

# 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:** July 30, 2018

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**Subject:** **Galleria Road 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 June 2018 toward successfully implementing the Galleria Road Bioremediation Treatability Study.

## Task Progress Update: June 2018

### Task M17 – Galleria Road 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.). The Phase 1 findings and resulting Phase 2 treatability study design will be presented in the third quarter 2018 to NDEP, EPA and the NERT Stakeholders, followed by third-party review and submittal of the Galleria Road Treatability Study Work Plan Addendum.
  - Phase 1 pre-design field activities are now complete. Activities completed in June include:
    - Nuclear magnetic resonance (NMR) logging was performed the week of June 2 – June 9, 2018. NMR logging was performed in the deepest monitoring well at each of the five locations (i.e., “B” wells). NMR estimates of hydraulic conductivity generally agreed (within an order of magnitude) with estimates derived using slug testing, particularly higher in the borehole. A full discussion of results and presentation of NMR profiles will be presented in the forthcoming Galleria Road Bioremediation Treatability Study Work Plan Addendum.
    - 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 are being compiled and will

- be included in the forthcoming progress reports and/or Galleria Road Bioremediation Treatability Study Work Plan Addendum.
- Borehole dilution testing was performed in monitoring wells GRTS-MW03A and GRTS-MW03B between June 12 and June 29, 2018. Results are being compiled and will be included in the forthcoming progress reports and/or Galleria Road Bioremediation Treatability Study Work Plan Addendum.
- As requested by NDEP, the following draft data associated with the treatability study are provided with this report:
  - Table 1 provides an updated well construction table, including ground surface elevations and depth to water at each monitoring well location. Tables 2 through 5 present soil and groundwater analytical and microbial data collected during drilling activities and subsequent groundwater sampling. Figure 1 provides a map of these monitoring well locations for reference. Formal presentation and interpretation of these results will be presented in the forthcoming Galleria Road Bioremediation Treatability Study Work Plan Addendum.
- Schedule and Progress Updates
  - Task remains on schedule.
- Health and Safety
  - There were no safety incidents related to Task M17 during June 2018.

## CERTIFICATION

### Galleria Road 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 AT*

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: 7/30/18

## 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 Road Bioremediation Treatability Study Monthly Progress Report.



July 30, 2018

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

\_\_\_\_\_  
Date

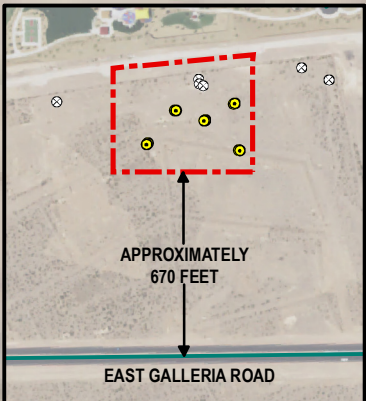
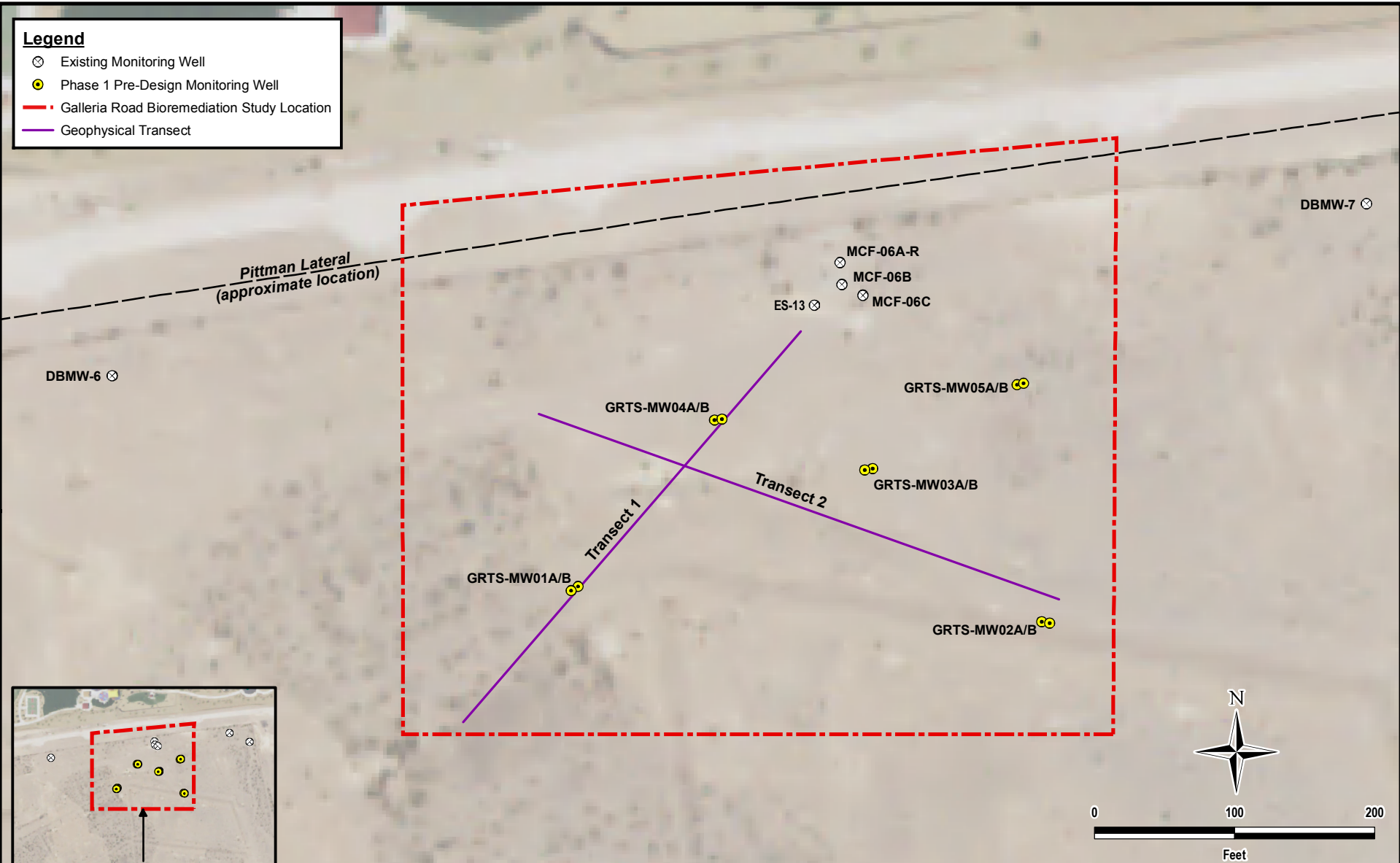
Nevada CEM Certificate Number: 2167  
Nevada CEM Expiration Date: September 18, 2018

