	EPA:300.0	0.133
CAMO-19-163722	R-50 S1	11/01/2018	Total Dissolved Solids	184	mg/L		Y	Y	EPA:160.1	3.40
CAMO-19-163998	R-50 S1	11/19/2018	Chloride	13.8	mg/L		Y	Y	EPA:300.0	0.134
CAMO-19-163998	R-50 S1	11/19/2018	Perchlorate	0.543	µg/L		Y	Y	SW-846:6850	0.050
CAMO-19-163998	R-50 S1	11/19/2018	Chromium	93.7	µg/L		Y	Y	SW-846:6020	3.00
CAMO-19-163998	R-50 S1	11/19/2018	Fluoride	0.234	mg/L		Y	Y	EPA:300.0	0.033
CAMO-19-163998	R-50 S1	11/19/2018	Nitrate-Nitrite as Nitrogen	2.34	mg/L		Y	Y	EPA:353.2	0.085
CAMO-19-163998	R-50 S1	11/19/2018	Sulfate	16.2	mg/L		Y	Y	EPA:300.0	0.133
CAMO-19-163998	R-50 S1	11/19/2018	Total Dissolved Solids	153	mg/L		Y	Y	EPA:160.1	3.40
CAMO-19-164864	R-50 S1	12/18/2018	Chloride	14.7	mg/L		Y	Y	EPA:300.0	0.134
CAMO-19-164864	R-50 S1	12/18/2018	Perchlorate	0.526	µg/L		Y	Y	SW-846:6850	0.050
CAMO-19-164864	R-50 S1	12/18/2018	Chromium	83.5	µg/L		Y	Y	SW-846:6020	3.00
CAMO-19-164864	R-50 S1	12/18/2018	Fluoride	0.220	mg/L		Y	Y	EPA:300.0	0.033
CAMO-19-164864	R-50 S1	12/18/2018	Nitrate-Nitrite as Nitrogen	2.52	mg/L		Y	Y	EPA:353.2	0.085
CAMO-19-164864	R-50 S1	12/18/2018	Sulfate	17.1	mg/L		Y	Y	EPA:300.0	0.133
CAMO-19-164864	R-50 S1	12/18/2018	Total Dissolved Solids	147	mg/L		Y	Y	EPA:160.1	3.40
CAMO-19-163725	R-50 S2	11/01/2018	Chloride	2.16	mg/L		Y	Y	EPA:300.0	0.067
CAMO-19-163725	R-50 S2	11/01/2018	Perchlorate	0.353	µg/L		Y	Y	SW-846:6850	0.050
CAMO-19-163725	R-50 S2	11/01/2018	Chromium	4.26	µg/L	J	Y	Y	SW-846:6020	3.00
CAMO-19-163725	R-50 S2	11/01/2018	Fluoride	0.366	mg/L		Y	Y	EPA:300.0	0.033
CAMO-19-163725	R-50 S2	11/01/2018	Nitrate-Nitrite as Nitrogen	0.595	mg/L		Y	Y	EPA:353.2	0.085
CAMO-19-163725	R-50 S2	11/01/2018	Sulfate	2.67	mg/L		Y	Y	EPA:300.0	0.133
CAMO-19-163725	R-50 S2	11/01/2018	Total Dissolved Solids	136	mg/L		Y	Y	EPA:160.1	3.40
CAMO-19-164001	R-50 S2	11/19/2018	Chloride	2.15	mg/L		Y	Y	EPA:300.0	0.067
CAMO-19-164001	R-50 S2	11/19/2018	Perchlorate	0.39	µg/L		Y	Y	SW-846:6850	0.050
CAMO-19-164001	R-50 S2	11/19/2018	Chromium	4.23	µg/L	J	Y	Y	SW-846:6020	3.00
CAMO-19-164001	R-50 S2	11/19/2018	Fluoride	0.338	mg/L		Y	Y	EPA:300.0	0.033

