

TECHNICAL MEMORANDUM

To: Nevada Environmental Response Trust

Cc: Nevada Division of Environmental Protection
United States Environmental Protection Agency

From: Chris Hayes

Date: October 25, 2022

Subject: Unit 4 Source Area In-Situ Bioremediation Treatability Study Monthly Progress Report

At the direction of the Nevada Environmental Response Trust (NERT or Trust), Tetra Tech, Inc. (Tetra Tech) has prepared this memorandum to summarize Tetra Tech's progress during September 2022 toward successfully implementing the Unit 4 Source Area In-Situ Bioremediation (ISB) Treatability Study.

Task Progress Update: September 2022

Task M21 – Unit 4 Source Area ISB Treatability Study

- Current Status –

Phase 2 of the Unit 4 Source Area ISB Treatability Study is ongoing. A layout map and construction details of all injection, monitoring, and extraction wells are provided on Figure 1 and in Table 1. Operations, maintenance and monitoring activities completed during September 2022 are summarized below.

- Operations and Maintenance

- Area 1 – The first phase of the treatability study for Area 1 consists of a total dissolved solids (TDS) reduction period prior to the injection of a carbon substrate due to the presence of extremely elevated TDS concentrations in groundwater in the Area 1 deep zone. Groundwater-only circulation consisting of the injection of clean water (formerly known as stabilized Lake Mead water [SLMW]) in a pulsed manner and continuous groundwater extraction is being performed in an effort to reduce TDS concentrations to levels that allow biodegradation processes to proceed (i.e., TDS concentrations to below 21,000 milligrams per liter [mg/L]) prior to implementation of the treatability study.
- The injection of clean water and extraction operations began in the Area 1 deep zone on September 8, 2022 and continued daily for the remainder of the month. A total of 72,363 gallons of clean water was injected into four injection wells within the Area 1 deep zone, while a total of 24,421 gallons of groundwater was extracted from one extraction well. No injection/extraction operations occurred within the Area 1 intermediate zone. Summaries of Area 1 extractions and injections are provided in Tables 2 and 3, respectively.

- An initial one-time injection of fluorescein dye was injected into U4-E-4D, and U4-E-5D on September 16, 2022 to assess the horizontal and vertical distribution of the injectate/dye and evaluate travel times.
- Area 2 – Because TDS concentrations within Area 2 are lower than Area 1 and averaged approximately 19,500 mg/L during baseline sampling, ISB injection/extraction activities are being implemented without an initial TDS reduction step.
 - Carbon substrate solution/water injection and groundwater extraction operations began in both the intermediate and deep zones within Area 2 on September 13, 2022. Injections were suspended for minor system maintenance on September 14/15, but resumed on September 16 and continued for the remainder of the month. Extractions occurred every day in September following startup on September 13, 2022. A total of 17,391 gallons of carbon solution and 13,912 gallons of distribution water were injected into two injection wells within the Area 2 intermediate zone, while approximately 40,095 gallons of groundwater were extracted from two extraction wells. A total of 10,938 gallons of carbon solution and 9,223 gallons of distribution water were injected into four injection wells within the Area 2 deep zone, while approximately 8,874 gallons of groundwater were extracted from one extraction well. Summaries of Area 2 extractions and injections are provided in Tables 2 and 4, respectively.
 - The injection process consisted of daily-pulsed injections of a carbon substrate solution, followed by daily injections of distribution water. The carbon substrate solution consisted of molasses, filtered Fluidized Bed Reactor (FBR) biosolids, 0.5 molar sodium bicarbonate solution, trace mineral solution, and vitamin B12. The macronutrient solution consisting of urea and diammonium phosphate (DAP) is not currently being added to the injectate solution. Prior to the start of system operations, a small laboratory study was performed to evaluate precipitate formation observed during the previous bench-scale studies. The study indicated that the addition of urea/DAP to the injectate solution may increase precipitate formation. As a result, the macronutrient solution is not being included in the injectate solution at this time but may be added in the future if deemed required based on effectiveness monitoring results.
 - An initial one-time injection of rhodamine dye was injected into wells U4-E-9I and U4-E-10I on September 16, 2022 to assess the horizontal and vertical distribution of the injectate/dye and evaluate travel times.
- Effectiveness Monitoring –
 - A baseline groundwater sampling event was completed during the April 2022 prior to system start-up. The baseline sampling results were provided in the June 2022 monthly progress report. Following system start-up in early September, the monitoring program described in the NDEP-approved Unit 4 Source Area ISB Treatability Study Work Plan Addendum was subsequently implemented to evaluate the effectiveness of ISB at reducing contaminant concentrations in groundwater within the Unit 4 Treatability Study Area. During the month of September 2022, the first biweekly sampling event was performed within Area 2 from September 26 – 28, 2022. Groundwater analytical results will be provided in future monthly progress reports as the data are received from the laboratory.
 - The first sampling event associated with the concurrent dye study was performed from September 19 – 21, 2022. Dye testing will continue to be performed during the planned groundwater monitoring and extraction monitoring activities. Results from the dye testing

will be presented in future Monthly Progress Reports as data are received from the laboratory.