# Figures

# DRAFT


**Legend**

- ⊗ Existing Monitoring Well
- ⊙ Phase 1 Pre-Design Monitoring Well
- - - Galleria Road Bioremediation Study Location
- Geophysical Transect



Imagery Source: Esri World Map, June 2015

\\TTS100FS1\PROJECTS\INERT\GIS FIGURE DATABASE\MXD\MP\U\FIGURE\_1\_1.MXD

 <b>TETRA TECH</b> www.tetrattech.com 150 S. 4th Street, Unit A Henderson, Nevada 89015 Phone: (702) 854-2293	NEVADA ENVIRONMENTAL RESPONSE TRUST	Project No.: 117-7502018
	MONTHLY PROGRESS REPORT	Date: JULY 11, 2018
<b>GALLERIA ROAD BIOREMEDIATION TREATABILITY STUDY PRE-DESIGN SOIL BORING AND MONITORING WELL LOCATIONS</b>		Designed By: SRA
		Figure No. <h1>1</h1>

# Tables

**Table 1**  
**Phase 1 : Pre-Design Monitoring Well Construction Details**  
 Galleria Road Bioremediation Treatability Study

Monitoring Well/Borehole ID	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Depth to Water <sup>1</sup>	Well Diameter	Borehole Diameter	Borehole Total Depth	Well Total Depth	Bottom of Screen	Top of Screen	Screen Length	Slot Size
			feet amsl	feet amsl	feet bTOC	inches	inches	feet bgs	feet bgs	feet bgs	feet bgs	feet	inches
<b>Newly Installed Monitoring Wells (April 2018)</b>													
<b>GRTS-MW01A</b>	26728794.03	834737.35	1633.882	1633.486	47.10	2	6	82	80.5	80	60	20	0.010
<b>GRTS-MW01B</b>	26728796.86	834742.46	1633.883	1633.322	56.45	2	6	120	110.5	110	90	20	0.010
<b>GRTS-MW02A</b>	26728771.59	835074.09	1632.586	1632.039	56.10	2	6	82	80.5	80	60	20	0.010
<b>GRTS-MW02B</b>	26728770.64	835079.15	1632.432	1631.894	63.91	2	6	120	110.5	110	90	20	0.010
<b>GRTS-MW03A</b>	26728879.93	834947.17	1630.720	1630.178	53.04	4	8	80	75.5	75	65	10	0.010
<b>GRTS-MW03B</b>	26728880.95	834952.89	1630.625	1630.271	59.75	4	8	120	110.5	110	90	20	0.010
<b>GRTS-MW04A</b>	26728915.61	834839.84	1631.086	1630.704	50.21	2	6	86.5	85.4	85	70	15	0.010
<b>GRTS-MW04B</b>	26728916.48	834845.04	1631.186	1630.856	56.24	2	6	120	110	109.5	89.5	20	0.010
<b>GRTS-MW05A</b>	26728941.02	835055.82	1628.633	1628.193	52.75	2	6	80	70.5	70	60	10	0.010
<b>GRTS-MW05B</b>	26728941.82	835060.59	1628.605	1628.231	55.13	2	6	120	85.5	85	75	10	0.010
<b>Existing Monitoring Wells within Treatability Study Area</b>													
<b>MCF-06B<sup>2</sup></b>	26729012.56	834930.85	1630.270	1633.056	57.22	4	8	266	85.15	82	67	15	0.010
<b>MCF-06C<sup>2</sup></b>	26729004.80	834945.70	1630.280	1633.014	56.96	4	8	67.42	62.3	59	44	15	0.010
<b>ES-13</b>	26728998.71	834911.17	1630.615	1632.518	60.12	4	8	120	105	105	90	15	0.010

