

# 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:** Dan Pastor and Dana Grady

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**Date:** August 29, 2018

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**Subject:** **Galleria Drive Bioremediation Treatability 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 which summarizes Tetra Tech's progress during July 2018 toward successfully implementing the Galleria Drive Bioremediation Treatability Study.

## Task Progress Update: July 2018

### Task M17 – Galleria Drive Bioremediation Treatability Study

- Task Leader – Dana Grady/Dan Pastor
- Current Status
  - Phase 1 pre-design field activities were performed from April to June 2018 to gather relevant data and information required to optimize the final treatability study design (targeted treatment interval and depth, contaminant concentrations, etc.). Based on the results of the recent Phase 1 pre-design activities, it was determined a Phase 1 Work Plan Modification is necessary as Phase I investigation results yielded information that perchlorate is deeper than expected, i.e., in the deeper Upper Muddy Creek formation (UMCf) (90 -110' bgs). The additional data collected in the proposed Phase I modification will support the forthcoming Work Plan Addendum. Following implementation of this modification, the Phase 1 findings and resulting Phase 2 treatability study design will be presented to NDEP, EPA and the NERT Stakeholders, followed by a third-party cost evaluation and submittal of the Galleria Drive Treatability Study Work Plan Addendum.
  - The following bullets provide a high-level summary of work completed in July:
    - Bench-scale testing at UNLV is on-going. Initial characterization of soil and groundwater collected from the upper UMCf (60 to 85 feet below ground surface [bgs]) and the lower UMCf (90 to 110 feet bgs) was performed by UNLV to establish baseline conditions. Batch microcosms were set up using a slow-release substrate (emulsified vegetable oil) and soluble substrates (acetate and molasses). Initial results of the microcosms indicated that the shallow soil and groundwater from the UMCf responded very rapidly to nitrate reduction. Nitrate concentrations decreased from 160 milligrams

per liter (mg/L) to non-detect levels within three days for all substrates that were examined. The deeper soil/groundwater microcosms did not have detectable concentrations of nitrate at the inception. Chlorate concentrations in the upper UMCf also decreased from 8.37 mg/L to non-detect levels within 5 days. Chlorate in the deeper UMCf continues to be analyzed and have not yet shown a response to biodegradation. Perchlorate results are pending laboratory reanalysis and chemist evaluation to confirm results. As more results become available, the next monthly progress report will provide an update on the lag time and inception of perchlorate biodegradation in the upper and lower UMCf microcosms.

- Bio-traps® placed in monitoring wells GRTS-MW04A/B on May 17, 2018 were retrieved on June 12, 2018. The bio-traps® were sent to Microbial Insights for testing of phospholipid fatty acids and perchlorate reductase. Results of these Bio-traps® indicate a robust microbial population in groundwater that could possess the ability to biodegrade perchlorate and other inorganic electron acceptors, such as chlorate and nitrate. Specifically, the microbial biomass results were  $3.73 \times 10^5$  cells/gram in GRTS-MW04A (screened from 70 – 85 feet bgs) and  $5.82 \times 10^4$  cells/gram in GRTS-MW04B (screened from 89.5 – 109.5 feet bgs). A complete summary of the microbial data will be presented in the forthcoming Galleria Drive Bioremediation Treatability Study Work Plan Addendum. Figure 1 provides a map of these monitoring well locations for reference.
- Results from the borehole dilution testing performed at monitoring well GRTS-MW03A indicate an average flow velocity of approximately 3 feet per day (ft/day). Results from testing performed in well GRTS-MW03B indicate a flow velocity of approximately 0.003 ft/day.
- Based on the results of the recent Phase 1 pre-design activities, a Galleria Drive Bioremediation Treatability Study – Phase 1 Modification is being prepared to recommend additional pre-design testing. As detailed in the Galleria Drive Bioremediation Treatability Study Work Plan, pre-design activities have focused primarily on two zones, specifically the shallow UMCf from 60 to 85 feet bgs and a deeper interval within the UMCf from 90 to 110 feet bgs. A review of the pre-design results indicates that these two potential treatment intervals vary considerably with respect to lithological characteristics, groundwater flow patterns and rates, contaminant concentrations, and groundwater geochemistry. Due to these differences, the treatability study design will be refined for testing each of these two potential treatment zones. A bioremediation treatability study design will be prepared for the 60 to 85 foot bgs interval as planned; however, additional information is required to determine if in-situ bioremediation is a feasible approach in the deeper zone from 90 to 110 ft bgs. Recommendations will include batch microcosm testing and field screening injection tests for the 90 – 110 ft bgs interval. The Phase 1 Modification will be submitted in August 2018.
- Schedule and Progress Updates
  - Once the modification is approved, updated schedule information will be presented in subsequent monthly progress reports.
- Health and Safety
  - There were no safety incidents related to Task M17 during July 2018.