- Schedule and Progress Updates
 - Area 1 TDS reduction operations are anticipated to continue through March 2023.
 - Area 2 ISB operations are anticipated to continue through September 2023.
- Health and Safety
 - There were no health and safety incidents related to Task M21 during September 2022.

CERTIFICATION

Unit 4 Source Area In-Situ Bioremediation Treatability Study Monthly Progress Report

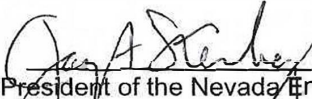
**Nevada Environmental Response Trust Site
(Former Tronox LLC Site)
Henderson, Nevada**

Nevada Environmental Response Trust (NERT) Representative Certification

I certify that this document and all attachments submitted to the Division were prepared at the request of, or under the direction or supervision of NERT. Based on my own involvement and/or my inquiry of the person or persons who manage the systems(s) or those directly responsible for gathering the information or preparing the document, or the immediate supervisor of such person(s), the information submitted and provided herein is, to the best of my knowledge and belief, true, accurate, and complete in all material respects.

Office of the Nevada Environmental Response Trust

Le Petomane XXVII, not individually, but solely in its representative capacity as the Nevada Environmental Response Trust Trustee

Signature:  Not Individually, but Solely as President of the Trustee, not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust Trustee

Name: Jay A. Steinberg, not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust Trustee

Title: Solely as President and not individually

Company: Le Petomane XXVII, Inc., not individually, but solely in its representative capacity as the Nevada Environmental Response Trust Trustee

Date: 10/25/22

CERTIFICATION

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been prepared in a manner consistent with the current standards of the profession, and to the best of my knowledge, comply with all applicable federal, state, and local statutes, regulations, and ordinances. I hereby certify that all laboratory analytical data was generated by a laboratory certified by the NDEP for each constituent and media presented herein.

Description of Services Provided: Prepared Unit 4 Source Area In-Situ Bioremediation Treatability Study Monthly Progress Report.



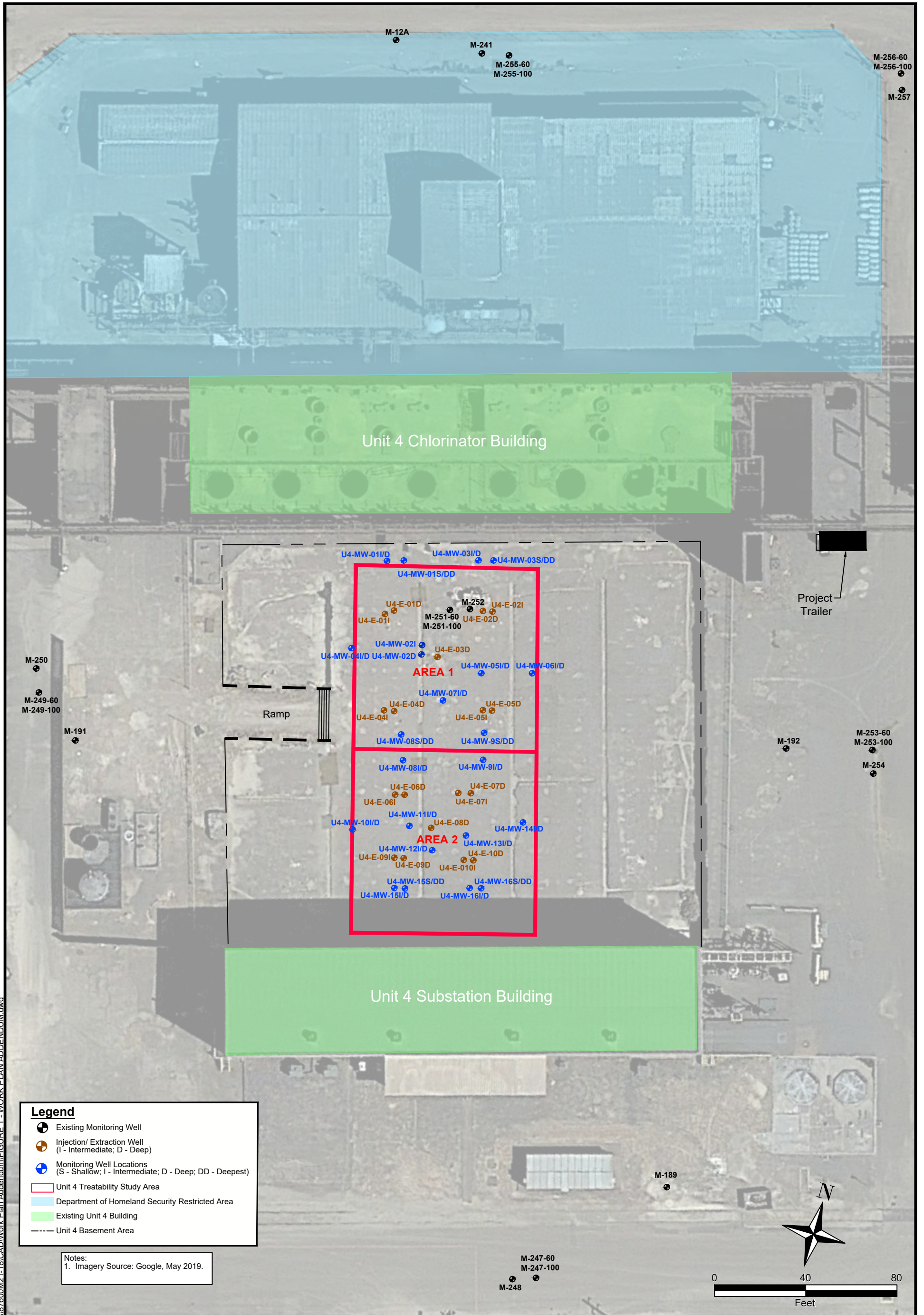
David S. Wilson, CEM
Principal Engineer
Tetra Tech, Inc.