Notes:

amsl - above mean sea level

bTOC - below top of casing

bgs - below ground surface

1. Depth to water measurements collected on May 25, 2018.

2. Top of casing elevation resurveyed on May 9, 2018.



Table 2  
Phase 1 : Pre-Design Soil Analytical Results  
Galleria Road Bioremediation Treatability Study

Location	Sample Date	QCType	Depth (ft bgs)	Lab SampleID	EPA 314.0	Anions by EPA 300.0 (soluble)			EPA 300.1B	EPA 351.2	SW6010B	SW9060A	SM 2320B (soluble)		SM 2320B (soluble)	SM 2540C (soluble)	
					Perchlorate	Chloride (as Cl)	Nitrate (as NO3)	Sulfate	Chlorate	Total Kjeldahl Nitrogen (TKN)	Phosphorus	Total Organic Carbon	Alkalinity as CaCO3	Bicarbonate ion as HCO3	Carbonate (as CO3)	Total Dissolved Solids	
					mg/kg	mg/L	mg/L	mg/L	ug/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/L	mg/L	mg/L	
GRTS-MW01B	4/19/2018	FD	110 - 110.5	440-209324-6	<0.067	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW01B	4/19/2018	N	70 - 70.5	440-209324-1	2.4	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW01B	4/19/2018	N	80 - 80.5	440-209324-2	<0.065	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW01B	4/19/2018	N	90 - 90.5	440-209324-3	<0.064	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW01B	4/19/2018	N	100 - 100.5	440-209324-4	<0.063 UJ	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW01B	4/19/2018	N	110 - 110.5	440-209324-5	<0.068	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW01B	4/19/2018	N	120 - 120.5	440-209324-7	<0.068	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW02B	4/13/2018	N	65 - 65.5	440-209035-1	0.52	19	1.3	1,700	2,700 J	11 J	81	<600 UJ	<4.0	<4.8	<2.4	2,400	---
GRTS-MW02B	4/14/2018	FD	109 - 109.5	440-209035-5	<0.072	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW02B	4/14/2018	N	70 - 70.5	440-209035-2	0.069	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW02B	4/14/2018	N	81 - 81.5	440-209035-3	0.20	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW02B	4/14/2018	N	91 - 91.5	440-209035-6	<0.070	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW02B	4/14/2018	N	92 - 92.5	440-209035-7	<0.070	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW02B	4/14/2018	N	100 - 100.5	440-209035-8	<0.066	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW02B	4/14/2018	N	109 - 109.5	440-209035-4	<0.069	61	<0.25	1,800	<370 UJ	57 J	210	7,900 J	<4.0	<4.8	<2.4	3,400	---
GRTS-MW02B	4/14/2018	N	120 - 120.5	440-209035-9	<0.066	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW03B	4/25/2018	FD	110 - 110.5	440-209880-9	0.076 J	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW03B	4/25/2018	N	63 - 63.5	440-209880-1	0.22	140	<1.3	1,900	<350 UJ	63 J	210	26,000 J	<4.0	<4.8	<2.4	2,600	---
GRTS-MW03B	4/25/2018	N	73 - 73.5	440-209880-2	0.77	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW03B	4/25/2018	N	83 - 83.5	440-209880-3	<0.061	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW03B	4/25/2018	N	93 - 93.5	440-209880-4	0.75	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW03B	4/25/2018	N	95 - 95.5	440-209880-6	0.29	160	<1.3	1,600	<330 UJ	67 J	700	<600 UJ	<4.0	<4.8	<2.4	2,600	---
GRTS-MW03B	4/25/2018	N	102 - 102.5	440-209880-5	0.20 J	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW03B	4/25/2018	N	110 - 110.5	440-209880-7	0.072 J	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW03B	4/25/2018	N	120 - 120.5	440-209880-8	<0.080	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW04B	4/12/2018	N	70 - 70.5	440-208822-1	0.57	130	<0.25	610	<330 UJ	88 J	490	1,900 J	<4.0	<4.8	<2.4	1,300	---
GRTS-MW04B	4/12/2018	N	79 - 79.5	440-208822-2	<0.015	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW04B	4/12/2018	N	90 - 90.5	440-208822-3	<0.066	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW04B	4/12/2018	N	94 - 94.5	440-208822-7	<0.065	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW04B	4/12/2018	N	100 - 100.5	440-208822-4	<0.067	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW04B	4/12/2018	N	110 - 110.5	440-208822-5	<0.077	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW04B	4/12/2018	N	120 - 120.5	440-208822-6	<0.061	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	FD	72 - 72.5	440-209097-6	1.3 J	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	N	45.5 - 46	440-209097-1	0.56	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	N	47 - 47.5	440-209097-2	0.68	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	N	52 - 52.5	440-209097-3	0.60	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	N	61 - 61.5	440-209097-4	1.2	99	0.36 J	1,900	1,100 J	62 J	180	33,000 J	<4.0	<4.8	<2.4	2,400	---
GRTS-MW05B	4/17/2018	N	72 - 72.5	440-209097-5	1.7 J	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	N	82 - 82.5	440-209097-7	<0.065	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	N	92 - 92.5	440-209097-8	<0.066	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	N	102 - 102.5	440-209097-9	<0.058	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	N	111 - 111.5	440-209097-10	<0.064	---	---	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	N	120 - 120.5	440-209097-11	<0.013	---	---	---	---	---	---	---	---	---	---	---	---