Field Sample ID	Location ID	Sample Date	Parameter Name	Report Result	Report Units	Lab Qualifier	Detect Flag	Filtered	Lab Method	Report Detection Limit
CAMO-19-164001	R-50 S2	11/19/2018	Nitrate-Nitrite as Nitrogen	0.541	mg/L		Y	Y	EPA:353.2	0.017
CAMO-19-164001	R-50 S2	11/19/2018	Sulfate	2.61	mg/L		Y	Y	EPA:300.0	0.133
CAMO-19-164001	R-50 S2	11/19/2018	Total Dissolved Solids	80.0	mg/L		Y	Y	EPA:160.1	3.40
CAMO-19-164867	R-50 S2	12/17/2018	Chloride	2.10	mg/L		Y	Y	EPA:300.0	0.067
CAMO-19-164867	R-50 S2	12/17/2018	Perchlorate	0.396	µg/L		Y	Y	SW-846:6850	0.050
CAMO-19-164867	R-50 S2	12/17/2018	Chromium	4.32	µg/L	J	Y	Y	SW-846:6020	3.00
CAMO-19-164867	R-50 S2	12/17/2018	Fluoride	0.332	mg/L		Y	Y	EPA:300.0	0.033
CAMO-19-164867	R-50 S2	12/17/2018	Nitrate-Nitrite as Nitrogen	0.525	mg/L		Y	Y	EPA:353.2	0.017
CAMO-19-164867	R-50 S2	12/17/2018	Sulfate	2.55	mg/L		Y	Y	EPA:300.0	0.133
CAMO-19-164867	R-50 S2	12/17/2018	Total Dissolved Solids	121	mg/L		Y	Y	EPA:160.1	3.40
CAMO-19-164006	R-62	11/09/2018	Chloride	17.0	mg/L		Y	Y	EPA:300.0	0.268
CAMO-19-164006	R-62	11/09/2018	Perchlorate	0.89	µg/L		Y	Y	SW-846:6850	0.050
CAMO-19-164006	R-62	11/09/2018	Chromium	277	µg/L		Y	Y	SW-846:6020	15.0
CAMO-19-164006	R-62	11/09/2018	Fluoride	0.147	mg/L		Y	Y	EPA:300.0	0.033
CAMO-19-164006	R-62	11/09/2018	Nitrate-Nitrite as Nitrogen	1.96	mg/L		Y	Y	EPA:353.2	0.085
CAMO-19-164006	R-62	11/09/2018	Sulfate	30.4	mg/L		Y	Y	EPA:300.0	0.532
CAMO-19-164006	R-62	11/09/2018	Total Dissolved Solids	194	mg/L		Y	Y	EPA:160.1	3.40
CAMO-18-159831	SIMR-2	07/27/2018	Chloride	2.28	mg/L		Y	Y	EPA:300.0	0.067
CAMO-18-159831	SIMR-2	07/27/2018	Perchlorate	0.415	µg/L		Y	Y	SW-846:6850	0.050
CAMO-18-159831	SIMR-2	07/27/2018	Chromium	5.1	µg/L	J	Y	Y	SW-846:6020	3.00
CAMO-18-159831	SIMR-2	07/27/2018	Fluoride	0.219	mg/L		Y	Y	EPA:300.0	0.033
CAMO-18-159831	SIMR-2	07/27/2018	Nitrate-Nitrite as Nitrogen	0.710	mg/L		Y	Y	EPA:353.2	0.017
CAMO-18-159831	SIMR-2	07/27/2018	Sulfate	2.99	mg/L		Y	Y	EPA:300.0	0.133
CAMO-18-159831	SIMR-2	07/27/2018	Total Dissolved Solids	131	mg/L		Y	Y	EPA:160.1	3.40
CAMO-18-160441	SIMR-2	08/16/2018	Chloride	2.14	mg/L		Y	Y	EPA:300.0	0.067
CAMO-18-160441	SIMR-2	08/16/2018	Perchlorate	0.411	µg/L		Y	Y	SW-846:6850	0.050
CAMO-18-160441	SIMR-2	08/16/2018	Chromium	4.78	µg/L	J	Y	Y	SW-846:6020	3.00