October 25, 2022

Date

Nevada CEM Certificate Number: 2385
Nevada CEM Expiration Date: September 19, 2024

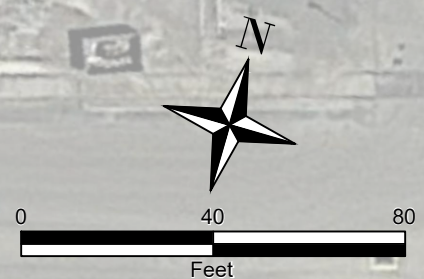
Figures



Legend

- Existing Monitoring Well
- Injection/ Extraction Well (I - Intermediate, D - Deep)
- Monitoring Well Locations (S - Shallow; I - Intermediate; D - Deep; DD - Deepest)
- Unit 4 Treatability Study Area
- Department of Homeland Security Restricted Area
- Existing Unit 4 Building
- Unit 4 Basement Area

Notes:
1. Imagery Source: Google, May 2019.



\\its318fs3.tt.local\CES\Projects\87600\M21-18\CAD\Work Plan Addendum\FIGURE 1 - WORK PLAN ADDENDUM.dwg

NEVADA ENVIRONMENTAL RESPONSE TRUST SITE

UNIT 4 SOURCE AREA IN-SITU BIOREMEDIATION TREATABILITY STUDY
HENDERSON, NEVADA

INJECTION/ EXTRACTION AND MONITORING WELL LAYOUT

TETRA TECH

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Project No.:	117-7502021-M21
Date:	May 10, 2022
Designed By:	AC
Figure No.	1

Tables

Table 1
Phase 2 Well Construction Details
 Unit 4 Source Area In-Situ Bioremediation Treatability Study

