

February 22, 2019

## TECHNICAL MEMORANDUM

To: Steve Clough  
Nevada Environmental Response Trust

From: John Pekala, CEM#2347, Expires 9/20/2020, Ramboll  
Jessica Donovan and Greg Kinsall, Ramboll

Re: **RI Phase 3 Modification No. 6  
Nevada Environmental Response Trust Site  
Henderson, Nevada  
Ramboll Project No. 1690011200-050**

This Technical Memorandum presents Ramboll's recommended Modification No. 6 to the scope of work for the Remedial Investigation (RI) Phase 3 Investigation currently in progress at the Nevada Environmental Response Trust Site (the "Site") located in Henderson, Nevada. This modification includes additional field activity as detailed below.

### **AECOM Phase 2 Downgradient Study Monitoring Well Installations**

AECOM specified the installation of additional soil borings and monitoring wells to further evaluate perchlorate contamination in groundwater migrating into the Las Vegas Wash (LVW) as described in the *Data Gap Investigation Plan – Phase II Groundwater Quality Assessment* (AECOM January 2019). At the request of NDEP, and through this RI Phase 3 Modification No. 6, the Trust will contract the drilling contractor responsible for installing these soil borings/wells and perform related activities associated with the drilling. On behalf of the Trust, Ramboll will contract with the driller/developer for completion of the soil borings/wells and will provide a geologist for contractor oversight during drilling. Ramboll's project role will be to manage the driller/developer's efforts, observe field conditions, collect soil samples, and conduct nuclear magnetic resonance (NMR) logging. AECOM's project role will be to conduct geologic logging during drilling activities, collect groundwater samples following well completion, conduct hydraulic pumping tests and tracer testing, and install transducers in each well.

Phase 3 Modification No. 6 will include the drilling of 14 soil borings along the LVW for the purposes of collecting soil samples for laboratory analyses and the installation of 14 4-inch diameter groundwater monitoring wells (primary wells, see Figure 1). The soil borings/wells will be located within previously approved parcel boundaries in the Revocable Permit for Occupancy of Clark County Owned Property by the Nevada Environmental Response Trust dated May 15, 2018 ("Revocable Permit"). The affected Clark County Assessor's Parcel Nos. and the primary wells associated with each parcel are:

- 160-29-601-001 (wells NERT4.65N1, NERT4.64N1, and NERT4.70N1);
- 160-29-701-002 (wells NERT4.71N1, NERT4.71S2, and NERT4.64S1);

- 160-28-201-003 (well NERT3.98S1); and
- 160-28-501-003 (wells NERT3.63S1, NERT3.60S1, NERT3.58S1, NERT3.40S1, NERT3.35S1, NERT3.60N1, and NERT3.58N1).

Additionally, 12 2-inch diameter observation wells will be installed to be used to monitor water levels during planned aquifer pumping tests to be conducted by AECOM; four each centered around the previously identified primary wells NERT4.64S1, NERT3.60S1, and NERT3.58S1. The observation wells will be labeled OW4.64S1-A, B, C, D; OW3.60S1-A, B, C, D; and OW3.58S1-A, B, C, D. The locations of the observation wells are anticipated to be within 30 feet of their associated primary wells, but the precise locations will be selected by AECOM after initial permeability testing of the primary wells.

Ramboll will retain a licensed drilling contractor to advance the soil borings using a combination of roto sonic and air rotary drilling methods, as appropriate for the conditions encountered. Table 1 provides location rationale and construction details for the primary monitoring wells and observation wells. As described in AECOM's work plan, continuous soil cores will be collected for lithologic logging and sampling during drilling for the 14 primary wells. Primary soil borings, except for two locations (NERT4.71S2 and NERT4.63S1), will be advanced to a depth of up to 90 feet below ground surface (bgs) and soil samples will be collected at 10-foot intervals for laboratory analysis (perchlorate, chlorate, total chromium and moisture content). After completion of the 90-foot soil borings, the boreholes will be backfilled to the appropriate depth for the primary wells with planned constructed depths ranging between 35 and 60 feet bgs. Primary monitoring wells will be constructed using 4-inch diameter schedule 40 polyvinyl chloride (PVC) casing and screened with slotted PVC well screen. Wells will be completed with flush-mounted, tamper-resistant, traffic-rated well boxes at an elevation approximately one-half inch above grade. Observation wells will range in depth between 35 and 55 feet bgs and will be constructed of 2-inch schedule 40 PVC with slotted PVC well screen. It is anticipated that observation wells will be decommissioned after completion of the aquifer pumping tests.

In addition to the activities planned in the Data Gap Investigation Plan – Phase II Groundwater Quality Assessment (AECOM January 2019), Ramboll will select a subset of soil samples from the primary soil borings for physical tests including grain size distribution, porosity, bulk density, and fraction organic carbon (foc) to support soil descriptions and future dissolved mass calculations (to be presented in the RI Report for OU-3). Table 1 specifies the depth intervals that the soil samples will be collected and the planned laboratory analysis. This will provide additional information on the distribution of contaminants in the subsurface outside of the screened interval and is consistent with the sampling program for the Phase 3 RI Work Plan within the Northeast Sub-Area (Ramboll Environ 2017). This data will be used to determine the extent of perchlorate in the subsurface and provide for a more refined estimate of perchlorate mass in the environment.