Field Sample ID	Location ID	Sample Date	Parameter Name	Report Result	Report Units	Lab Qualifier	Detect Flag	Filtered	Lab Method	Report Detection Limit
CAMO-18-160441	SIMR-2	08/16/2018	Fluoride	0.243	mg/L		Y	Y	EPA:300.0	0.033
CAMO-18-160441	SIMR-2	08/16/2018	Nitrate-Nitrite as Nitrogen	0.701	mg/L		Y	Y	EPA:353.2	0.017
CAMO-18-160441	SIMR-2	08/16/2018	Sulfate	2.73	mg/L		Y	Y	EPA:300.0	0.133
CAMO-18-160441	SIMR-2	08/16/2018	Total Dissolved Solids	151	mg/L		Y	Y	EPA:160.1	3.40
CAMO-18-160812	SIMR-2	09/13/2018	Chloride	2.22	mg/L		Y	Y	EPA:300.0	0.067
CAMO-18-160812	SIMR-2	09/13/2018	Perchlorate	0.432	µg/L		Y	Y	SW-846:6850	0.050
CAMO-18-160812	SIMR-2	09/13/2018	Chromium	4.64	µg/L	J	Y	Y	SW-846:6020	3.00
CAMO-18-160812	SIMR-2	09/13/2018	Fluoride	0.281	mg/L		Y	Y	EPA:300.0	0.033
CAMO-18-160812	SIMR-2	09/13/2018	Nitrate-Nitrite as Nitrogen	0.656	mg/L		Y	Y	EPA:353.2	0.017
CAMO-18-160812	SIMR-2	09/13/2018	Sulfate	2.90	mg/L		Y	Y	EPA:300.0	0.133
CAMO-18-160812	SIMR-2	09/13/2018	Total Dissolved Solids	117	mg/L		Y	Y	EPA:160.1	3.40

Notes: SIMR-2 data reported here in accordance with the memorandum of agreement and protocol agreement between San Ildefonso Pueblo and the U.S. Department of Energy.
J in the Lab Qualifier column means the analyte is classified as estimated.
H in the Lab Qualifier column means that the required extraction or analysis holding time for this result was exceeded.
Y in the Detect Flag column means the analyte was detected.
N in the Detect Flag column means the analyte was not detected.
Y in the Filtered column means the sample was filtered.
N in the Filtered column means the sample was not filtered.
A blank cell under Lab Qualifier indicates the corresponding parameter was detected and no qualifier is applicable to the result.

ENCLOSURE 5

Treated Groundwater Extraction and Injection Summary Tables –
2018 Quarter 4, DP-1835