Well ID	Screened Lithology	Northing	Easting	Ground Surface Elevation ¹	Top of Casing Elevation	Construction Type	Casing Material	Screen Material	Slot Size	Filter Pack Gradation	Borehole Diameter	Borehole Total Depth	Well Diameter	Nominal Screen Length	Well Total Depth	Bottom of Screen	Top of Screen
				feet amsl	feet amsl				inches								
U4-E-03D	UMCf	26717310.37	828241.13	1805.49	1804.94	Single	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	8	113.0	4	15	111.1	110.1	95.1
U4-E-06D	UMCf	26717253.44	828232.43	1805.44	1804.74	Single	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	8	112.0	4	15	111.1	110.1	95.1
U4-E-06I	UMCf	26717252.90	828228.29	1805.47	1805.04	Single	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	8	92.5	4	15	89.2	88.2	73.2
U4-E-07D	UMCf	26717258.48	828261.02	1805.62	1805.31	Single	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	8	111.5	4	15	110.6	109.6	94.6
U4-E-07I	UMCf	26717257.68	828255.56	1805.62	1805.16	Single	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	8	92.0	4	15	90.7	89.7	74.7
U4-E-08D	UMCf	26717240.82	828246.11	1805.45	1804.91	Single	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	8	120.0	4	15	110.6	109.6	94.6
U4-E-09D	UMCf	26717225.92	828236.22	1805.45	1804.91	Single	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	8	112.0	4	15	110.5	109.5	94.5
U4-E-09I	UMCf	26717225.46	828232.18	1805.47	1805.14	Single	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	8	93.3	4	15	90.9	89.9	74.9
U4-E-10D	UMCf	26717229.55	828266.50	1805.66	1805.28	Single	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	8	112.0	4	15	110.5	109.5	94.5
U4-E-10I	UMCf	26717229.15	828262.34	1805.71	1805.37	Single	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	8	92.0	4	15	90.2	89.2	74.2
U4-MW-01I	UMCf	26717353.59	828209.51	1805.57	1805.14	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	108.0	2	10	86.7	86.7	76.7
U4-MW-01D	UMCf	26717353.51	828209.25	1805.57	1805.10		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	106.7	106.7	96.7
U4-MW-01S	UMCf	26717354.83	828216.42	1805.57	1805.02	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	131.0	2	10	64.7	64.7	54.7
U4-MW-01DD	UMCf	26717354.86	828216.87	1805.57	1805.09		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	129.9	129.9	119.9
U4-MW-03I	UMCf	26717359.79	828248.76	1805.61	1805.17	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	108.3	2	10	86.6	86.6	76.6
U4-MW-03D	UMCf	26717360.01	828249.20	1805.61	1805.18		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	106.6	106.6	96.6
U4-MW-03S	UMCf	26717360.79	828255.35	1805.56	1805.19	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	131.3	2	10	64.5	64.5	54.5
U4-MW-03DD	UMCf	26717360.84	828255.62	1805.56	1805.20		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	129.7	129.7	119.7
U4-MW-04I	UMCf	26717313.50	828199.89	1805.49	1805.13	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	108.5	2	10	86.8	86.8	76.8
U4-MW-04D	UMCf	26717313.36	828199.55	1805.49	1805.15		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	107.0	107.0	97.0
U4-MW-05I	UMCf	26717311.18	828257.53	1805.52	1805.06	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	108.0	2	10	86.6	86.6	76.6
U4-MW-05D	UMCf	26717311.18	828257.89	1805.52	1805.05		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	108.2	108.2	98.2
U4-MW-06I	UMCf	26717314.46	828279.53	1805.52	1805.21	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	108.3	2	10	86.5	86.5	76.5
U4-MW-06D	UMCf	26717314.51	828279.82	1805.52	1805.20		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	107.1	107.1	97.1
U4-MW-07I	UMCf	26717296.98	828242.85	1805.36	1805.16	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	109.2	2	10	86.8	86.8	76.8
U4-MW-07D	UMCf	26717296.68	828242.80	1805.36	1805.01		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	106.5	106.5	96.5
U4-MW-08I	UMCf	26717268.25	828229.36	1805.45	1804.97	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	108.0	2	10	88.0	88.0	78.0
U4-MW-08D	UMCf	26717268.30	828229.62	1805.45	1804.99		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	108.6	108.6	98.6
U4-MW-08S	UMCf	26717279.33	828226.78	1805.47	1804.94	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	131.2	2	10	64.9	64.9	54.9
U4-MW-08DD	UMCf	26717279.35	828227.22	1805.47	1804.95		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	129.8	129.8	119.8
U4-MW-09I	UMCf	26717273.70	828264.04	1805.62	1805.22	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	108.0	2	10	86.8	86.8	76.8
U4-MW-09D	UMCf	26717273.73	828264.40	1805.62	1805.20		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	106.9	106.9	96.9
U4-MW-09S	UMCf	26717285.44	828262.62	1805.55	1805.12	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	132.0	2	10	65.3	65.3	55.3
U4-MW-09DD	UMCf	26717285.52	828263.00	1805.55	1805.12		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	129.8	129.8	119.8
U4-MW-10I	UMCf	26717234.83	828212.05	1805.55	1805.10	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	109.0	2	10	87.1	87.1	77.1
U4-MW-10D	UMCf	26717235.18	828212.26	1805.55	1805.07		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	106.9	106.9	96.9
U4-MW-11I	UMCf	26717240.19	828236.42	1805.41	1805.03	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	109.0	2	10	87.0	87.0	77.0
U4-MW-11D	UMCf	26717240.23	828236.77	1805.41	1804.96		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	107.4	107.4	97.4
U4-MW-12I	UMCf	26717231.25	828247.87	1805.47	1805.11	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	108.0	2	10	86.8	86.8	76.8
U4-MW-12D	UMCf	26717231.22	828248.29	1805.47	1805.12		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	107.1	107.1	97.1
U4-MW-13I	UMCf	26717242.66	828261.00	1805.64	1805.28	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	109.0	2	10	87.1	87.1	77.1
U4-MW-13D	UMCf	26717242.70	828261.37	1805.64	1805.35		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	108.2	108.2	98.2
U4-MW-14I	UMCf	26717249.26	828285.32	1805.43	1805.13	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	109.0	2	10	87.3	87.3	77.3
U4-MW-14D	UMCf	26717249.24	828285.84	1805.43	1805.05		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	107.3	107.3	97.3
U4-MW-15I	UMCf	26717212.34	828233.91	1805.48	1805.03	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	109.0	2	10	86.8	86.8	76.8
U4-MW-15D	UMCf	26717212.35	828234.41	1805.48	1804.97		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	106.0	106.0	96.0
U4-MW-15S	UMCf	26717212.89	828238.61	1805.44	1805.05	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	132.0	2	10	64.8	64.8	54.8
U4-MW-15DD	UMCf	26717212.87	828239.01	1805.44	1804.98		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	130.3	130.3	120.3
U4-MW-16I	UMCf	26717217.25	828266.62	1805.68	1805.36	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	108.5	2	10	87.0	87.0	77.0
U4-MW-16D	UMCf	26717217.40	828266.90	1805.68	1805.27		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	106.8	106.8	96.8
U4-MW-16S	UMCf	26717217.87	828271.70	1805.59	1805.24	Dual-Nested	Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16	11	131.0	2	10	64.8	64.8	54.8
U4-MW-16DD	UMCf	26717218.04	828271.95	1805.59	1805.32		Schedule 80 PVC	Stainless Steel Wire-Wrap	0.010	#2/16			2	10	130.8	130.8	120.8

Notes

- amsl - above mean sea level
- bgs - below ground surface
- bTOC - below top of casing
- PVC - polyvinyl chloride
- UMCf - Upper Muddy Creek formation

1. Ground surface refers to the concrete floor of the Unit 4 basement, which is approximately 8 feet below the surrounding grade.
2. Well names including E indicate an extraction/injection well. Well names including MW indicate a monitoring well.

