

TECHNICAL MEMORANDUM

To: Nevada Environmental Response Trust

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

From: Dana Grady

Date: October 25, 2022

Subject: Las Vegas Wash ZVI-Enhanced 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 Las Vegas Wash Zero-Valent Iron (ZVI)-Enhanced Bioremediation Treatability Study.

Task Progress Update: September 2022

Task M18 – Las Vegas Wash ZVI-Enhanced Bioremediation Treatability Study

- Current Status
 - An application for an Underground Injection Control (UIC) General Permit for Groundwater Remediation (Long-Term) was submitted to BWPC on July 28, 2022 and subsequently approved by BWPC on September 9, 2022.
 - The Nevada Division of Water Resources provided concurrence via email on September 8, 2022 that a Water Appropriations Permit application was not required for implementation of the ZVI Treatability Study based on the one-time non-consumptive use of the extracted groundwater.
 - The first phase of pre-construction field activities, which included the installation and development of nine pre-construction pilot wells, began on August 17, 2022 and was completed on August 31, 2022. A layout map and construction details for the pilot wells are provided on Figure 1 and in Table 1. Soil analytical results from drilling activities are summarized in Table 2.
 - Groundwater sampling of newly installed wells was performed on August 31 – September 1, 2022. Table 3 presents a summary of the groundwater analytical results. Perchlorate results ranged from 2.84 to 8.26 milligrams per liter (mg/L), while chlorate results ranged from 7.32 to 100 mg/L. Concentrations were generally consistent with historical results from monitoring wells located within the proposed test areas.
 - Slug testing of newly installed wells performed from September 6 – 9, 2022. The estimated hydraulic conductivities at the pre-construction monitoring wells screened in the alluvium ranged from 2.1 to 38.7 feet per day (ft/day). The estimated hydraulic conductivities at the pre-

- construction monitoring wells screened in the UMCf ranged from 0.04 to 2.9 ft/day. These results are consistent with Phase 1 results for the treatability study area.
- A preliminary summary of the information collected from the newly installed pre-construction pilot wells and path forward for the second phase of pre-construction well installation was presented to the Nevada Division of Environmental Protection (NDEP) on September 16, 2022. NDEP provided concurrence to move forward with the installation of the second phase of pre-construction pilot wells in accordance with the NDEP-approved Work Plan Addendum.
 - The second phase of pre-construction field activities, which included the installation and development of 16 additional pre-construction pilot wells to confirm final alignment, configuration, and terminal depths of the Test 1a/1b and Test 2a/2b/2c ZVI installations, began on September 21, 2022 and is ongoing. Approximate locations of these 16 additional pre-construction pilot wells are shown on Figure 1. Well construction details will be provided in the October monthly progress report once final survey data has been received.
- Schedule and Progress Updates
 - Groundwater sampling of all newly installed monitoring wells and select existing monitoring wells is scheduled to be performed the week of October 17 – 21, 2022.
 - Aquifer testing, including both borehole dilution and slug testing, of newly installed wells will begin on October 24, 2022 and is tentatively scheduled to be completed by November 4, 2022.
 - The grading permit application package will be submitted to City of Henderson in late October 2022.
 - Health and Safety
 - There were no health and safety incidents related to Task M18 during September 2022.

CERTIFICATION

Las Vegas Wash ZVI-Enhanced 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 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 Las Vegas Wash ZVI-Enhanced 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



DOCUMENT PATH: C:\USERS\DIANA_SIN\DEVELOPMENT\PROJECTS\117-7502022\FIGURE 1_10172022.MXD

Legend

- Existing Monitoring Well Location
- ⊙ Pre-Construction Monitoring Wells

Notes:
 1. Imagery Source: Esri World Map, October 2019.