## CERTIFICATION

### Galleria Drive 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 per*

**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

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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 Galleria Drive Bioremediation Treatability Study Monthly Progress Report.



August 29, 2018

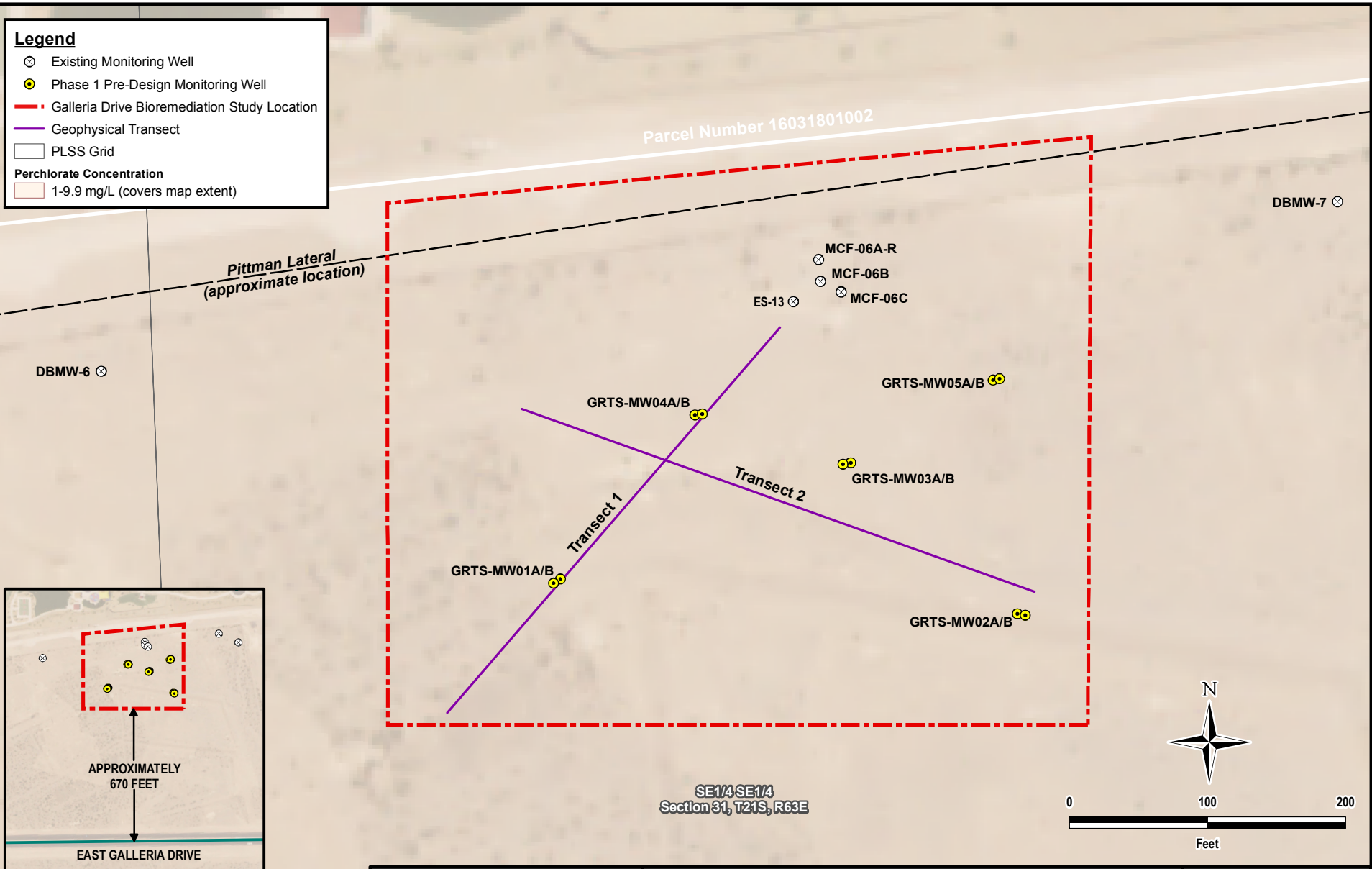
**Kyle Hansen, CEM**  
Field Operations Manager/Geologist  
Tetra Tech, Inc.

Date

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

# Figures

**DRAFT**



Notes:

- Perchlorate concentrations sourced from the Annual Remedial Performance Report for Chromium and Perchlorate (Ramboll Environ, 2017).
- Imagery Source: Esri World Map, June 2015

**Tt TETRA TECH**  
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NEVADA ENVIRONMENTAL RESPONSE TRUST

MONTHLY PROGRESS REPORT

**GALLERIA DRIVE BIOREMEDIATION TREATABILITY STUDY  
 PRE-DESIGN SOIL BORING AND MONITORING WELL LOCATIONS**

Project No.:	117-7502018
Date:	JULY 10, 2018
Designed By:	SRA
Figure No.	<b>1</b>

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