Notes  
mg/kg milligrams per kilogram  
mg/L milligrams per liter  
ug/L micrograms per liter  
ug/kg micrograms per kilogram  
SU Standard Units  
FD Field duplicate  
N Normal field sample  
The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.  
<  
J- The result is an estimated quantity, but the result may be biased low.  
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.  
UJ The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.  
-- Not Analyzed

Table 2  
Phase 1 : Pre-Design Soil Analytical Results  
Galleria Road Bioremediation Treatability Study

Location	Sample Date	QCType	Depth (ft bgs)	Lab SampleID	SW6010B (soluble)				SW6020 (soluble)				SW7199	SW9045
					Calcium	Magnesium	Potassium	Sodium	Arsenic	Chromium	Iron	Manganese	Chromium, Hexavalent	pH
					mg/L	mg/L	mg/L	mg/L	ug/L	ug/L	ug/L	ug/L	mg/kg	SU
GRTS-MW01B	4/19/2018	FD	110 - 110.5	440-209324-6	---	---	---	---	---	---	---	---	---	---
GRTS-MW01B	4/19/2018	N	70 - 70.5	440-209324-1	---	---	---	---	---	---	---	---	---	---
GRTS-MW01B	4/19/2018	N	80 - 80.5	440-209324-2	---	---	---	---	---	---	---	---	---	---
GRTS-MW01B	4/19/2018	N	90 - 90.5	440-209324-3	---	---	---	---	---	---	---	---	---	---
GRTS-MW01B	4/19/2018	N	100 - 100.5	440-209324-4	---	---	---	---	---	---	---	---	---	---
GRTS-MW01B	4/19/2018	N	110 - 110.5	440-209324-5	---	---	---	---	---	---	---	---	---	---
GRTS-MW01B	4/19/2018	N	120 - 120.5	440-209324-7	---	---	---	---	---	---	---	---	---	---
GRTS-MW02B	4/13/2018	N	65 - 65.5	440-209035-1	640	24	22	18	7.9	3.1 J	<40	<2.5	<0.24	7.2 J
GRTS-MW02B	4/14/2018	FD	109 - 109.5	440-209035-5	---	---	---	---	---	---	---	---	---	---
GRTS-MW02B	4/14/2018	N	70 - 70.5	440-209035-2	---	---	---	---	---	---	---	---	---	---
GRTS-MW02B	4/14/2018	N	81 - 81.5	440-209035-3	---	---	---	---	---	---	---	---	---	---
GRTS-MW02B	4/14/2018	N	91 - 91.5	440-209035-6	---	---	---	---	---	---	---	---	---	---
GRTS-MW02B	4/14/2018	N	92 - 92.5	440-209035-7	---	---	---	---	---	---	---	---	---	---
GRTS-MW02B	4/14/2018	N	100 - 100.5	440-209035-8	---	---	---	---	---	---	---	---	---	---
GRTS-MW02B	4/14/2018	N	109 - 109.5	440-209035-4	610	55	230 J	58	7.1	<2.5	<40	6.2	<0.22	7.4 J
GRTS-MW02B	4/14/2018	N	120 - 120.5	440-209035-9	---	---	---	---	---	---	---	---	---	---
GRTS-MW03B	4/25/2018	FD	110 - 110.5	440-209880-9	---	---	---	---	---	---	---	---	---	---
GRTS-MW03B	4/25/2018	N	63 - 63.5	440-209880-1	510	86	98	81	3.8 J	<2.5	<40	<2.5	<0.21	7.6 J
GRTS-MW03B	4/25/2018	N	73 - 73.5	440-209880-2	---	---	---	---	---	---	---	---	---	---
GRTS-MW03B	4/25/2018	N	83 - 83.5	440-209880-3	---	---	---	---	---	---	---	---	---	---
GRTS-MW03B	4/25/2018	N	93 - 93.5	440-209880-4	---	---	---	---	---	---	---	---	---	---
GRTS-MW03B	4/25/2018	N	95 - 95.5	440-209880-6	360	94 J	150 J	110 J	<2.5	2.6 J	<40	13	<0.20	7.8 J
GRTS-MW03B	4/25/2018	N	102 - 102.5	440-209880-5	---	---	---	---	---	---	---	---	---	---
GRTS-MW03B	4/25/2018	N	110 - 110.5	440-209880-7	---	---	---	---	---	---	---	---	---	---
GRTS-MW03B	4/25/2018	N	120 - 120.5	440-209880-8	---	---	---	---	---	---	---	---	---	---
GRTS-MW04B	4/12/2018	N	70 - 70.5	440-208822-1	33	61	120	88	5.0	<2.5	<40	<2.5	<0.20	7.6 J
GRTS-MW04B	4/12/2018	N	79 - 79.5	440-208822-2	---	---	---	---	---	---	---	---	---	---
GRTS-MW04B	4/12/2018	N	90 - 90.5	440-208822-3	---	---	---	---	---	---	---	---	---	---
GRTS-MW04B	4/12/2018	N	94 - 94.5	440-208822-7	---	---	---	---	---	---	---	---	---	---
GRTS-MW04B	4/12/2018	N	100 - 100.5	440-208822-4	---	---	---	---	---	---	---	---	---	---
GRTS-MW04B	4/12/2018	N	110 - 110.5	440-208822-5	---	---	---	---	---	---	---	---	---	---
GRTS-MW04B	4/12/2018	N	120 - 120.5	440-208822-6	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	FD	72 - 72.5	440-209097-6	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	N	45.5 - 46	440-209097-1	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	N	47 - 47.5	440-209097-2	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	N	52 - 52.5	440-209097-3	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	N	61 - 61.5	440-209097-4	500	70	97	65	<2.5	6.0 J	<40	<2.5	<0.20	7.4 J
GRTS-MW05B	4/17/2018	N	72 - 72.5	440-209097-5	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	N	82 - 82.5	440-209097-7	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	N	92 - 92.5	440-209097-8	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	N	102 - 102.5	440-209097-9	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	N	111 - 111.5	440-209097-10	---	---	---	---	---	---	---	---	---	---
GRTS-MW05B	4/17/2018	N	120 - 120.5	440-209097-11	---	---	---	---	---	---	---	---	---	---