Please contact us should you have any questions regarding the recommended scope of RI Phase 3 Modification No. 6.

**Attachments**

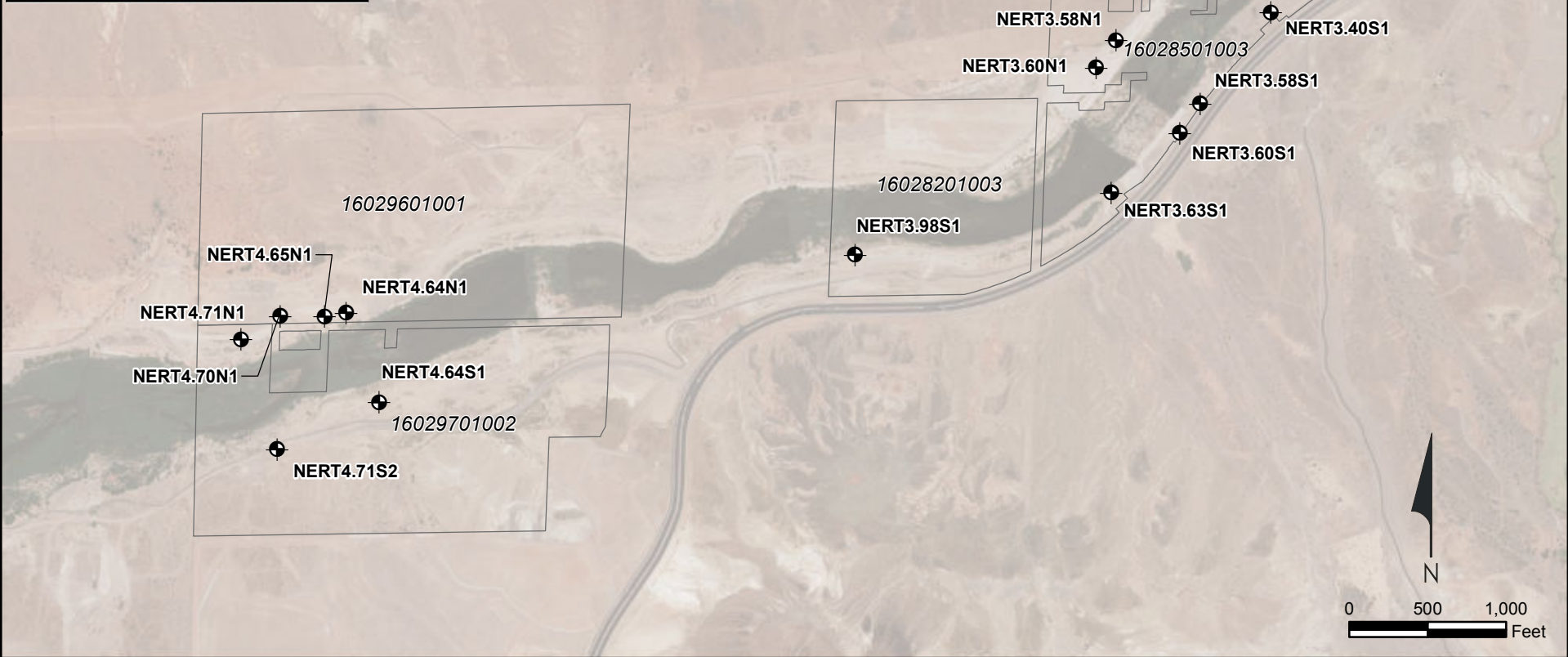
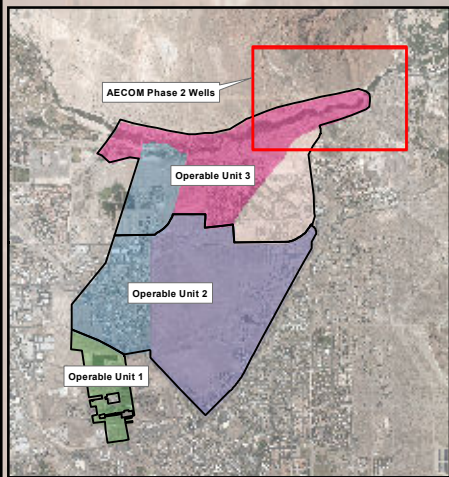
Table 1 Revised AECOM Downgradient Investigation Monitoring Well Installation

Figure 1 AECOM Downgradient Investigation Monitoring Well Installation Locations

**References:**

AECOM. 2017. Data Gap Investigation Plan – Phase I Groundwater Well Installation, NERT Remedial Investigation – Downgradient Study Area, Nevada Environmental Response Trust Site, Henderson, Nevada. May.

Ramboll Environ. 2017. RI/FS Work Plan Addendum: Phase 3 Remedial Investigation, Revision 1, Nevada Environmental Response Trust Site, Henderson, Nevada. October 27.



