

TECHNICAL MEMORANDUM

To: Nevada Environmental Response Trust

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

From: Dan Pastor and Dana Grady

Date: August 29, 2018

Subject: Seep Well Field Area 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 which summarizes Tetra Tech's progress during July 2018 toward successfully implementing the Seep Well Field (SWF) Area Bioremediation Treatability Study.

Task Progress Update: July 2018

Task M11 – Seep Well Field Area Bioremediation Treatability Study (SWFTS)

- Task Leader – Dana Grady/Dan Pastor
- Current Status
 - As briefly summarized in the June 2018 monthly progress report, the third injection event began on June 11, 2018 and was completed on June 30, 2018. For reference, the attached Figure 1 presents the injection and monitoring well locations. A summary table of injection quantities and rates is provided in Table 1.
 - Monthly groundwater sampling was performed the week of July 9 – 13, 2018. A limited groundwater sampling event consisting of perchlorate, chlorate, and nitrate was performed on July 26 – 27, 2018 to monitor for key perchlorate reductions and capture immediate and critical geochemical response, particularly in monitoring wells immediately downgradient, similar to those observed in the weekly groundwater sampling following the first injection event. Results and preliminary analyses of groundwater sampling will be provided in upcoming monthly progress reports as data become available. Additional monthly sampling will be performed in August, September, and October 2018.
- Schedule and Progress Updates
 - This task remains on schedule.
 - The next groundwater sampling event is scheduled for the week of August 13 – August 17, 2018.
- Health and Safety
 - There were no safety incidents related to Task M11 during July 2018.

CERTIFICATION

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

*not individually, but solely
as Pres. of NERT*

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: 8/29/18

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 Seep Well Field Area Bioremediation Treatability Study Monthly Progress Report.



August 29, 2018

Kyle Hansen, CEM
Field Operations Manager/Geologist
Tetra Tech, Inc.