Notes

- mg/kg milligrams per kilogram
- mg/L milligrams per liter
- ug/L micrograms per liter
- ug/kg micrograms per kilogram
- SU Standard Units
- FD Field duplicate
- N Normal field sample
- < The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
- J- The result is an estimated quantity, but the result may be biased low.
- 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.
- UJ The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
- Not Analyzed

**DRAFT**

**Table 3**  
**Phase 1 : Pre-Design Soil Microbial Results**  
Galleria Road Bioremediation Treatability Study

Location	Sample Date	Depth (ft bgs)	Sample Matrix	Microbial Census	Microbial Phospholipid Fatty Acid Analysis (PLFA)								
				Perchlorate reductase gene (pcrA)	Total Biomass	Proteobacteria (Monos)	Firmicutes (TerBrSats)	Anaerobic metal reducers (BrMonos)	SRB/Actinomycetes (MidBrSats)	General (Nsats)	Eukaryotes (polyenoics)	Slowed Growth	Decreased Permeability
				cells/gram	cells/gram	%	%	%	%	%	%	ratio cy/cis	ratio trans/cis
GRTS-MW01B	4/19/2018	75-75.5	Soil	<1.67E+04 (I)	3.22E+05	19.71	5.25	0	0	68.17	6.88	1.95	0
GRTS-MW03B	4/26/2018	63-63.5	Soil	<1.67E+04 (I)	4.74E+05	10.80	14.03	0	2.37	69.80	3.01	0	0

Notes

- Monos Monoenoic
- TerBrSats Terminally Branched Saturated
- BrMonos Branched Monoenoic
- MidBrSats Mid-Chain Branched Saturated
- Nsats Normal Saturated
- < Not detected
- (I) Inhibited

**DRAFT**

**Table 4**  
**Phase 1 : Pre-Design Depth-Discrete Groundwater Analytical Results**  
Galleria Road Bioremediation Treatability Study

Location	Sample Depth	Sample Date	QCType	Lab SampleID	EPA 314.0		EPA 300.1
	ft bgs				Perchlorate	Nitrate (as N)	Chlorate
					ug/L	mg/L	ug/L
GRTS-MW01B	74.5	4/19/2018	N	440-209325-1	1,800	4.5 J	1,800
GRTS-MW04B	79	4/12/2018	N	440-208821-1	6,000	<5.5	7,700

Notes

ft bgs feet below ground surface

ug/L micrograms per liter

mg/L milligrams per liter

N Normal field sample

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

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

**Table 5**  
**Phase 1 : Pre-Design Groundwater Analytical Results from Monitoring Wells**  
 Galleria Road Bioremediation Treatability Study

