

# TECHNICAL MEMORANDUM

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**To:** Nevada Environmental Response Trust

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

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**From:** Katie Hendrickson

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**Date:** February 22, 2021

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**Subject:** Hydrogen-Based Gas Permeable Membrane Pilot Study Monthly Progress Report

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At the direction of the Nevada Environmental Response Trust (NERT or Trust), Tetra Tech, Inc. (Tetra Tech) has prepared this memorandum that summarizes Tetra Tech's progress made during January 2021 toward successfully implementing the Hydrogen-Based Gas Permeable Membrane Pilot Study.

## Task Progress Update: January 2021

### Task M26 – Hydrogen-Based Gas Permeable Membrane Pilot Study

- Current Status
  - Test Scenario #1B, which involves treatment of the existing FBR influent obtained from the FBR equalization tank, began on November 24, 2020 and continued through January 2020.
  - The system was operated at 2 gpm until January 15 when the flow rate was adjusted to 1.5 gpm to optimize mass loading for the available reactor surface area based on operational sample results.
  - Operational samples showed influent perchlorate concentrations in January ranged from 36,900 ppb to 54,200 ppb. Perchlorate concentrations in samples from the lag reactor were below 87 ppb in January, with perchlorate concentrations below detection limits in samples from the lag reactor beginning January 16, 2021. Performance samples were collected on January 12, 18, and 26, 2021. Influent perchlorate concentrations were 46,000 ppb, 45,000 ppb, and 52,000 ppb and perchlorate concentrations for samples from the lag reactor were 25 ppb, 2.1 ppb, and 14 ppb respectively, which is over a 99.9% reduction. Nitrate concentrations for samples from the lag reactor were below detection limits and chlorate concentrations for samples from the lag reactor were less than 74 ppb. The available January performance results are shown on Table 1. Pending results will be presented in future monthly progress reports. Figure 1 displays the perchlorate operational and performance sample results.
  - A meeting was held on January 19, 2021 with NDEP to review the status of Scenario 1B. The operational results available at that time were reviewed which showed significant perchlorate, chlorate and nitrate reduction. During the meeting, it was concluded that an additional two weeks of operations under Scenario 1 would be completed.

- Schedule and Progress Updates
  - Per the meeting on January 19, operation of the Pilot System under Scenario #1B using FBR influent water is anticipated to continue through early February 2021. The transition to Scenario 2, which involves treatment of water from the Athens Well Field and Interceptor Well Field after chromium treatment, will begin upon completion of Scenario 1B.
- Health and Safety
  - There were no health and safety incidents related to Task M26 during January 2021. Safety measures continue to be implemented to minimize potential exposure to COVID-19, including the use of face coverings, gloves, and hand sanitizer, as well as protocols for monitoring temperatures, minimizing the number of people on site at one time, and evaluating tasks to increase physical distance between personnel.

## CERTIFICATION

### Hydrogen-Based Gas Permeable Membrane Pilot Study Monthly Progress Report

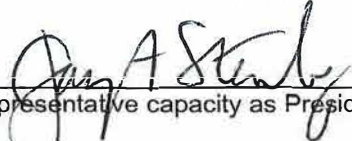
**Nevada Environmental Response Trust Site  
(Former Tronox LLC Site)  
Henderson, Nevada**

#### **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:** 2/22/21

## CERTIFICATION

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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 Hydrogen-Based Gas Permeable Pilot Study Monthly Progress Report.