Table E5-1
Daily Extraction Summary Table
2018 Quarter 4, DP-1835

Date	CrEX-1 (gal.)	CrEX-2 (gal.)	CrEX-3 (gal.)	CrEX-4 (gal.)	Total (gal.)
10/1/2018	92,417	91,780	44,016	0	228,213
10/2/2018	91,791	92,581	77,660	0	262,032
10/3/2018	83,858	89,641	76,710	0	250,210
10/4/2018	9,595	90,717	75,614	0	245,926
10/5/2018	93,593	97,308	77,757	0	268,658
10/6/2018	93,319	96,979	77,750	0	268,048
10/7/2018	90,701	96,121	77,207	0	264,029
10/8/2018	85,940	94,677	70,664	0	251,281
10/9/2018	49,987	53,828	33,584	0	137,399
10/10/2018	0	0	0	0	0
10/11/2018	0	0	0	0	0
10/12/2018	49,344	45,606	40,141	0	135,092
10/13/2018	97,393	90,713	79,197	0	267,303
10/14/2018	96,061	90,031	78,117	0	264,209
10/15/2018	93,017	88,520	76,620	0	258,157
10/16/2018	91,268	87,417	75,693	0	254,377
10/17/2018	94,502	89,429	77,499	0	261,430
10/18/2018	92,635	89,134	76,338	0	258,107
10/19/2018	91,137	87,959	75,159	0	254,255
10/20/2018	90,858	88,693	75,007	0	254,558
10/21/2018	89,001	87,865	73,714	0	250,579
10/22/2018	85,553	85,714	70,447	0	241,715
10/23/2018	91,284	92,542	73,135	0	256,961
10/24/2018	84,500	90,545	70,593	0	245,638
10/25/2018	87,705	85,891	41,809	0	215,404
10/26/2018	109,222	34,020	50,855	0	194,098
10/27/2018	92,536	91,985	76,090	0	260,612
10/28/2018	86,713	90,121	74,022	0	250,856
10/29/2018	76,394	87,503	70,392	0	234,290
10/30/2018	88,524	91,226	33,605	0	213,354
10/31/2018	115,084	101,066	0	0	216,151
11/1/2018	115,185	100,795	0	0	215,981
11/2/2018	115,181	100,786	0	0	215,967
11/3/2018	115,223	100,819	0	0	216,042
11/4/2018	115,180	100,784	0	0	215,964
11/5/2018	91,458	78,993	0	0	170,451
11/6/2018	115,221	100,124	0	0	215,345

Table E5-1
Daily Extraction Summary Table
2018 Quarter 4, DP-1835

Date	CrEX-1 (gal.)	CrEX-2 (gal.)	CrEX-3 (gal.)	CrEX-4 (gal.)	Total (gal.)
11/7/2018	115,185	100,132	0	0	215,317
11/8/2018	115,224	100,164	0	0	215,388
11/9/2018	115,208	100,095	0	0	215,303
11/10/2018	115,192	100,174	0	0	215,366
11/11/2018	115,196	100,090	0	0	215,286
11/12/2018	115,193	99,962	0	0	215,156
11/13/2018	115,187	99,728	0	0	214,914
11/14/2018	115,501	98,646	0	0	214,147
11/15/2018	116,886	100,640	0	0	217,526
11/16/2018	119,480	103,246	0	0	222,725
11/17/2018	119,552	103,241	0	0	222,793
11/18/2018	119,470	103,290	0	0	222,760
11/19/2018	119,527	103,211	0	0	222,738
11/20/2018	119,500	103,281	0	0	222,781
11/21/2018	119,526	103,188	0	0	222,714
11/22/2018	119,510	103,467	0	0	222,977
11/23/2018	119,540	103,497	0	0	223,037
11/24/2018	119,521	103,483	0	0	223,004
11/25/2018	119,526	103,257	0	0	222,783
11/26/2018	100,759	97,387	43,779	0	241,924
11/27/2018	94,821	96,876	43,091	0	234,789
11/28/2018	109,360	101,283	0	0	210,644
11/29/2018	108,714	97,948	0	0	206,662
11/30/2018	120,980	102,728	0	0	223,708
12/1/2018	120,940	102,524	0	0	223,465
12/2/2018	120,977	102,270	0	0	223,247
12/3/2018	120,957	102,246	0	0	223,203
12/4/2018	115,656	105,451	0	0	221,107
12/5/2018	113,757	106,633	0	0	220,391
12/6/2018	113,753	106,611	0	0	220,365
12/7/2018	113,781	106,600	0	0	220,381
12/8/2018	113,738	106,616	0	0	220,353
12/9/2018	113,764	106,607	0	0	220,371
12/10/2018	113,767	106,612	0	0	220,379
12/11/2018	113,761	106,611	0	0	220,372
12/12/2018	113,760	106,602	0	0	220,362
12/13/2018	113,732	106,557	0	0	220,290