Location	Sample Date	QCType	Lab SampleID	EPA 314.0	Anions by EPA 300.0				EPA 300.1	EPA 351.2	EPA 365.3	Field Tests						Field Tests		NTOTAL	RSK175	SM 2320B	SM 2320B	SM 2320B
				Perchlorate	Chloride (as Cl)	Nitrate (as N)	Nitrite (as N)	Sulfate	Chlorate	Total Kjeldahl Nitrogen (TKN)	Phosphorus	Dissolved Oxygen	Ferrous Iron	Oxidation-Reduction Potential	pH	Specific Conductivity	Sulfide	Temperature	Turbidity	Nitrogen, Total	Methane	Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3
				ug/L	mg/L	mg/L	mg/L	mg/L	ug/L	mg/L	mg/L	mg/L	mg/L	mV	SU	mS/cm	mg/L	C	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
ES-13	5/9/2018	N	440-210948-5	2,800	8,100	<5.5	<7.0	26,000	1,600	<0.10	0.080	2.01	0.0	-58	7.71	47.5	0.0	28.6	2.8	<0.11	<0.00025	87	87	<4.0
GRTS-MW01A	5/10/2018	N	440-211094-3	14,000	5,300	22	<7.0	11,000	19,000	<0.10	0.087	0.42	0.0	47.9	7.75	26.05	0.0	29.41	25.5	22	<0.00025	78	78	<4.0
GRTS-MW01B	5/10/2018	N	440-211094-4	3,200	12,000	<5.5	<7.0	34,000	<250	4.3	0.68	0.30	0.0	113	8.10	50.9	0.0	35.47	102	4.3	0.0015	100	100	<4.0
GRTS-MW02A	5/10/2018	N	440-211094-1	5,600	3,200	24	<3.5	7,000	8,200	0.42	0.16	4.92	0.0	48.8	7.86	18.13	0.0	30.82	119	24	<0.00025	75	75	<4.0
GRTS-MW02B	5/10/2018	N	440-211094-2	<50	8,100	<5.5	<7.0	30,000	<250	3.6	0.90	7.45	0.0	150	8.19	43.5	0.0	28.22	550	3.6	<0.00025	99	99	<4.0
GRTS-MW03A	5/7/2018	FD	440-210696-3	5,700	1,700	37	<1.4	3,400	12,000	<0.10	<0.025	---	---	---	---	---	---	---	---	37	<0.00025	78	78	<4.0
GRTS-MW03A	5/7/2018	N	440-210696-2	5,600	1,700	38	<1.4	3,500	12,000	<0.10	<0.025	2.31	0.0	-10.2	7.82	12.36	0.0	30.44	5.75	38	<0.00025	78	78	<4.0
GRTS-MW03B	5/7/2018	N	440-210696-1	1,700	8,500	<5.5	<7.0	27,000	150 J	0.38	<0.025	3.29	0.0	162	8.10	45.7	0.0	34.88	8.3	0.38	<0.00025	95	95	<4.0
GRTS-MW04A	5/8/2018	N	440-210833-1	8,800	7,300	5.8 J	<7.0	18,000	10,000	<0.10	0.089	0.79	0.0	90.3	7.66	43.80	0.0	28.70	27.3	5.8	<0.00025 UJ	89	89	<4.0
GRTS-MW04B	5/8/2018	N	440-210833-2	<50	10,000	<5.5	<7.0	31,000	<100	2.1	0.28	0.50	0.0	131	7.87	78.2	0.0	35.19	10.3	2.1	0.0016	100	100	<4.0
GRTS-MW05A	5/9/2018	N	440-210948-1	8,000	2,000	36	<3.5	4,000	13,000	R	0.059	5.26	0.0	141	8.22	12.5	0.0	30.61	19.3	36	<0.00025	66	66	<4.0
GRTS-MW05B	5/9/2018	N	440-210948-2	6,800	6,000	5.8 J	<7.0	18,000	9,600	0.27	0.14	2.61	0.0	60.2	7.92	38.1	0.0	27.34	26.4	6.1	0.0014	99	99	<4.0
MCF-06B	5/9/2018	N	440-210948-4	3,300	6,500	<5.5	<7.0	19,000	3,700	<0.10	0.11	1.34	0.0	55.6	6.79	47.43	0.0	30.46	0.66	<0.11	<0.00025	71	71	<4.0
MCF-06C	5/8/2018	N	440-210833-3	7,100	1,600	43	<1.4	2,800	11,000	<0.10	0.047 J	2.75	0.0	153	7.59	13.9	0.0	29.67	46.7	43	<0.00025	69	69	<4.0

Notes

ug/L micrograms per liter SU  
 mg/L milligrams per liter mS/cm  
 mV millivolts C  
 FD Field duplicate NTU  
 N Normal field sample  
 if the analyte was analyzed for, but was not detected  
 < above the level of the reported sample quantitation limit  
 J- The result is an estimated quantity, but the result may be biased low.  
 J The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.  
 UJ The reported quantitation limit is approximate and may be inaccurate or imprecise.  
 R The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.