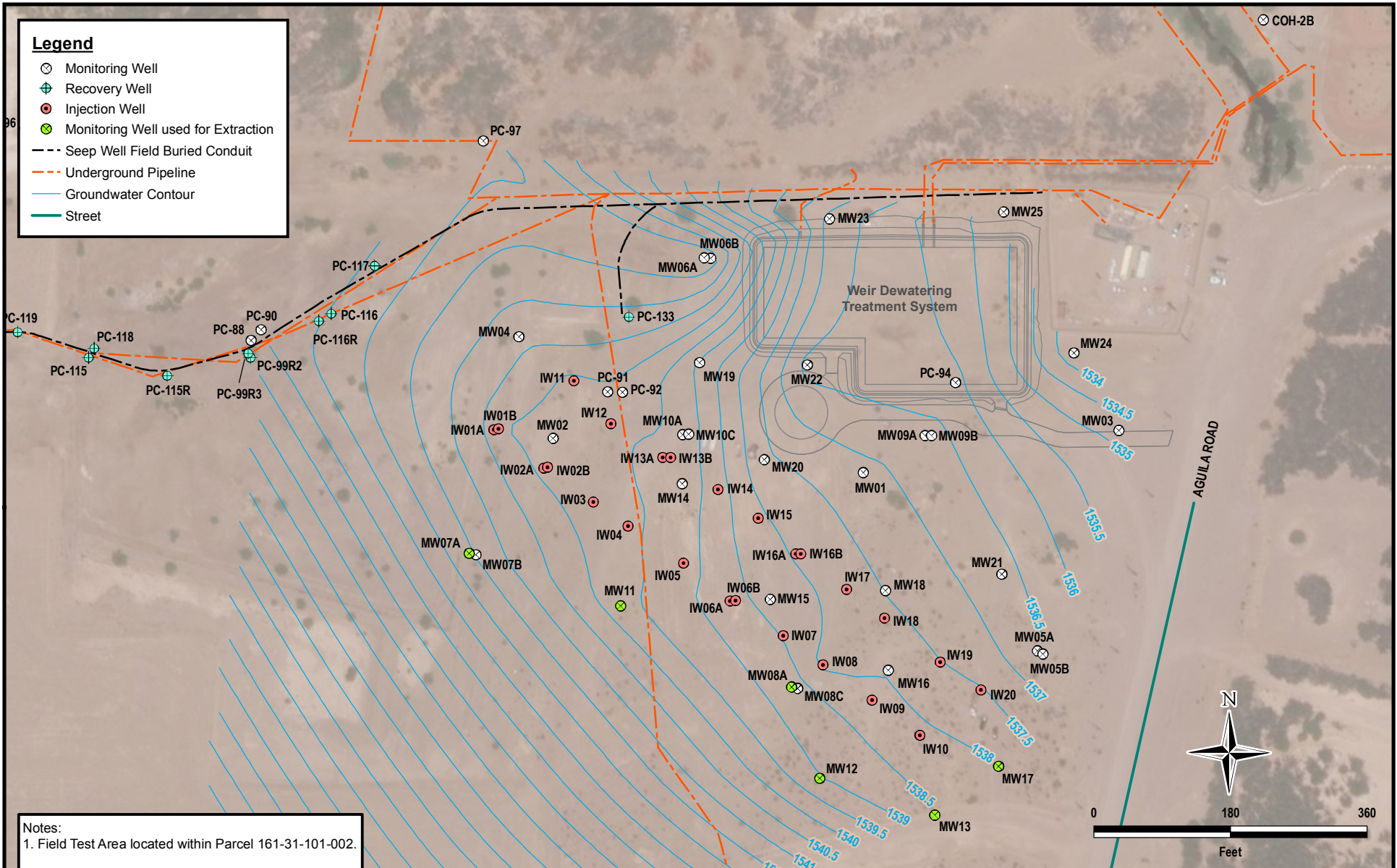
Date

Nevada CEM Certificate Number: 2167
Nevada CEM Expiration Date: September 18, 2020

Figures

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Tables

**Table 1
Summary of Injection Activities - June 2018
Seep Well Field Area Bioremediation Treatability Study**

Injection Date and Time ¹	Injection Well ID	Average Flow Rate (gpm)	Maximum Pressure (psi)	Injectate Solution						Volume of Distribution Water Injected (gal)
				Volume of EOS (gal)	Volume of Aquapure 3601 NSF (gal)	Volume of Glycerin (gal)	Mass of Sodium Sulfite (lbs)	Volume of Water Injected as Part of Injectate Solution (gal)	Total Volume of Injectate (gal)	
06/12/2018 11:44 - 14:55	SWFTS-IW02A	3.4	20	131	2	4	3	523	659	0
	SWFTS-IW02B	2.5	25	95	1	3	2	382	481	0
	SWFTS-IW04	5.5	10	208	2	6	5	834	1051	0
	SWFTS-IW07	4.2	10	159	2	5	4	637	803	0
	SWFTS-IW08	5.3	15	204	2	6	5	817	1030	0
	SWFTS-IW13A	3.9	10	149	2	5	4	598	753	0
	SWFTS-IW14	5.0	20	191	2	6	5	762	961	0
	SWFTS-IW16A	4.4	20	169	2	5	4	677	853	0
	SWFTS-IW17	3.5	10	134	2	4	3	535	675	0
	SWFTS-IW18	3.4	15	130	2	4	3	520	655	0
SWFTS-IW20	3.6	20	137	2	4	3	546	689	0	
Daily Summary				1708	20	52	41	6830	8609	0
06/13/2018 5:05 - 14:55	SWFTS-IW01A	6.0	10	334	4	7	6	1337	1671	0
	SWFTS-IW01B	5.9	10	318	3	7	5	1271	1589	0
	SWFTS-IW02A	4.6	20	269	1	3	2	1077	1346	0
	SWFTS-IW02B	5.0	20	305	2	4	3	1218	1523	0
	SWFTS-IW04	4.8	10	392	3	7	5	1566	1958	0