Table E5-1
Daily Extraction Summary Table
2018 Quarter 4, DP-1835

Date	CrEX-1 (gal.)	CrEX-2 (gal.)	CrEX-3 (gal.)	CrEX-4 (gal.)	Total (gal.)
12/14/2018	113,769	106,579	0	0	220,348
12/15/2018	113,767	106,575	0	0	220,342
12/16/2018	113,762	106,562	0	0	220,325
12/17/2018	99,877	98,610	42,823	0	241,309
12/18/2018	99,307	96,930	40,441	0	236,679
12/19/2018	118,845	106,147	0	0	224,991
12/20/2018	115,195	106,587	0	0	221,782
12/21/2018	118,201	106,205	0	0	224,406
12/22/2018	119,521	106,031	0	0	225,552
12/23/2018	120,187	105,816	0	0	226,003
12/24/2018	120,941	105,520	0	0	226,461
12/25/2018	120,959	105,676	0	0	226,635
12/26/2018	120,989	105,804	0	0	226,793
12/27/2018	120,952	105,777	0	0	226,729
12/28/2018	120,964	105,760	0	0	226,724
12/29/2018	119,508	105,995	0	0	225,502
12/30/2018	119,510	105,965	0	0	225,475
12/31/2018	119,539	105,963	0	0	225,502
					Subtotal: 20,442,977

Table E5-2
Daily Injection Summary Table 2018 Quarter 4, DP1835

Date	CrIN-1* (gal.)	CrIN-2* (gal.)	CrIN-3 (gal.)	CrIN-4 (gal.)	CrIN-5 (gal.)	CrIN-6* (gal.)	Total (gal.)
10/1/2018	0	0	49,318	90,032	84,168	0	223,519
10/2/2018	0	0	86,567	89,309	83,514	0	259,390
10/3/2018	0	0	86,915	89,258	83,420	0	259,593
10/4/2018	0	0	87,036	89,627	83,249	0	259,912
10/5/2018	0	0	86,769	89,450	83,373	0	259,592
10/6/2018	0	0	86,595	89,319	83,543	0	259,457
10/7/2018	0	0	87,142	87,180	83,492	0	257,814
10/8/2018	0	0	87,384	86,380	83,517	0	257,282
10/9/2018	0	0	51,740	51,569	49,900	0	153,208
10/10/2018	0	0	0	0	0	0	0
10/11/2018	0	0	0	0	0	0	0
10/12/2018	0	0	43,875	46,738	43,290	0	133,903