**Table 2
Summary of Injection Activities
Area 1 - September 2022
Unit 4 Source Area Bioremediation Treatability Study**

Study Area				Area 1 Deep											
Well ID				U4-E-01D			U4-E-02D			U4-E-04D			U4-E-05D		
Date	Injection Start Time	Injection Stop Time	Duration	Average Flow Rate	Volume Injected	Maximum Injection Pressure	Average Flow Rate	Volume Injected	Maximum Injection Pressure	Average Flow Rate	Volume Injected	Maximum Injection Pressure	Average Flow Rate	Volume Injected	Maximum Injection Pressure
			minutes	gpm	gallons	psi	gpm	gallons	psi	gpm	gallons	psi	gpm	gallons	psi
9/8/2022	9/8/22 7:00	9/8/22 16:15	555	1.5	811.30	18	0.7	414.16	30	1.4	801.14	18	1.4	804.46	12
9/9/2022	9/9/22 6:15	9/9/22 15:15	540	1.5	819.57	22	0.7	384.05	29	1.5	803.85	20	1.4	761.85	11
9/10/2022	9/10/22 5:07	9/10/22 15:05	598	1.5	889.46	22	0.7	425.25	30	1.4	845.09	21	1.5	881.56	12
9/11/2022	9/11/22 5:30	9/11/22 15:07	577	1.4	829.37	23	1.5	875.68	33	1.4	830.5	20	1.5	863.08	16
9/12/2022	9/12/22 5:15	9/12/22 15:15	600	1.5	879.77	23	1.6	949.02	34	1.5	911.78	23	1.5	877.44	14
9/13/2022	9/13/22 7:00	9/13/22 14:20	440	1.6	709.17	22	1.5	656.08	33	1.6	708.21	22	1.5	677.81	18
9/14/2022	9/14/22 8:40	9/14/22 10:25	105	1.3	138.99	22	1.5	155.19	32	1.5	154	20	1.5	154.77	12
9/15/2022	9/15/22 5:35	9/15/22 15:35	600	1.5	920.39	22	1.6	969.60	32	1.5	924.27	20	1.6	963.34	15
9/16/2022	9/16/22 5:30	9/16/22 17:03	693	1.0	705.23	22	1.0	679.94	32	1.0	661.91	23	0.9	657.03	14
9/17/2022	9/17/22 5:00	9/17/22 18:10	790	1.3	1,056.91	22	1.3	1062.65	33	1.4	1101.13	23	1.3	1032.55	18
9/18/2022	9/18/22 4:35	9/18/22 13:58	563	1.3	756.20	24	1.3	724.21	32	1.4	785.44	22	1.4	777.95	14
9/19/2022	9/19/22 5:02	9/19/22 15:35	633	1.3	835.25	23	1.3	792.08	32	1.4	856.11	24	1.4	894.71	19
9/20/2022	9/20/22 4:30	9/20/22 15:50	680	1.3	916.74	22	1.3	870.08	32	1.4	944.24	24	1.3	866.99	14
9/21/2022	9/21/22 4:45	9/21/22 13:33	528	1.2	651.09	23	1.3	669.04	34	1.4	735.73	23	1.3	710.66	16
9/22/2022	9/22/22 5:10	9/22/22 14:59	589	1.3	783.99	42	1.3	776.69	42	1.3	791.77	42	1.3	762.92	42
9/23/2022	9/23/22 4:56	9/23/22 14:54	598	1.4	832.90	42	1.3	777.00	42	1.3	798.61	42	1.3	785.52	42
9/24/2022	9/24/22 4:55	9/24/22 15:04	609	1.4	868.92	42	1.4	834.00	42	1.4	829.71	42	1.4	822.72	42
9/25/2022	9/25/22 4:44	9/25/22 14:49	605	1.4	841.05	40	1.4	835.29	42	1.4	848.84	42	1.4	843.95	41
9/26/2022	9/26/22 4:32	9/26/22 14:32	600	1.4	831.44	40	1.4	829.28	40	1.4	816.86	41	1.4	823.05	40
9/27/2022	9/27/22 4:32	9/27/22 14:56	624	1.4	854.14	40	1.4	848.97	40	1.3	827.28	41	1.3	828.56	40
9/28/2022	9/28/22 4:43	9/28/22 14:45	602	1.4	857.31	42	1.4	826.68	42	1.4	834.47	42	1.4	845.71	42
9/29/2022	9/29/22 5:01	9/29/22 15:15	614	1.4	867.23	42	1.4	838.12	42	1.4	840.09	42	1.4	857.01	42
9/30/2022	9/30/22 4:43	9/30/22 15:08	625	1.4	868.32	41	1.3	843.09	42	1.3	823.87	42	1.3	833.97	42
September Total				18,524.74			17,036.15			18,474.90			18,327.61		

Notes:

gpm - gallons per minute

psi - pounds per square inch

1.Injectate solution in Area 1 Deep wells consists of only Stabilized Lake Mead Water as part of the total dissolved solids (TDS)-reduction period of the treatability study.