**Table 5**  
**Phase 1 : Pre-Design Groundwater Analytical Results from Monitoring Wells**  
 Galleria Road Bioremediation Treatability Study

Location	Sample Date	QCType	Lab SampleID	SM 2320B	SM 2540C	SM 5310B	Dissolved Metals by SW6010B					Dissolved Metals by SW6010B						Total Manganese by SW6010B	Dissolved Manganese by SW6010B	Dissolved Metals by SW6010B								
				Hydroxide Alkalinity as CaCO3	Total Dissolved Solids	Total Organic Carbon	Aluminum	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead			Magnesium	Molybdenum	Nickel	Phosphorus	Potassium	Silicon	Silver	Sodium	Strontium
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
ES-13	5/9/2018	N	440-210948-5	<4.0	54,000	1.8	<0.50	<0.050	<0.010	10	<0.025	570	<0.025	<0.050	<0.050	<0.50	<0.038	5,100	<0.15	<0.15	5.4	<0.050	<1.0	6,400	4.7	<0.050	6,500	11
GRTS-MW01A	5/10/2018	N	440-211094-3	<4.0	27,000	1.9	<0.50	<0.050	<0.010	5.2	<0.025	520	0.085	<0.050	<0.050	<0.50	<0.038	1,900	<0.15	<0.15	1.2	<0.050	<1.0	2,100	12	<0.050	2,600	10
GRTS-MW01B	5/10/2018	N	440-211094-4	<4.0	64,000	3.4	0.53 J	<0.050	<0.010	9.6	<0.025	550	<0.025	<0.050	<0.050	0.52 J	<0.076	6,100	0.36	0.24	4.3	<0.050	<1.0	5,200	7.6	<0.050	6,600	11
GRTS-MW02A	5/10/2018	N	440-211094-1	<4.0	17,000	2.4	0.50 J	0.056 J	<0.010	4.2	<0.025	590	0.036 J	<0.050	<0.050	0.55 J	<0.038	1,200	0.12	<0.15	3.3	<0.050	<1.0	1,400	12	<0.050	1,600	11
GRTS-MW02B	5/10/2018	N	440-211094-2	<4.0	50,000	4.6	3.5	0.073 J	<0.010	9.0	<0.025	520	<0.025	<0.050	<0.050	3.7	<0.038	5,400	0.64	0.46	1.6	<0.050	<1.0	4,300	19	<0.050	4,800	12
GRTS-MW03A	5/7/2018	FD	440-210696-3	<4.0	8,600	2.2	<0.50	<0.050	<0.010	3.0	<0.025	670	0.11	<0.050	<0.050	<0.50	<0.038	570	<0.075	<0.15	0.55	<0.050	<1.0	560	19	<0.050	970	13
GRTS-MW03A	5/7/2018	N	440-210696-2	<4.0	8,600	1.9	<0.50	<0.050	<0.010	2.8	<0.025	640	0.11	<0.050	<0.050	<0.50	<0.038	540	<0.075	<0.15	0.51	<0.050	<1.0	540	19	<0.050	930	12
GRTS-MW03B	5/7/2018	N	440-210696-1	<4.0	50,000	4.1	<1.3	<0.13	<0.025	9.7	<0.063	570	<0.063	<0.13	<0.13	<1.3	<0.095	5,600	0.46 J	0.40 J	1.8	<0.13	<2.5	5,200	5.1	<0.13	5,300	13
GRTS-MW04A	5/8/2018	N	440-210833-1	<4.0	39,000	1.2	<0.50	<0.050	<0.010	8.6	<0.025	590	0.050	<0.050	<0.050	<0.50	<0.038	3,700	<0.15	<0.15	4.4	<0.050	<1.0	3,900	6.0	<0.050	4,700	12
GRTS-MW04B	5/8/2018	N	440-210833-2	<4.0	60,000	3.8	<0.50	<0.050	<0.010	11	<0.025	610	<0.025	<0.050	<0.050	<0.50	<0.038	6,300	0.36	0.34	1.3	<0.050	<1.0	6,000	5.0	<0.050	7,600	13
GRTS-MW05A	5/9/2018	N	440-210948-1	<4.0	11,000	1.9	<0.10	0.030	<0.0020	3.3	<0.0050	660	0.085	<0.010	0.020	<0.10	<0.0076	700	<0.030	<0.030	0.87	<0.010	<0.20	950	15	<0.010	1,200	12
GRTS-MW05B	5/9/2018	N	440-210948-2	<4.0	38,000	2.8	<0.50	<0.050	<0.010	8.1	<0.025	570	<0.025	<0.050	<0.050	<0.50	<0.038	4,000	<0.15	<0.15	5.0	<0.050	<1.0	4,600	6.6	<0.050	4,300	11
MCF-06B	5/9/2018	N	440-210948-4	<4.0	43,000	1.1	<0.50	<0.050	<0.010	7.3	<0.025	560	<0.025	<0.050	0.052 J	<0.50	<0.038	4,300	<0.15	<0.15	2.4	<0.050	<1.0	5,000	2.6	<0.050	4,800	9.9
MCF-06C	5/8/2018	N	440-210833-3	<4.0	7,600	1.6	<0.50	<0.050	<0.010	2.6	<0.025	730	0.091	<0.050	<0.050	<0.50	<0.038	460	<0.075	<0.15	0.36	<0.050	<1.0	380	26	<0.050	880	14