Table E5-2
Daily Injection Summary Table 2018 Quarter 4, DP1835

Date	CrIN-1* (gal.)	CrIN-2* (gal.)	CrIN-3 (gal.)	CrIN-4 (gal.)	CrIN-5 (gal.)	CrIN-6* (gal.)	Total (gal.)
10/13/2018	0	0	81,436	92,436	87,626	0	261,498
10/14/2018	0	0	81,113	91,014	89,493	0	261,620
10/15/2018	0	0	76,347	89,776	90,721	0	256,845
10/16/2018	0	0	76,305	89,356	90,733	0	256,395
10/17/2018	0	0	76,321	89,252	90,723	0	256,296
10/18/2018	0	0	76,333	89,229	90,702	0	256,265
10/19/2018	0	0	76,306	89,294	90,117	0	255,717
10/20/2018	0	0	76,331	89,271	89,960	0	255,562
10/21/2018	0	0	76,309	88,901	89,948	0	255,158
10/22/2018	0	0	76,312	88,376	89,734	0	254,423
10/23/2018	0	0	76,333	87,833	89,297	0	253,463
10/24/2018	0	0	76,309	87,843	89,349	0	253,502
10/25/2018	0	0	28,833	89,444	90,657	0	208,934
10/26/2018	0	0	17,415	89,720	88,892	0	196,027
10/27/2018	0	0	64,344	89,050	87,638	0	241,032
10/28/2018	0	0	66,146	88,401	86,736	0	241,283
10/29/2018	0	0	66,264	88,218	87,003	0	241,486
10/30/2018	0	0	33,198	89,306	87,569	0	210,074
10/31/2018	0	0	26,622	90,173	88,230	0	205,026
11/1/2018	0	0	39,820	89,588	87,833	0	217,241
11/2/2018	0	0	38,922	89,849	87,863	0	216,634
11/3/2018	0	0	38,840	89,567	88,300	0	216,707
11/4/2018	0	0	38,861	89,350	88,188	0	216,398
11/5/2018	0	0	30,589	71,085	71,008	0	172,682
11/6/2018	0	0	38,742	87,824	90,165	0	216,731
11/7/2018	0	0	38,830	87,891	90,707	0	217,427
11/8/2018	0	0	38,795	87,794	90,717	0	217,306
11/9/2018	0	0	38,242	86,297	89,944	0	214,483
11/10/2018	0	0	37,616	85,325	89,356	0	212,297
11/11/2018	0	0	38,587	88,193	90,060	0	216,839
11/12/2018	0	0	37,438	89,214	89,275	0	215,927
11/13/2018	0	0	36,830	87,829	89,265	0	213,924
11/14/2018	0	0	42,365	84,428	89,302	0	216,095
11/15/2018	0	0	42,470	83,641	89,268	0	215,379
11/16/2018	0	0	44,791	84,048	89,243	0	218,082
11/17/2018	0	0	46,070	86,923	89,308	0	222,301
11/18/2018	0	0	46,102	87,852	89,239	0	223,193

Table E5-2
Daily Injection Summary Table 2018 Quarter 4, DP1835

Date	CrIN-1* (gal.)	CrIN-2* (gal.)	CrIN-3 (gal.)	CrIN-4 (gal.)	CrIN-5 (gal.)	CrIN-6* (gal.)	Total (gal.)
11/19/2018	0	0	46,051	89,007	89,137	0	224,194
11/20/2018	0	0	46,093	89,209	89,213	0	224,514
11/21/2018	0	0	46,083	89,283	89,196	0	224,561
11/22/2018	0	0	46,077	89,307	89,205	0	224,590
11/23/2018	0	0	46,087	86,790	89,293	0	222,171
11/24/2018	0	0	46,063	86,402	89,281	0	221,746
11/25/2018	0	0	46,082	86,403	89,283	0	221,768
11/26/2018	0	0	66,728	86,194	88,501	0	241,423
11/27/2018	0	0	54,089	86,270	89,227	0	229,587
11/28/2018	0	0	35,998	86,422	89,499	0	211,919
11/29/2018	0	0	38,637	86,414	89,426	0	214,476
11/30/2018	0	0	46,091	86,446	89,291	0	221,828
12/1/2018	0	0	46,072	86,452	89,267	0	221,791
12/2/2018	0	0	46,132	86,343	89,293	0	221,768
12/3/2018	0	0	46,046	86,372	89,278	0	221,696
12/4/2018	0	0	46,076	86,492	89,272	0	221,840
12/5/2018	0	0	46,064	86,486	89,280	0	221,830
12/6/2018	0	0	46,075	86,487	89,275	0	221,838
12/7/2018	0	0	46,085	86,519	89,292	0	221,897
12/8/2018	0	0	46,085	86,744	89,262	0	222,092
12/9/2018	0	0	46,062	86,785	89,280	0	222,127
12/10/2018	0	0	46,088	86,811	89,284	0	222,183
12/11/2018	0	0	46,032	86,717	89,280	0	222,029
12/12/2018	0	0	45,972	86,909	89,280	0	222,162
12/13/2018	0	0	46,006	86,960	89,286	0	222,253
12/14/2018	0	0	45,897	87,009	89,260	0	222,167
12/15/2018	0	0	45,918	86,834	89,285	0	222,037
12/16/2018	0	0	45,734	87,260	89,279	0	222,274
12/17/2018	0	0	64,609	87,012	88,839	0	240,459
12/18/2018	0	0	63,983	86,655	89,057	0	239,695
12/19/2018	0	0	42,187	87,777	89,447	0	219,411
12/20/2018	0	0	47,532	86,776	89,272	0	223,579
12/21/2018	0	0	47,506	86,891	89,282	0	223,679
12/22/2018	0	0	47,549	89,016	89,033	0	225,598
12/23/2018	0	0	47,488	87,252	89,273	0	224,012
12/24/2018	0	0	47,527	90,732	89,249	0	227,508
12/25/2018	0	0	47,522	90,724	89,308	0	227,554