Table 3
Summary of Groundwater Extraction Activities - September 2022
 Unit 4 Source Area Bioremediation Treatability Study

Study Area		Area 1 Deep			Area 2 Intermediate						Area 2 Deep		
Well ID		U4-E-03D			U4-E-06I			U4-E-07I			U4-E-08D		
Date/Time	Duration ¹	Average Flow Rate	Volume Extracted ¹	Cumulative Total Volume	Average Flow Rate	Volume Extracted ¹	Cumulative Total Volume	Average Flow Rate	Volume Extracted ¹	Cumulative Total Volume	Average Flow Rate	Volume Extracted ¹	Cumulative Total Volume
	minutes	gpm	gallons	gallons	gpm	gallons	gallons	gpm	gallons	gallons	gpm	gallons	gallons
9/8/22 16:42	597	0.8	481.18	481.18	---	---	---	---	---	---	---	---	---
9/9/22 5:46	784	0.7	582.80	1,063.98	---	---	---	---	---	---	---	---	---
9/10/22 4:39	1373	0.8	1,035.41	2,099.39	---	---	---	---	---	---	---	---	---
9/11/22 4:59	1460	0.7	1,072.22	3,171.61	---	---	---	---	---	---	---	---	---
9/12/22 4:36	1417	0.7	1,028.28	4,199.89	---	---	---	---	---	---	---	---	---
9/13/22 4:45	1449	0.7	1,035.44	5,235.33	---	---	---	---	---	---	---	---	---
9/14/22 5:48	1503 ⁽²⁾	0.7	1,103.55	6,338.88	1.1	1,400.14	1,400.14	0.4	489.54	489.54	0.3	426.16	426.16
9/15/22 4:58	1390	0.8	1,085.10	7,423.98	1.2	1,671.94	3,072.08	0.4	595.10	1,084.64	0.3	477.93	904.09
9/16/22 4:57	1439	0.8	1,085.61	8,509.59	1.2	1,782.87	4,854.95	0.4	588.87	1,673.51	0.3	455.82	1,359.91
9/17/22 4:40	1423	0.7	1,016.83	9,526.42	1.2	1,658.41	6,513.36	0.4	559.59	2,233.10	0.3	474.94	1,834.85
9/18/22 3:55	1395	0.7	977.85	10,504.27	1.2	1,617.30	8,130.66	0.4	542.56	2,775.66	0.3	443.32	2,278.17
9/19/22 4:16	1461	0.6	925.19	11,429.46	1.1	1,624.23	9,754.89	0.4	551.68	3,327.34	0.3	459.57	2,737.74
9/20/22 3:13	1377	0.8	1,047.68	12,477.14	1.1	1,535.25	11,290.14	0.4	569.08	3,896.42	0.4	501.57	3,239.31
9/21/22 3:15	1442	0.7	1,072.09	13,549.23	1.2	1,684.76	12,974.90	0.4	543.05	4,439.47	0.3	487.48	3,726.79
9/22/22 3:15	1440	0.8	1,170.80	14,720.03	1.2	1,760.13	14,735.03	0.4	547.47	4,986.94	0.3	499.43	4,226.22
9/23/22 3:17	1442	0.8	1,145.88	15,865.91	1.3	1,823.37	16,558.40	0.4	517.65	5,504.59	0.3	475.88	4,702.10
9/24/22 3:18	1441	0.8	1,084.31	16,950.22	1.1	1,629.51	18,187.91	0.3	495.74	6,000.33	0.3	495.50	5,197.60
9/25/22 3:27	1449	0.8	1,087.61	18,037.83	1.2	1,702.80	19,890.71	0.4	557.89	6,558.22	0.3	506.37	5,703.97
9/26/22 3:23	1436	0.8	1,094.44	19,132.27	1.3	1,817.48	21,708.19	0.4	551.85	7,110.07	0.3	478.00	6,181.97
9/27/22 3:17	1434	0.7	999.85	20,132.12	1.3	1,859.78	23,567.97	0.3	414.99	7,525.06	0.4	521.56	6,703.53
9/28/22 3:24	1447	0.7	1,042.10	21,174.22	1.3	1,864.03	25,432.00	0.4	517.77	8,042.83	0.4	553.58	7,257.11
9/29/22 3:18	1434	0.7	1,038.30	22,212.52	1.2	1,771.71	27,203.71	0.2	309.34	8,352.17	0.4	513.93	7,771.04
9/30/22 3:28	1450	0.8	1,098.55	23,311.07	1.2	1,780.96	28,984.67	0.3	488.52	8,840.69	0.4	521.64	8,292.68
10/1/22 3:26	1438	0.8	1,109.93	24,421.00	1.2	1,795.13	30,779.80	0.3	474.51	9,315.20	0.4	580.94	8,873.62
September Total				24,421.00			30,779.80			9,315.20			8,873.62

Notes:

gpm - gallons per minute

1. Extraction operations are active 24 hours per day. Volume and duration quantities represent gallons or minutes of extraction since previous record indicated.
2. Extraction operations began in Area 1 on 9/8/2022 at 6:45 AM. Extraction operations began in Area 2 on 9/13/2022 at 9:00 AM.

