TETRA TECH

TECHNICAL MEMORANDUM

To:	**Nevada Environmental Response Trust**
Cc:	Nevada Division of Environmental Protection United States Environmental Protection Agency
From:	Arul Ayyaswami and Dan Pastor
Date:	November 15, 2018
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 that summarizes Tetra Tech's progress made during September 2018 toward successfully implementing the Unit 4 Source Area In-Situ Bioremediation Treatability Study. The location of the treatability study is depicted on Figure 1 and the location of the borings and wells are depicted on Figure 2.

Task Progress Update: September 2018

Task M21 – Unit 4 Source Area In-situ Bioremediation (ISB) Treatability Study

- Task Leader – Arul Ayyaswami
- Current Status
    - The University of Nevada – Las Vegas (UNLV) continued microcosm testing with a combination of molasses, molassess with acetate, mixed microbial cultures, and soil and groundwater collected from boring and well locations in the vicinity of the Unit 4 Building. Hexavalent chromium concentrations reduced from 38 milligrams per liter (mg/L) to 0.6 mg/L within 15 days and to 0.12 mg/L within 28 days in microcosms containing molasses. TDS concentrations in the microcosms were as high as 21,000 mg/L. Nitrate, chlorate, and perchlorate are being analyzed and the results are not currently available.
    - UNLV began setting up four columns for conducting column testing in accordance with the Unit 4 Source Area In-Situ Bioremediation Treatability Study Bench-Scale Work Plan. Two columns were packed with soil collected from the intermediate zone (75 to 85 feet bgs) and two columns were packed with soil collected from the deep zone (95 to 105 feet bgs). Groundwater was collected from U4-E-01I and U4-E-05D and transported to UNLV for use in the column studies.
    - NDEP approved Treatability / Pilot Study Modification No. 4 for the Unit 4 Source Area In-Situ Bioremediation Treatability Study Work Plan in a letter dated September 10, 2018 after receiving the additional documents requested in NDEP's e-mail dated August 29, 2018.
    - The existing groundwater model for the Unit 4 area was updated to include data obtained during pre-implementation field activities.

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- Schedule and Progress Updates
    - The following activities are scheduled to be conducted in October 2018:
        - Continued UNLV microcosm and column testing in accordance with the Unit 4 Source Area In-Situ Bioremediation Treatability Study Bench-Scale Work Plan and Treatability Study Modification No. 1.
        - Continue groundwater modeling to assist with the injection and extraction system design.
        - Installation of equipment for performing the extended groundwater extraction test as specified in Treatability / Pilot Study Modification No. 4.
        - Start injection and extraction system design including well design, injection and extraction rates, cycling frequency, performance monitoring program, and conveyence pipeline.
    - The Phase 1 findings will be presented to NDEP, EPA, and the NERT Stakeholders, followed by a third-party cost evaluation and submittal of the Unit 4 Source Area Bioremediation Treatability Study Work Plan Addendum in second quarter of 2019.
- Health and Safety
    - There were no health and safety incidents related to Task M21 during September 2018.

CERTIFICATION

Unit 4 Source 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: _____, 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: 11/6/18

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 Unit 4 Source Area Bioremediation Treatability Study Monthly Progress Report, Nevada Environmental Response Trust Site, Henderson, Nevada.