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NEVADA ENVIRONMENTAL RESPONSE TRUST
 LAS VEGAS WASH ZVI-ENHANCED BIOREMEDIATION TREATABILITY STUDY
 MONTHLY PROGRESS REPORT
 HENDERSON, NEVADA
PRE-CONSTRUCTION MONITORING WELLS

PROJECT NO.:	117-7502022
DATE:	OCTOBER 17, 2022
DESIGNED BY:	AAM
Figure No.	1

Tables

Table 1
Phase 2 Pre-Construction Well Construction Details
 Las Vegas Wash ZVI-Enhanced Bioremediation Treatability Study

Well ID	Screened Lithology	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Depth to Water ¹	Groundwater Elevation	Casing Material	Slot Size	Filter Pack Gradation	Nominal Borehole Diameter	Borehole Total Depth	Well Diameter	Nominal Screen Length	Well Total Depth	Bottom of Screen	Top of Screen
				feet amsl	feet amsl	ft bTOC	amsl		inches		inches	feet bgs	inches	feet	feet bgs	feet bgs	feet bgs
ZTS-MW116	UMCf	26732461.29	833014.94	1548.45	1547.92	16.63	1531.29	Schedule 40 PVC	0.010	#2/16	6	55	2	15	48.5	48	33
ZTS-MW117	UMCf	26732546.84	832964.21	1547.64	1547.32	16.31	1531.01	Schedule 40 PVC	0.010	#2/16	8	75	4	15	56	55.5	40.5
ZTS-MW118	Alluvium	26732588.00	832939.61	1547.64	1547.41	16.66	1530.75	Schedule 40 PVC	0.020	#2/16	8	40	4	10	24	23.5	13.5
ZTS-MW119	Alluvium	26732634.25	832912.06	1547.46	1547.12	16.70	1530.42	Schedule 40 PVC	0.020	#3	8	37.5	4	10	25.5	25	15
ZTS-MW124	Alluvium	26732935.79	833025.72	1544.78	1544.44	16.20	1528.24	Schedule 40 PVC	0.020	#3	8	40	4	10	34.5	34	24
ZTS-MW125	UMCf	26732907.80	833037.00	1546.94	1546.51	18.48	1528.03	Schedule 40 PVC	0.010	#2/16	8	75	4	10	50.5	50	40
ZTS-MW126	Alluvium	26732842.82	833063.07	1548.61	1548.47	20.32	1528.15	Schedule 40 PVC	0.020	#3	8	40	4	10	30.5	30	20
ZTS-MW127	Alluvium	26732787.83	833086.14	1548.05	1547.67	19.41	1528.26	Schedule 40 PVC	0.020	#3	8	40	4	5	23.5	23	18
ZTS-MW128	UMCf	26732659.68	833137.95	1555.83	1555.41	27.90	1527.51	Schedule 40 PVC	0.010	#2/16	6	75	2	10	52.5	52	42

Notes

amsl - above mean sea level

bgs - below ground surface

bTOC - below top of casing

PVC - polyvinyl chloride

UMCf - Upper Muddy Creek formation

1. Depth to water collected on September 6, 2022.

DRAFT

Table 2
Pre-Construction Soil Sampling Results
Las Vegas Wash ZVI-Enhanced Bioremediation Treatability Study

Well	Sample Date	QC Type	Event	Sampled Lithology	Sample Depth	E314.0	E300.1	SW6010B	Walkley-Black	SM2540 G
						Perchlorate	Chlorate	Chromium	Total Organic Carbon	Total Solids
					ft bgs	mg/kg	mg/kg	mg/kg	mg/kg	%
ZTS-MW-117-SO-17.7	08/25/2022	N	BL01	Alluvium	17.5-18	0.693	10.8	4.98	<100	88.9
ZTS-MW-117-SO-22	08/25/2022	N	BL01	UMCf	22-22.5	2.39	34.5	8.13	<200	51.2
ZTS-MW-125-SO-29.5	08/26/2022	N	BL01	Alluvium	29.5-30	1.36	12.4	8.15	<500	69.6
ZTS-MW-125-SO-39	08/26/2022	N	BL01	UMCf	39-39.5	0.845	7.14	10.6	<100	50.5
ZTS-MW-127-SO-22	08/25/2022	N	BL01	Alluvium	22-22.5	1.54	19.8	9.93	<100	74.9
ZTS-MW-127-SO-22-FD	08/25/2022	FD	BL01	Alluvium	22-22.5	1.22	16.2	9	<100	77.3

Notes:

bgs - below ground surface

mg/kg - milligram per kilogram

N - normal field sample

UMCf - Upper Muddy Creek formation

< - The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.