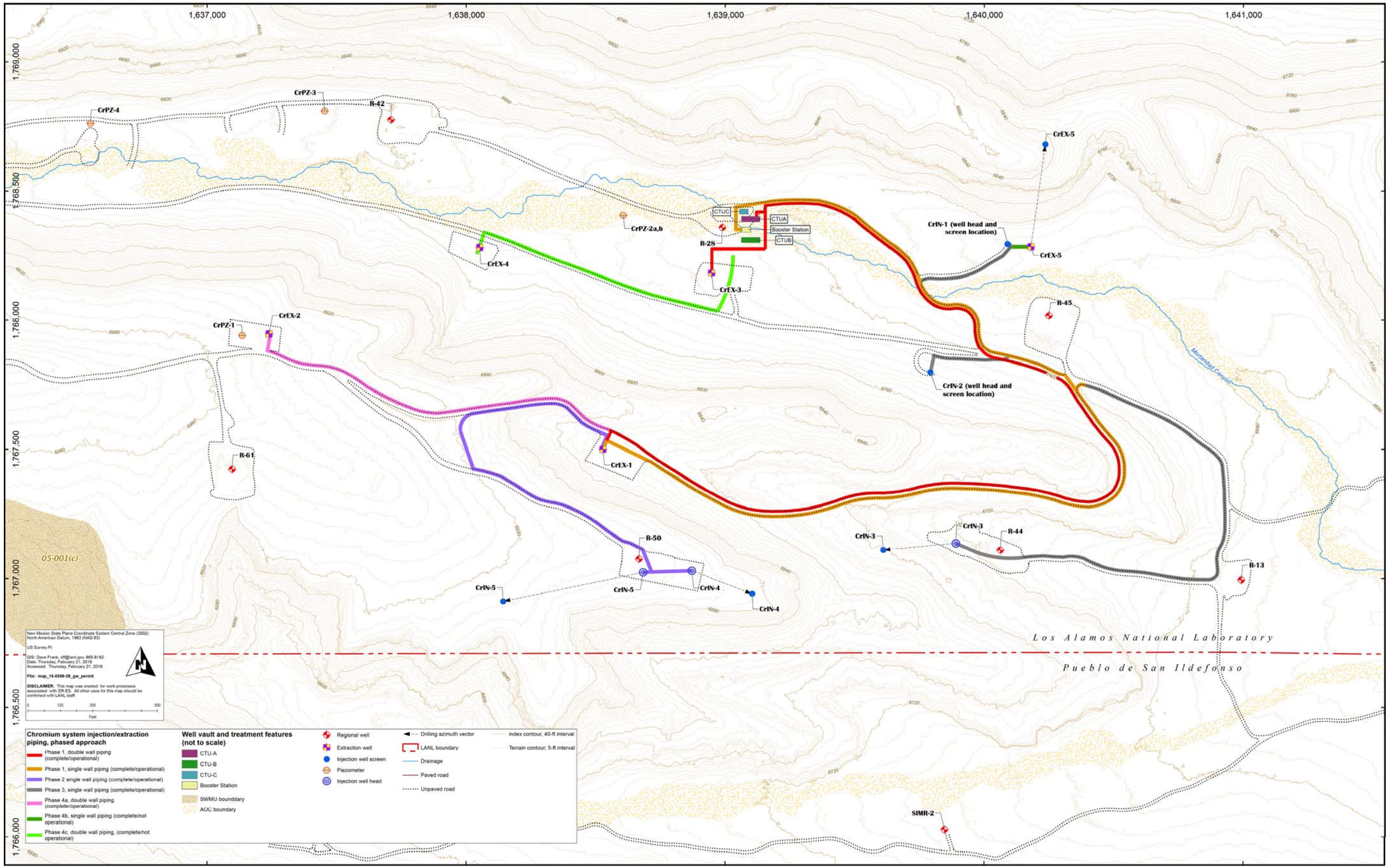
Table E5-2
Daily Injection Summary Table 2018 Quarter 4, DP1835