Notes  
 ug/L micrograms per liter SU  
 mg/L milligrams per liter mS/cm  
 mV millivolts C  
 FD Field duplicate NTU  
 N Normal field sample  
 The analyte was analyzed for, but was not detected  
 < above the level of the reported sample quantitation limit  
 J- The result is an estimated quantity, but the result may be biased low.  
 J The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.  
 The analyte was analyzed for, but was not detected.  
 UJ The reported quantitation limit is approximate and may be inaccurate or imprecise.  
 The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.  
 R

**Table 5**  
**Phase 1 : Pre-Design Groundwater Analytical Results from Monitoring Wells**  
 Galleria Road Bioremediation Treatability Study

Location	Sample Date	QCType	Lab SampleID	Dissolved Metals by SW6010B					Dissolved Metals by SW6020				SW7199	VFA-IC					
				Tin	Titanium	Tungsten	Vanadium	Zinc	Antimony	Arsenic	Selenium	Thallium	Chromium, Hexavalent	Acetic Acid	Butyric Acid	Formic Acid	Lactic Acid	Propionic Acid	Pyruvic Acid
				mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
ES-13	5/9/2018	N	440-210948-5	<0.50	<0.025	<0.50	<0.050	<0.12	<10	<10	50	<10	<0.25	<2.9	<2.6	<2.6	<3.1	<3.5	<19
GRTS-MW01A	5/10/2018	N	440-211094-3	<0.50	<0.025	<0.50	<0.050	<0.12	<10	19 J	360	13 J	79	<2.9	<2.6	<2.6	<3.1	<3.5	<37
GRTS-MW01B	5/10/2018	N	440-211094-4	<0.50	<0.025	<0.50	<0.050	<0.12	<10	13 J	18 J	<10	<0.25	<2.9	<2.6	<2.6	<3.1	<3.5	<19
GRTS-MW02A	5/10/2018	N	440-211094-1	<0.50	<0.025	<0.50	<0.050	<0.12	<10	<10	43	<10	25	<2.9	<2.6	<2.6	<3.1	<3.5	<37
GRTS-MW02B	5/10/2018	N	440-211094-2	<0.50	0.14	<0.50	<0.050	<0.12	<10	<10	<10	<10	<0.25	<2.9	<2.6	<2.6	<3.1	<3.5	<19
GRTS-MW03A	5/7/2018	FD	440-210696-3	<0.50	<0.025	<0.50	<0.050	<0.12	<10	31	40	<10	89	<2.9	<2.6	<2.6	<3.1	<3.5	<3.7
GRTS-MW03A	5/7/2018	N	440-210696-2	<0.50	<0.025	<0.50	<0.050	<0.12	<10	30	54	<10	89	<2.9	<2.6	<2.6	<3.1	<3.5	<3.7
GRTS-MW03B	5/7/2018	N	440-210696-1	<1.3	<0.063	<1.3	<0.13	<0.30 UJ	18 J	12 J	24 J	<10	<0.25	<2.9	<2.6	<2.6	<3.1	<3.5	<74 UJ
GRTS-MW04A	5/8/2018	N	440-210833-1	<0.50	<0.025	<0.50	<0.050	<0.12	<10	22	170 J-	<10	42	<2.9 UJ	<2.6 UJ	<2.6 UJ	<3.1 UJ	<3.5 UJ	<74 UJ
GRTS-MW04B	5/8/2018	N	440-210833-2	<0.50	<0.025	<0.50	<0.050	<0.12	<10	<10	<10	<10	<0.25	<2.9	<2.6	<2.6	<3.1	<3.5	<74
GRTS-MW05A	5/9/2018	N	440-210948-1	<0.10	<0.0050	<0.10	<0.010	<0.024	<10	16 J	48	<10	75	<5.8	<5.2	<5.2	<6.2	<7.0	<7.4 UJ
GRTS-MW05B	5/9/2018	N	440-210948-2	<0.50	<0.025	<0.50	<0.050	<0.12	<10	<10	41	<10	12	<5.8	<5.2	<5.2	<6.2	<7.0	<37
MCF-06B	5/9/2018	N	440-210948-4	<0.50	<0.025	<0.50	<0.050	<0.12	<10	<10	91	<10	<0.25	<2.9	<2.6	<2.6	<3.1	<3.5	<19
MCF-06C	5/8/2018	N	440-210833-3	<0.50	<0.025	<0.50	<0.050	<0.12	<10	50	44	<10	70	<2.9	<2.6	<2.6	<3.1	<3.5	<3.7

Notes

- ug/L micrograms per liter SU
- mg/L milligrams per liter mS/cm
- mV milliVolts C
- FD Field duplicate NTU
- N Normal field sample  
The analyte was analyzed for, but was not detected
- < above the level of the reported sample quantitation limit
- J- The result is an estimated quantity, but the result may be biased low.
- J The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
- J The analyte was analyzed for, but was not detected.
- UJ The reported quantitation limit is approximate and may be inaccurate or imprecise.  
The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.
- R