FD - field duplicate

Table 3
Pre-Construction Groundwater Sampling Results
 Las Vegas Wash ZVI-Enhanced Bioremediation Treatability Study

Well	Sample Date	QC Type	Event	Screened Lithology	Screened Interval	E314.0	E300.1	E300.0	E300.0	SM2540 C	Dissolved Metals by SW6020					Field Tests			
						Perchlorate	Chlorate	Nitrate (as N)	Sulfate	Total Dissolved Solids	Arsenic	Calcium	Chromium	Iron	Manganese	Specific Conductivity	Dissolved Oxygen	Oxidation-Reduction Potential	pH
						ft bgs	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mS/cm	mg/L	mV
ZTS-MW-116-BL01	09/01/2022	N	BL01	UMCf	33 - 48	3.51	12.6	6.71	2,660	3,360	0.0337	436	0.0216	<0.100	0.132	6.685	0.36	-0.2	7.34
ZTS-MW-117-BL01	09/01/2022	N	BL01	UMCf	40.5 - 55.5	2.84	7.32	3.36	1,460	2,730	0.0779	229	0.0108	<0.100	0.122	5.788	2.29	88.4	7.3
ZTS-MW-118-BL01	09/01/2022	N	BL01	Alluvium	13.5 - 23.5	7.16	89.9	19.4	2,640	8,540	0.0361	687	0.0487	<0.100	0.0712	7.639	3.07	105.5	7.06
ZTS-MW-119-BL01	09/01/2022	N	BL01	Alluvium	15 - 25	6.15	65.5	18	2,530	9,080	0.0267	663	0.0449	<0.100	0.0952	7.085	3.05	115.6	7.03
ZTS-MW-124-BL01	08/31/2022	N	BL01	Alluvium	24 - 34	3.73	36.2	16.5	2,440	3,020	0.044	545	0.0316	<0.100	0.0211	6.300	3.9	134.4	7.04
ZTS-MW-124-BL01-FD	08/31/2022	FD	BL01	Alluvium	24 - 34	3.69	36.9	16.3	2,460	2,310	0.0437	544	0.0308	<0.100	0.020	---	---	---	---
ZTS-MW-125-BL01	08/31/2022	N	BL01	UMCf	40 - 50	2.89	23.4	12.6	2,210	3,650	0.0401	466	0.0161	<0.100	0.105	6.736	1.97	117.1	7.17
ZTS-MW-126-BL01	08/31/2022	N	BL01	Alluvium	20 - 30	6.57	71.3	15.6	2,650	3,710	0.0373	600	0.0433	<0.100	0.388	7.382	1.91	111.1	7.25
ZTS-MW-127-BL01	08/31/2022	N	BL01	Alluvium	18 - 23	8.26	100	19	2,550	4,660	0.0297	632	0.0744	<0.100	0.245	7.583	2.86	124	7.01
ZTS-MW-128-BL01	09/01/2022	N	BL01	UMCf	42 - 52	4.71	13.3	7.25	2,060	3,050	0.0156	344	0.00476	<0.100	0.379	7.153	0.53	85.2	7.34

Notes:
 bgs - below ground surface
 mg/L - milligram per liter
 mS/cm - milliSiemens per centimeter
 mV - millivolts
 SU - standard units
 N - normal field sample
 UMCf - Upper Muddy Creek formation
 < - The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
 FD - field duplicate