	SWFTS-IW07	5.3	15	628	5	14	11	2514	3142	0
	SWFTS-IW08	6.1	15	596	5	13	10	2383	2979	0
	SWFTS-IW11	4.1	20	127	2	4	3	506	633	0
	SWFTS-IW13A	4.0	15	251	2	6	4	1002	1253	0
	SWFTS-IW13B	2.5	15	126	2	4	3	504	630	0
	SWFTS-IW14	4.6	20	538	5	13	12	2152	2690	0
	SWFTS-IW16A	5.1	15	231	1	2	4	923	1154	0
	SWFTS-IW16B	5.0	10	350	3	8	5	1399	1749	0
	SWFTS-IW17	5.4	15	638	5	15	12	2554	3192	0
SWFTS-IW18	4.5	15	531	6	16	12	2123	2654	0	
SWFTS-IW19	4.9	10	88	1	3	2	350	438	0	
SWFTS-IW20	4.4	20	519	6	15	11	2078	2597	0	
Daily Summary				6240	57	143	115	24958	31198	0
06/14/2018 05:15 - 14:55	SWFTS-IW01A	4.1	10	66	0	0	0	263	329	0
	SWFTS-IW01B	4.7	10	82	0	0	0	329	411	0
	SWFTS-IW03	3.1	10	353	4	11	8	1414	1767	0
	SWFTS-IW05	5.2	10	518	6	16	12	2073	2591	0
	SWFTS-IW06A	6.4	15	400	3	7	5	1600	2000	0
	SWFTS-IW06B	5.5	10	200	1	1	1	800	1000	0
	SWFTS-IW07	5.2	15	12	0	0	0	50	62	0
	SWFTS-IW09	4.0	15	428	5	13	10	1713	2141	0
	SWFTS-IW10	4.6	20	466	6	14	11	1864	2330	0
	SWFTS-IW11	3.5	15	411	5	12	6	1642	2053	0
	SWFTS-IW12	4.1	20	394	5	12	13	1576	1970	0
	SWFTS-IW13B	2.8	30	320	3	7	5	1282	1602	0
	SWFTS-IW14	3.4	15	71	0	0	0	286	357	0
	SWFTS-IW15	5.0	20	516	6	16	12	2062	2578	0
	SWFTS-IW16B	4.6	10	50	0	0	0	201	251	0
	SWFTS-IW17	6.3	20	28	0	0	0	111	139	0
SWFTS-IW18	4.1	10	339	1	5	4	1357	1696	0	
SWFTS-IW19	4.7	10	547	6	17	13	2188	2735	0	
SWFTS-IW20	5.0	15	144	0	0	0	576	720	0	
Daily Summary				5346	51	131	103	21386	26732	0