Table 4
Summary of Injection Activities
Area 2 - September 2022
 Unit 4 Source Area Bioremediation Treatability Study

Study Area				Area 2 Intermediate								Area 2 Deep			
Well ID				U4-E-09I				U4-E-10I				U4-E-06D			
Date	Injection Start Time	Injection Stop Time	Duration ⁽¹⁾	Volume Carbon Solution Injected ⁽²⁾	Volume Distribution Water Solution Injected ⁽³⁾	Average Flow Rate	Maximum Injection Pressure	Volume Carbon Solution Injected ⁽²⁾	Volume Distribution Water Solution Injected ⁽³⁾	Average Flow Rate	Maximum Injection Pressure	Volume Carbon Solution Injected ⁽²⁾	Volume Distribution Water Solution Injected ⁽³⁾	Average Flow Rate	Maximum Injection Pressure
			minutes	gallons	gallons	gpm	psi	gallons	gallons	gpm	psi	gallons	gallons	gpm	psi
9/13/2022	9/13/22 8:45	9/13/22 16:05	432	710.31	168.10	2.0	18	466.25	199.00	1.5	28	249.83	168.18	1.0	15
9/16/2022	9/16/22 10:57	9/16/22 16:40	292	271.70	265.20	1.8	16	284.44	216.29	1.7	14	120.03	108.01	0.8	13
9/17/2022	9/17/22 7:40	9/17/22 18:12	552	602.67	541.13	2.1	19	521.22	518.53	1.9	16	217.79	260.66	0.9	23
9/18/2022	9/18/22 4:40	9/18/22 13:56	485	466.75	448.14	1.9	18	462.90	453.49	1.9	12	168.88	186.61	0.7	12
9/19/2022	9/19/22 5:10	9/19/22 15:35	548	529.23	514.36	1.9	14	519.62	470.36	1.8	10	187.96	210.12	0.7	25
9/20/2022	9/20/22 5:00	9/20/22 15:50	565	496.08	561.05	1.9	23	441.55	522.90	1.7	10	176.35	220.52	0.7	14
9/21/2022	9/21/22 4:39	9/21/22 13:33	471	520.98	379.96	1.9	16	501.18	361.18	1.8	9	188.65	146.61	0.7	14
9/22/2022	9/22/22 5:30	9/22/22 14:59	498	549.29	402.73	1.9	29	563.23	410.37	2.0	29	167.15	105.71	0.5	32
9/23/2022	9/23/22 4:55	9/23/22 14:54	535	588.21	424.07	1.9	30	587.53	421.87	1.9	30	153.09	106.02	0.5	32
9/24/2022	9/24/22 4:56	9/24/22 15:04	559	628.92	440.72	1.9	30	634.15	447.24	1.9	30	165.36	109.40	0.5	32
9/25/2022	9/25/22 4:45	9/25/22 14:49	539	568.19	480.34	1.9	30	582.23	497.32	2.0	30	150.30	125.63	0.5	32
9/26/2022	9/26/22 4:34	9/26/22 14:32	547	592.31	452.13	1.9	30	612.33	446.36	1.9	30	149.62	127.30	0.5	32
9/27/2022	9/27/22 4:35	9/27/22 14:56	541	604.50	452.53	2.0	30	615.08	435.92	1.9	30	171.21	116.72	0.5	32
9/28/2022	9/28/22 4:42	9/28/22 14:45	555	553.83	523.29	1.9	30	547.91	531.20	1.9	29	143.70	131.50	0.5	32
9/29/2022	9/29/22 5:02	9/29/22 15:15	562	603.99	459.43	1.9	30	589.72	471.08	1.9	28	179.98	75.63	0.5	32
9/30/2022	9/30/22 4:44	9/30/22 15:08	562	578.87	490.39	1.9	29	595.80	505.81	2.0	28	160.07	130.24	0.5	30
September Total				8,865.83	7,003.57			8,525.14	6,908.92			2,749.97	2,328.86		

Notes:

gpm - gallons per minute

psi - pounds per square inch

(1) Injection duration indicates the total minutes of active injection per day, accounting for any downtime in injections that may have occurred throughout the day. Therefore, injection duration may be less than the difference in daily injection start and stop times indicated.

(2) Carbon substrate solution is batch mixed. Batches of carbon substrate solution includes the following components in solution with Stabilized Lake Mead Water (SLMW): 0.5% molasses, 0.25% filtered Fluidized Bed Reactor (FBR) sludge, 1.25% 0.5 Molar Sodium Bicarbonate Solution, 0.001% trace mineral solution, and 5 milligrams per liter Vitamin B12.