Date	CrIN-1* (gal.)	CrIN-2* (gal.)	CrIN-3 (gal.)	CrIN-4 (gal.)	CrIN-5 (gal.)	CrIN-6* (gal.)	Total (gal.)
12/26/2018	0	0	47,516	90,711	89,270	0	227,496
12/27/2018	0	0	47,517	90,714	89,273	0	227,504
12/28/2018	0	0	47,534	90,722	89,282	0	227,538
12/29/2018	0	0	47,503	90,715	87,841	0	226,059
12/30/2018	0	0	47,532	90,745	87,833	0	226,109
12/31/2018	0	0	47,541	90,704	87,853	0	226,099
							Subtotal 20,450,981

* UIC well construction and injection of treated groundwater did not occur during this quarter in accordance with the New Mexico Environment Department's correspondence on September 25, 2017.

ENCLOSURE 6

Facility Layout Map –
2018 Quarter 4, DP-1835


1,637,000
1,638,000
1,639,000
1,640,000
1,641,000
1,769,000
1,768,500
1,768,000
1,767,500
1,767,000
1,766,500
1,766,000
CrPZ-4
CrPZ-3
R-42
CrEX-5
CrIN-1 (well head and screen location)
CrPZ-2a,b
CTUC
CTUA
Booster Station
CTUB
R-28
CrEX-4
CrEX-3
CrEX-5
R-45
CrPZ-1
CrEX-2
CrIN-2 (well head and screen location)
Mortandad Canyon
CrEX-1
R-61
R-50
CrIN-3
CrIN-3
R-44
R-13
CrIN-5
CrIN-5
CrIN-4
CrIN-4
05-001(c)
Los Alamos National Laboratory
Pueblo de San Ildefonso
SIMR-2
New Mexico State Plane Coordinate System Central Zone (3002)
North American Datum, 1983 (NAD 83)
US Survey Ft
GIS: Dave Frank, dff@lanl.gov, 665-8182
Date: Thursday, February 21, 2019
Accessed: Thursday, February 21, 2019
File: map_15-0059-39_gw_permit
DISCLAIMER: This map was created for work processes associated with ER-ES. All other uses for this map should be confirmed with LANL staff.
0 125 250 500
Feet
Chromium system injection/extraction piping, phased approach
Phase 1, double wall piping (complete/operational)
Phase 1, single wall piping (complete/operational)
Phase 2 single wall piping (complete/operational)
Phase 3, single wall piping (complete/operational)
Phase 4a, double wall piping (complete/operational)
Phase 4b, single wall piping (complete/not operational)
Phase 4c, double wall piping, (complete/not operational)
Well vault and treatment features (not to scale)
CTU-A
CTU-B
CTU-C
Booster Station
SWMU bounddary
AOC boundary
Regional well
Extraction well
Injection well screen
Piezometer
Injection well head
Drilling azimuth vector
LANL boundary
Drainage
Paved road
Unpaved road
index contour, 40-ft interval
Terrain contour, 5-ft interval