**Table 1
Summary of Injection Activities - June 2018
Seep Well Field Area Bioremediation Treatability Study**

Injection Date and Time ¹	Injection Well ID	Average Flow Rate (gpm)	Maximum Pressure (psi)	Injectate Solution						Volume of Distribution Water Injected (gal)
				Volume of EOS (gal)	Volume of Aquapure 3601 NSF (gal)	Volume of Glycerin (gal)	Mass of Sodium Sulfite (lbs)	Volume of Water Injected as Part of Injectate Solution (gal)	Total Volume of Injectate (gal)	
06/15/2018 05:15 - 14:55	SWFTS-IW03	5.6	15	447	3	8	6	1786	2233	476
	SWFTS-IW05	3.1	10	282	1	3	3	1127	1409	0
	SWFTS-IW07	5.4	10	0	0	0	0	0	0	516
	SWFTS-IW09	4.1	25	372	2	6	5	1487	1859	0
	SWFTS-IW09	4.8	25	0	0	0	0	0	0	462
	SWFTS-IW10	3.1	25	334	2	5	4	1336	1670	0
	SWFTS-IW10	3.1	20	0	0	0	0	0	0	538
	SWFTS-IW11	3.0	10	263	1	3	6	1051	1314	0
	SWFTS-IW11	6.3	10	0	0	0	0	0	0	597
	SWFTS-IW12	7.8	15	706	6	16	13	2824	3530	0
	SWFTS-IW12	6.8	15	0	0	0	0	0	0	649
	SWFTS-IW13A	3.1	10	100	0	0	0	400	500	0
	SWFTS-IW13B	2.6	30	54	0	0	0	214	268	0
	SWFTS-IW13B	1.4	25	0	0	0	0	0	0	132
	SWFTS-IW14	4.4	15	0	0	0	0	0	0	421
	SWFTS-IW15	5.3	15	484	4	10	7	1938	2422	496
	SWFTS-IW18	5.8	10	0	0	0	0	0	0	552
SWFTS-IW19	4.1	10	365	1	6	5	1462	1827	0	
SWFTS-IW19	5.8	10	0	0	0	0	0	0	548	
Daily Summary				3406	21	59	52	13626	17032	5,387
06/16/2018 05:05 - 14:55	SWFTS-IW03	5.9	10	0	0	0	0	0	0	3,097
	SWFTS-IW07	6.0	10	0	0	0	0	0	0	3,514
	SWFTS-IW09	3.3	25	0	0	0	0	0	0	1,953
	SWFTS-IW10	5.5	20	0	0	0	0	0	0	3,251
	SWFTS-IW11	5.9	10	0	0	0	0	0	0	3,468
	SWFTS-IW12	5.6	15	0	0	0	0	0	0	3,324
	SWFTS-IW13B	2.1	35	0	0	0	0	0	0	1,213
	SWFTS-IW14	5.0	15	0	0	0	0	0	0	2,967
	SWFTS-IW15	5.4	15	0	0	0	0	0	0	3,206
	SWFTS-IW18	6.7	10	0	0	0	0	0	0	3,982
SWFTS-IW19	6.2	10	0	0	0	0	0	0	3,653	
Daily Summary				0	0	0	0	0	0	33,628
06/17/2018 05:05 - 14:50	SWFTS-IW03	4.6	10	0	0	0	0	0	0	2,561
	SWFTS-IW07	5.0	15	0	0	0	0	0	0	2,969
	SWFTS-IW09	2.5	25	0	0	0	0	0	0	1,459
	SWFTS-IW10	5.6	20	0	0	0	0	0	0	3,293
	SWFTS-IW11	5.4	10	0	0	0	0	0	0	3,173
	SWFTS-IW12	7.1	28	0	0	0	0	0	0	4,184
	SWFTS-IW13B	2.1	35	0	0	0	0	0	0	1,216
	SWFTS-IW14	4.6	15	0	0	0	0	0	0	2,705
	SWFTS-IW15	6.7	15	0	0	0	0	0	0	3,947
	SWFTS-IW18	6.3	10	0	0	0	0	0	0	3,684
SWFTS-IW19	6.5	10	0	0	0	0	0	0	3,802	
Daily Summary				0	0	0	0	0	0	32,993