November 15, 2018

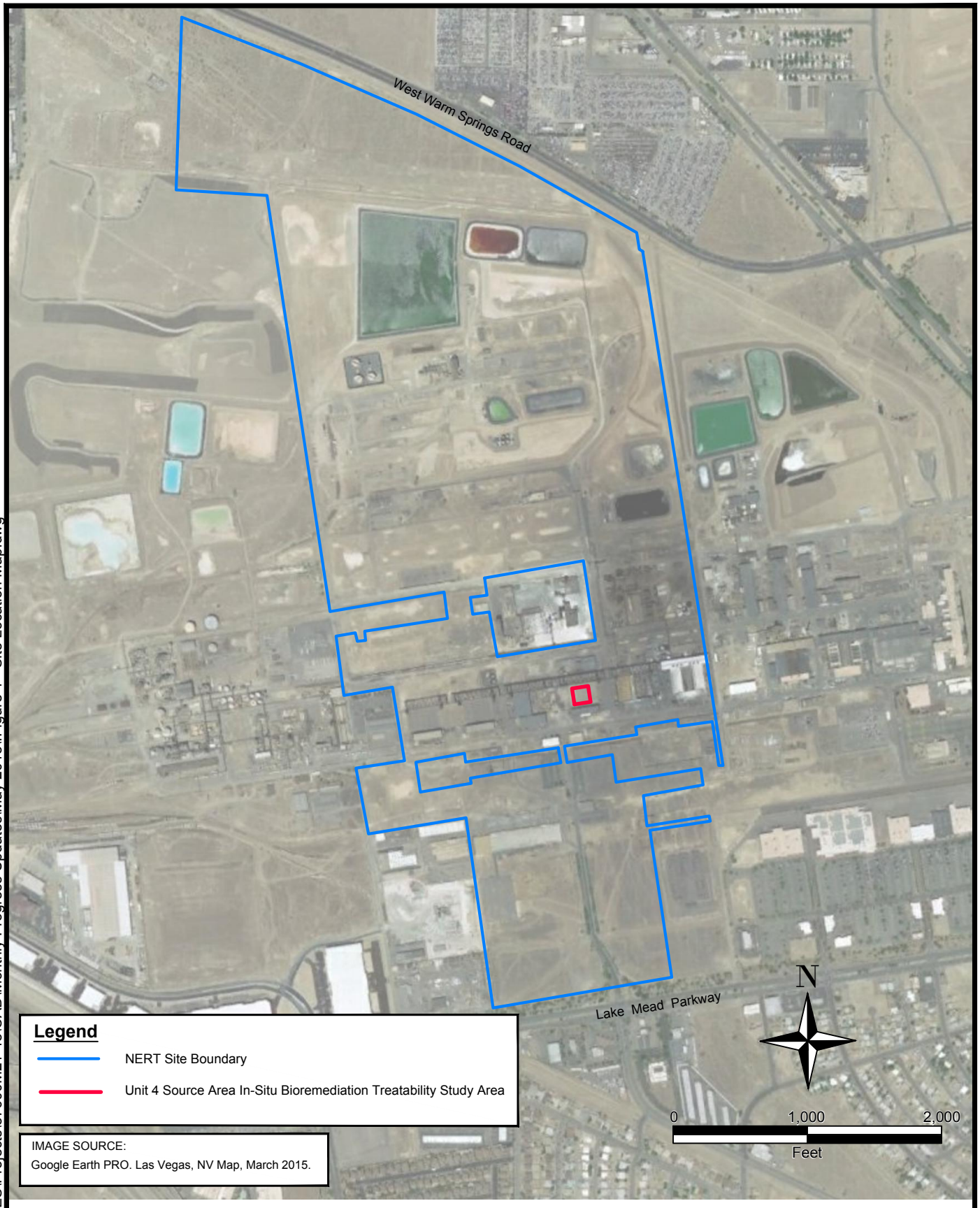
Kyle Hansen, CEM
Field Operations Manager/Geologist
Tetra Tech, Inc.

Date

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

Figures

DRAFT



tts318fs3.tt.local\CES\Projects\87600M21-18\CAD\Monthly Progress Updates\May 2018\:Figure 1 - Site Location Map.dwg

TETRA TECH

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NEVADA ENVIRONMENTAL RESPONSE TRUST SITE

UNIT 4 SOURCE AREA IN-SITU BIOREMEDIATION TREATABILITY STUDY

SITE LOCATION MAP

Project No:	117-7502018
Date:	JUNE 13, 2018
Designed By:	PK

Figure No.

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DRAFT

\\tts318fs1\.tt.local\ces\87600M21-18\CAD\ FIGURE 2 - BORING AND WELL LOCATIONS.dwg

Legend

- Geotechnical Soil Boring Location
- Existing Third Mobilization Monitoring Well
- Nested Monitoring Well (I - Intermediate; D - Deep)
- UMCf Injection/Extraction Well Cluster (2 Screen Intervals; I - Intermediate; D - Deep)
- Unit 4 Treatability Study Area
- Department of Homeland Security Restricted Area
- Existing Unit 4 Building

Notes:

1. All locations are approximate.
2. Imagery Source: Aerotech Mapping, August 2016.
3. Well location source: Unit 4 Source Area In-Situ Bioremediation Treatability Study Work Plan, Tetra Tech, 2017.

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NEVADA ENVIRONMENTAL RESPONSE TRUST SITE

UNIT 4 SOURCE AREA IN-SITU BIOREMEDIATION TREATABILITY STUDY

BORING AND WELL LOCATIONS

Project No:	117-7502018
Date:	JULY 10, 2018
Designed By:	CL

Figure No.

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