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

February 22, 2021

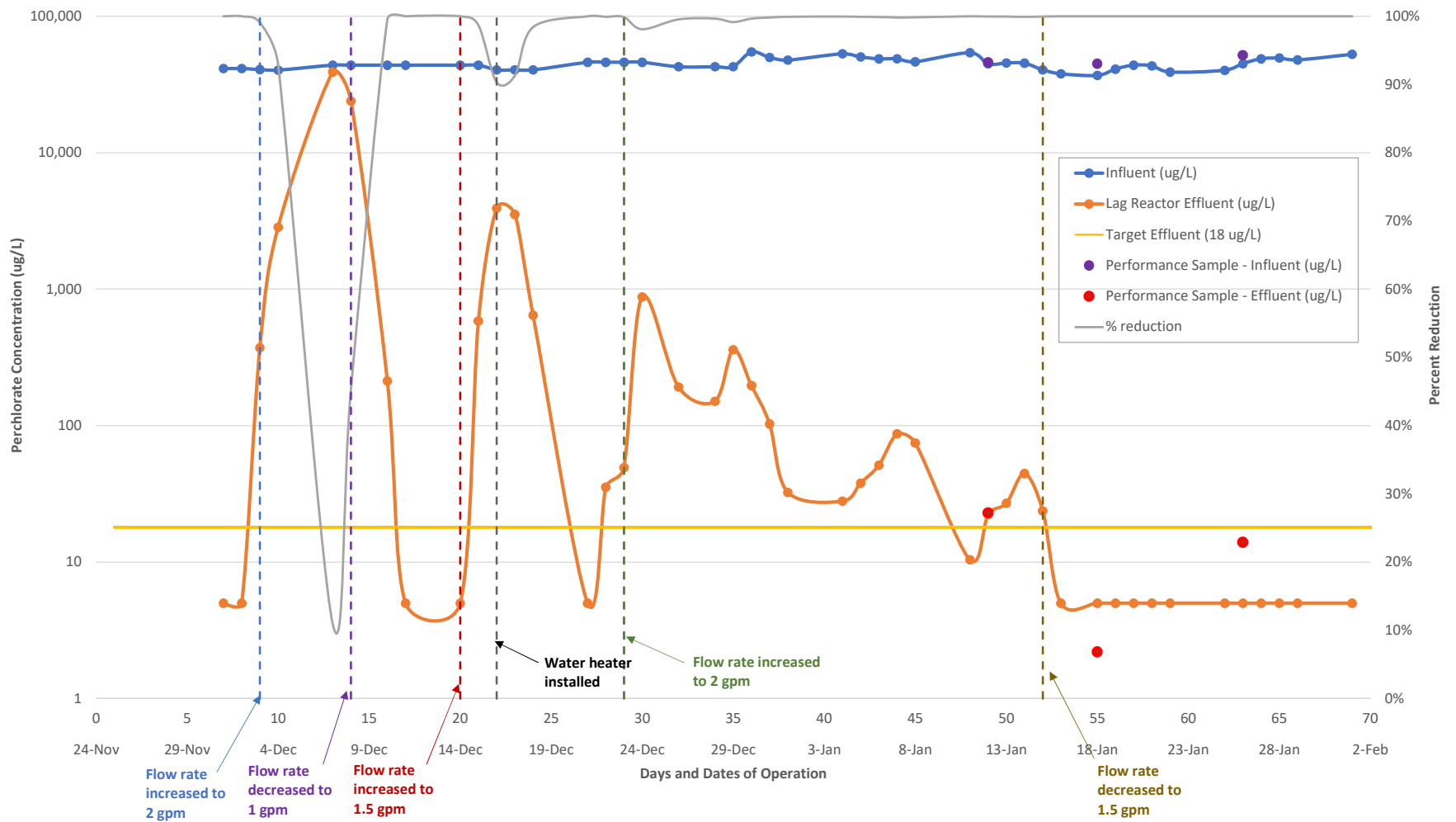
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Date

Nevada CEM Certificate Number: 2167  
Nevada CEM Expiration Date: September 18, 2022

## Figures

Figure 1. Perchlorate Concentrations and % Reduction



## Tables

**Table 1**  
**Scenario 1B Performance Monitoring Data**  
 Hydrogen-Gas Based Permeable Membrane Pilot Study

Date	Influent Water									
	Flow gpm	T °C	pH s.u.	Perchlorate ppb	Chlorate ppb	Nitrate -N ppm	Total Cr <sup>1</sup> ppb	Cr VI <sup>1</sup> ppb	TDS ppm	TSS ppm
1/12/2021	2.0	20.3	7.67	46,000	88,000	6.6	NA	NA	NA	13
1/18/2021	1.5	22.9	7.62	45,000	110,000	6.3	NA	NA	4,800	5.5
1/26/2021	1.5	20.0	7.78	52,000	110,000	6.8	NA	NA	4,400	12

Date	Biological Reactors																									
	Perchlorate (ppb)			Chlorate (ppb)			Nitrate (ppm)			Total Cr (ppb) <sup>1</sup>	Cr VI (ppb) <sup>1</sup>	TSS (ppm)			pH			T (°F)			ORP			Pressure (psig)		
	Lead	Middle	Lag	Lead	Middle	Lag	Lead	Middle	Lag	Lag	Lag	Lead	Middle	Lag	Lead	Middle	Lag	Lead	Middle	Lag	Lead	Middle	Lag	Lead	Middle	Lag
1/12/2021	31,000	620	25	14,000	140	72J	0.21	<0.014	<0.014	NA	NA	5.0	8.0	8.0	8.00	8.00	7.85	73.2	72.5	73.0	-365	-394	-376	13.4	11.2	18.8
1/18/2021	4,800	100	2.1	2,000	64J+	74	<0.014	<0.014	<0.014	NA	NA	5.0	8.5	13	8.00	7.99	7.83	78.4	77.7	78.6	-299	-432	-470	19.6	12.1	19.0
1/26/2021	32,000	53,000	14	32,000	73,000	53	0.99	10	<0.014	NA	NA	8.0	8.5	10	7.99	8.01	7.73	73.0	73.2	73.2	124	-411	-440	20.1	16.2	18.7

Date	Post Reactor Tank Effluent					
	Perchlorate ppb	Chlorate ppb	Nitrate - N ppm	Total Cr <sup>1</sup> ppb	Cr VI <sup>1</sup> ppb	TSS ppm
1/12/2021	23	69J	<0.014	NA	NA	9.5
1/18/2021	2.2	76	<0.014	NA	NA	7.0
1/26/2021	8.7	58	<0.014	NA	NA	15

<sup>1</sup> The chromium analysis will only be performed during Scenario #3.

NA = Not analyzed.

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

J+ = The result is an estimated quantity, but the result may be biased high.

□ = Laboratory result inconsistent with other process samples and split sample results. Results from split samples collected from the Middle Reactor on 1/26/21 are as follows:

Perchlorate = 514 ppb

Chlorate = <200 ppb

Nitrate = <0.5 ppm