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				Volume of EOS (gal)	Volume of Aquapure 3601 NSF (gal)	Volume of Glycerin (gal)	Mass of Sodium Sulfite (lbs)	Volume of Water Injected as Part of Injectate Solution (gal)	Total Volume of Injectate (gal)	
06/18/2018 05:05 - 14:55	SWFTS-IW03	4.4	10	0	0	0	0	0	0	2,459
	SWFTS-IW07	5.0	15	0	0	0	0	0	0	3,008
	SWFTS-IW09	3.8	30	0	0	0	0	0	0	2,230
	SWFTS-IW10	6.1	20	0	0	0	0	0	0	3,574
	SWFTS-IW11	5.2	10	0	0	0	0	0	0	3,048
	SWFTS-IW12	6.7	25	0	0	0	0	0	0	3,960
	SWFTS-IW13B	2.1	35	0	0	0	0	0	0	1,244
	SWFTS-IW14	4.1	15	0	0	0	0	0	0	2,435
	SWFTS-IW15	6.6	15	0	0	0	0	0	0	3,901
	SWFTS-IW18	5.9	10	0	0	0	0	0	0	3,469
SWFTS-IW19	6.7	10	0	0	0	0	0	0	3,945	
Daily Summary				0	0	0	0	0	0	33,273
06/19/2018 05:05 - 14:55	SWFTS-IW03	4.4	10	0	0	0	0	0	0	2,413
	SWFTS-IW07	5.5	15	0	0	0	0	0	0	3,246
	SWFTS-IW09	4.1	30	0	0	0	0	0	0	2,422
	SWFTS-IW10	5.5	20	0	0	0	0	0	0	3,232
	SWFTS-IW11	2.9	10	0	0	0	0	0	0	1,709
	SWFTS-IW12	5.8	25	0	0	0	0	0	0	3,408
	SWFTS-IW13A	3.1	10	0	0	0	0	0	0	2,298
	SWFTS-IW14	3.8	15	0	0	0	0	0	0	2,224
	SWFTS-IW15	6.6	15	0	0	0	0	0	0	3,913
	SWFTS-IW18	5.6	10	0	0	0	0	0	0	3,290
SWFTS-IW19	6.8	10	0	0	0	0	0	0	3,991	
Daily Summary				0	0	0	0	0	0	32,146
06/20/2018 05:00 - 13:55	SWFTS-IW03	5.6	10	0	0	0	0	0	0	3,032
	SWFTS-IW07	5.5	15	0	0	0	0	0	0	3,246
	SWFTS-IW09	5.2	30	0	0	0	0	0	0	3,068
	SWFTS-IW10	6.1	20	0	0	0	0	0	0	3,612
	SWFTS-IW11	4.0	10	0	0	0	0	0	0	2,333
	SWFTS-IW12	5.0	25	0	0	0	0	0	0	2,925
	SWFTS-IW13A	3.3	10	0	0	0	0	0	0	2,413
	SWFTS-IW14	4.2	15	0	0	0	0	0	0	2,453
	SWFTS-IW15	5.3	15	0	0	0	0	0	0	1,037
	SWFTS-IW16B	5.3	10	0	0	0	0	0	0	1,808
	SWFTS-IW17	4.1	20	0	0	0	0	0	0	1,016
	SWFTS-IW18	5.5	10	0	0	0	0	0	0	1,523
SWFTS-IW19	6.6	10	0	0	0	0	0	0	561	
SWFTS-IW20	5.5	20	0	0	0	0	0	0	2,528	
Daily Summary				0	0	0	0	0	0	31,555
06/25/2018 05:25 - 14:55	SWFTS-IW03	5.1	10	0	0	0	0	0	0	3,032
	SWFTS-IW06A	4.1	10	0	0	0	0	0	0	1,139
	SWFTS-IW07	1.7	15	0	0	0	0	0	0	1,001
	SWFTS-IW08	5.5	15	0	0	0	0	0	0	1,720
	SWFTS-IW09	3.3	30	0	0	0	0	0	0	1,956
	SWFTS-IW11	4.0	10	0	0	0	0	0	0	2,333
	SWFTS-IW12	5.0	25	0	0	0	0	0	0	2,925
	SWFTS-IW13A	4.1	10	0	0	0	0	0	0	2,794
	SWFTS-IW14	4.2	15	0	0	0	0	0	0	2,452
	SWFTS-IW16B	5.1	10	0	0	0	0	0	0	2,929
	SWFTS-IW17	5.9	25	0	0	0	0	0	0	3,345
SWFTS-IW20	4.7	25	0	0	0	0	0	0	2,653	
Daily Summary				0	0	0	0	0	0	28,279