(3) Distribution water solution is batch mixed. Batches of distribution water solution includes 0.0025 pounds of Vitamin C per gallon of Stabilized Lake Mead Water (SLMW).

**Table 4
Summary of Injection Activities
Area 2 - September 2022
Unit 4 Source Area Bioremediation Treatability Study**

Study Area				Area 2 Deep											
Well ID				U4-E-07D				U4-E-09D				U4-E-010D			
Date	Injection Start Time	Injection Stop Time	Duration ⁽¹⁾	Volume Carbon Solution Injected ⁽²⁾	Volume Distribution Water Solution Injected ⁽³⁾	Average Flow Rate	Maximum Injection Pressure	Volume Carbon Solution Injected ⁽²⁾	Volume Distribution Water Solution Injected ⁽³⁾	Average Flow Rate	Maximum Injection Pressure	Volume Carbon Solution Injected ⁽²⁾	Volume Distribution Water Solution Injected ⁽³⁾	Average Flow Rate	Maximum Injection Pressure
			minutes	gallons	gallons	gpm	psi	gallons	gallons	gpm	psi	gallons	gallons	gpm	psi
9/13/2022	9/13/22 8:45	9/13/22 16:05	432	268.28	130.10	0.9	10	225.51	88.79	0.7	20	160.15	116.34	0.6	13
9/16/2022	9/16/22 10:57	9/16/22 16:40	292	91.86	94.80	0.6	7	82.76	133.62	0.7	21	80.53	111.36	0.7	10
9/17/2022	9/17/22 7:40	9/17/22 18:12	552	220.20	237.21	0.8	10	170.80	177.78	0.6	16	182.47	192.05	0.7	11
9/18/2022	9/18/22 4:40	9/18/22 13:56	485	219.78	186.63	0.8	12	224.33	209.07	0.9	20	210.27	245.96	0.9	22
9/19/2022	9/19/22 5:10	9/19/22 15:35	548	167.86	193.42	0.7	8	161.37	265.33	0.8	20	230.16	179.11	0.7	15
9/20/2022	9/20/22 5:00	9/20/22 15:50	565	183.62	199.74	0.7	9	242.08	160.95	0.7	21	161.65	178.08	0.6	14
9/21/2022	9/21/22 4:39	9/21/22 13:33	471	234.17	120.90	0.8	11	164.56	145.83	0.7	13	192.93	157.44	0.7	17
9/22/2022	9/22/22 5:30	9/22/22 14:59	498	162.68	104.39	0.5	30	157.93	108.26	0.5	31	190.03	113.30	0.6	30
9/23/2022	9/23/22 4:55	9/23/22 14:54	535	165.53	106.94	0.5	30	164.05	110.75	0.5	31	162.26	112.54	0.5	31
9/24/2022	9/24/22 4:56	9/24/22 15:04	559	162.02	110.59	0.5	30	167.22	113.69	0.5	30	163.66	122.27	0.5	30
9/25/2022	9/25/22 4:45	9/25/22 14:49	539	147.18	121.50	0.5	30	153.94	126.39	0.5	32	151.85	137.33	0.5	31
9/26/2022	9/26/22 4:34	9/26/22 14:32	547	152.36	115.56	0.5	30	123.62	154.91	0.5	32	151.04	120.51	0.5	38
9/27/2022	9/27/22 4:35	9/27/22 14:56	541	158.79	117.30	0.5	30	176.09	123.19	0.6	32	169.53	128.71	0.6	31
9/28/2022	9/28/22 4:42	9/28/22 14:45	555	151.30	130.89	0.5	30	146.77	156.52	0.5	31	164.20	142.34	0.6	30
9/29/2022	9/29/22 5:02	9/29/22 15:15	562	157.95	127.36	0.5	30	168.09	128.17	0.5	31	165.43	132.60	0.5	31
9/30/2022	9/30/22 4:44	9/30/22 15:08	562	153.18	130.06	0.5	30	164.83	136.08	0.5	30	160.78	137.21	0.5	30
September Total				2,796.76	2,227.39			2,693.95	2,339.33			2,696.94	2,327.15		

Notes:

gpm - gallons per minute

psi - pounds per square inch

(1) Injection duration indicates the total minutes of active injection per day, accounting for any downtime in injections that may have occurred throughout the day. Therefore, injection duration may be less than the difference in daily injection start and stop times indicated.

(2) Carbon substrate solution is batch mixed. Batches of carbon substrate solution includes the following components in solution with Stabilized Lake Mead Water (SLMW): 0.5% molasses, 0.25% filtered Fluidized Bed Reactor (FBR) sludge, 1.25% 0.5 Molar Sodium Bicarbonate Solution, 0.001% trace mineral solution, and 5 milligrams per liter Vitamin B12.

(3) Distribution water solution is batch mixed. Batches of distribution water solution includes 0.0025 pounds of Vitamin C per gallon of Stabilized Lake Mead Water (SLMW).