Table 1
Summary of Injection Activities - June 2018
Seep Well Field Area Bioremediation Treatability Study

Injection Date and Time ¹	Injection Well ID	Average Flow Rate (gpm)	Maximum Pressure (psi)	Injectate Solution						Volume of Distribution Water Injected (gal)
				Volume of EOS (gal)	Volume of Aquapure 3601 NSF (gal)	Volume of Glycerin (gal)	Mass of Sodium Sulfite (lbs)	Volume of Water Injected as Part of Injectate Solution (gal)	Total Volume of Injectate (gal)	
06/26/2018 05:05 - 14:55	SWFTS-IW01B	5.1	10	0	0	0	0	0	0	2,864
	SWFTS-IW02B	6.3	0	0	0	0	0	0	0	2,346
	SWFTS-IW03	5.1	10	0	0	0	0	0	0	430
	SWFTS-IW04	5.9	10	0	0	0	0	0	0	2,956
	SWFTS-IW05	7.0	10	0	0	0	0	0	0	3,078
	SWFTS-IW06A	5.2	10	0	0	0	0	0	0	3,049
	SWFTS-IW08	3.9	20	0	0	0	0	0	0	2,286
	SWFTS-IW09	3.4	30	0	0	0	0	0	0	995
	SWFTS-IW11	3.6	10	0	0	0	0	0	0	839
	SWFTS-IW13A	4.1	10	0	0	0	0	0	0	745
	SWFTS-IW13B	3.2	35	0	0	0	0	0	0	1,870
	SWFTS-IW14	4.4	15	0	0	0	0	0	0	1,843
	SWFTS-IW16B	5.9	10	0	0	0	0	0	0	3,486
SWFTS-IW17	5.9	25	0	0	0	0	0	0	3,491	
SWFTS-IW20	4.1	30	0	0	0	0	0	0	2,411	
Daily Summary				0	0	0	0	0	0	32,689
06/27/2018 05:05 - 14:55	SWFTS-IW01A	4.2	10	0	0	0	0	0	0	856
	SWFTS-IW01B	4.9	10	0	0	0	0	0	0	2,904
	SWFTS-IW02A	3.3	10	0	0	0	0	0	0	766
	SWFTS-IW02B	5.4	0	0	0	0	0	0	0	3,157
	SWFTS-IW04	4.8	10	0	0	0	0	0	0	2,818
	SWFTS-IW05	6.9	10	0	0	0	0	0	0	3,636
	SWFTS-IW06A	4.9	10	0	0	0	0	0	0	2,862
	SWFTS-IW08	6.7	20	0	0	0	0	0	0	3,973
	SWFTS-IW13B	2.2	35	0	0	0	0	0	0	642
	SWFTS-IW16A	4.0	15	0	0	0	0	0	0	1,938
	SWFTS-IW16B	3.3	10	0	0	0	0	0	0	527
	SWFTS-IW17	5.7	25	0	0	0	0	0	0	3,357
	SWFTS-IW20	4.9	30	0	0	0	0	0	0	2,885
Daily Summary				0	0	0	0	0	0	30,321
06/28/2018 05:00 - 14:55	SWFTS-IW01A	6.2	10	0	0	0	0	0	0	3,671
	SWFTS-IW01B	3.3	10	0	0	0	0	0	0	1,983
	SWFTS-IW02A	5.9	10	0	0	0	0	0	0	3,498
	SWFTS-IW02B	3.0	0	0	0	0	0	0	0	1,772
	SWFTS-IW04	5.4	10	0	0	0	0	0	0	3,226
	SWFTS-IW05	9.3	10	0	0	0	0	0	0	5,213
	SWFTS-IW06A	5.7	10	0	0	0	0	0	0	1,700
	SWFTS-IW06B	7.1	10	0	0	0	0	0	0	2,068
	SWFTS-IW08	7.8	20	0	0	0	0	0	0	4,636
	SWFTS-IW16A	5.7	15	0	0	0	0	0	0	3,401
	SWFTS-IW17	6.7	25	0	0	0	0	0	0	3,954
SWFTS-IW20	5.5	30	0	0	0	0	0	0	3,242	
Daily Summary				0	0	0	0	0	0	38,364
06/29/2018 04:30 - 14:55	SWFTS-IW01A	7.1	15	0	0	0	0	0	0	4,200
	SWFTS-IW01B	2.1	20	0	0	0	0	0	0	999
	SWFTS-IW02A	7.2	15	0	0	0	0	0	0	4,268
	SWFTS-IW02B	2.7	0	0	0	0	0	0	0	1,475
	SWFTS-IW04	6.9	20	0	0	0	0	0	0	4,101
	SWFTS-IW05	9.1	10	0	0	0	0	0	0	5,036
	SWFTS-IW06B	3.6	15	0	0	0	0	0	0	2,153
	SWFTS-IW08	8.0	20	0	0	0	0	0	0	4,754
	SWFTS-IW16A	5.1	15	0	0	0	0	0	0	3,008
	SWFTS-IW17	5.6	25	0	0	0	0	0	0	2,337
SWFTS-IW20	5.7	30	0	0	0	0	0	0	3,357	
Daily Summary				0	0	0	0	0	0	35,688

**Table 1
Summary of Injection Activities - June 2018
Seep Well Field Area Bioremediation Treatability Study**

Injection Date and Time ¹	Injection Well ID	Average Flow Rate (gpm)	Maximum Pressure (psi)	Injectate Solution						Volume of Distribution Water Injected (gal)
				Volume of EOS (gal)	Volume of Aquapure 3601 NSF (gal)	Volume of Glycerin (gal)	Mass of Sodium Sulfite (lbs)	Volume of Water Injected as Part of Injectate Solution (gal)	Total Volume of Injectate (gal)	
06/30/2018 04:30 - 14:55	SWFTS-IW01A	2.3	15	0	0	0	0	0	0	23
	SWFTS-IW02A	5.1	15	0	0	0	0	0	0	218
	SWFTS-IW04	4.8	10	0	0	0	0	0	0	24
	SWFTS-IW05	9.0	10	0	0	0	0	0	0	537
	SWFTS-IW06B	5.1	15	0	0	0	0	0	0	154
	SWFTS-IW08	8.7	20	0	0	0	0	0	0	131
	SWFTS-IW16A	5.0	15	0	0	0	0	0	0	403
	SWFTS-IW20	4.7	30	0	0	0	0	0	0	424
Daily Summary				0	0	0	0	0	0	1,914
Injection Event Summary				16701	149	385	310	66800	83572	336,237

Notes:

gpm gallons per minute
 psi pounds per square inch
 EOS emulsified vegetable oil substrate
 gal gallons
 lbs pounds

%wt percent by weight
 g/L grams per liter
¹ Not all injection wells indicated were operated during the entire time interval specified.
² Aquapure 3601 NSF is a mixture of phosphates, sodium hydroxide, and other trace amendments used as nutrients for biological activities.□