**AECOM Downgradient Investigation Monitoring Well Installation Locations**  
 Nevada Environmental Response Trust Site  
 Henderson, Nevada

Figure  
**1**

**Table 1**  
**Revised AECOM Downgradient Investigation**  
**Monitoring Well Installation**  
NERT RI - Downgradient Study Area  
Henderson, Nevada

Proposed Phase II Well	Boring Depth in feet bgs <sup>(1)</sup>	Planned Sampling Intervals in feet bgs	Soil Sample Analyses				Well Depth in feet bgs	Well Diameter <sup>(2)</sup>	Well Screen in feet bgs <sup>(3)</sup>	Sand Pack Interval in feet bgs <sup>(4)</sup>	Geology and Approximate Distance from Pertinent Features
			Chlorate	Perchlorate	Total Chromium	Moisture Content					
NERT4.71S2	55	10, 20, 30, 40, 50	X	X	X	X	55	4"	35 - 55	33 - 55	This proposed well is in alluvium overlying the Muddy Creek formation 410 feet north-northeast of well LVWPS-205B and 530 feet west-southwest of well LVWPS-210A. It is about 160 feet southwest of the proposed location of well LVWPS-MM218.
NERT4.64S1	55	10, 20, 30, 40, 50	X	X	X	X	55	4"	35 - 55	33 - 55	This well is in alluvium overlying the Muddy Creek formation 190 feet east northeast from well LVWPS-210A and 180 feet west southwest of proposed well LVWPS-MM219.
NERT4.71N1	90	10, 20, 30, 40, 50, 60, 70, 80, 90	X	X	X	X	55	4"	35 - 55	33 - 55	This proposed well is in alluvium overlying the Muddy Creek formation 640 feet south of proposed well WMW4.9N.
NERT4.70N1	90	10, 20, 30, 40, 50, 60, 70, 80, 90	X	X	X	X	50	4"	30 - 50	28 - 50	This proposed well is in alluvium overlying the Muddy Creek formation. It is about 280 feet west of Phase II proposed well NERT4.71N1.
NERT4.65N1	90	10, 20, 30, 40, 50, 60, 70, 80, 90	X	X	X	X	50	4"	30 - 50	28 - 50	This proposed well is in alluvium overlying the Muddy Creek formation. It is about 265 feet west northwest of Phase II proposed well NERT4.70N1
NERT4.64N1	90	10, 20, 30, 40, 50, 60, 70, 80, 90	X	X	X	X	50	4"	30 - 50	28 - 50	This proposed well is in alluvium overlying the Muddy Creek formation. It is 135 feet west northwest of Phase II proposed well NERT4.65N1.
NERT3.98S1	90	10, 20, 30, 40, 50, 60, 70, 80, 90	X	X	X	X	50	4"	30 - 50	28 - 50	This proposed well is in alluvium overlying the Muddy Creek formation. It is about 70 feet south of the downgradient edge of Homestead weir.
NERT3.63S1	90	10, 20, 30, 40, 50, 60, 70, 80, 90	X	X	X	X	40	4'	20 - 40	18 - 40	This proposed well is in alluvium overlying the Thumb formation. It is about 200 feet south-southwest of Three Kids Weir. It is about 600 feet west-southwest of proposed well WMW3.5S. The actual depth and screened interval of the proposed well will be dependent on the ground surface elevation where the proposed well is drilled and the depth to groundwater.
NERT3.60S1	90	10, 20, 30, 40, 50, 60, 70, 80, 90	X	X	X	X	35	4"	15 - 35	13 - 35	This proposed well is in alluvium overlying the Thumb formation. It is about 140 feet south-southeast of Three Kids Weir. It is approximately 195 feet northwest of proposed well WMW3.5S. The actual depth and screened interval of the proposed well will be dependent on the ground surface elevation where the proposed well is drilled and the depth to groundwater.
NERT3.58S1	90	10, 20, 30, 40, 50, 60, 70, 80, 90	X	X	X	X	35	4"	15 - 35	13 - 35	This proposed well is in alluvium overlying the Thumb formation. It is about 200 feet east northeast of three Kids Weir. It is about 225 feet northwest of Phase II proposed well NERT3.60S. The actual depth and screened interval of the proposed well will be dependent on the ground surface elevation where the proposed well is drilled and the depth to groundwater.
NERT3.60N1	90	10, 20, 30, 40, 50, 60, 70, 80, 90	X	X	X	X	40	4"	20 - 40	18 - 40	This proposed well is in the Thumb formation. It is about 300 feet northeast of well WMW3.5N. Although there was not a warm water anomaly detected, the high surface water concentration(200 µg/L) indicates that there is perchlorate entering LVW I this area.

**Table 1**  
**Revised AECOM Downgradient Investigation**  
**Monitoring Well Installation**  
NERT RI - Downgradient Study Area  
Henderson, Nevada

Proposed Phase II Well	Boring Depth in feet bgs <sup>(1)</sup>	Planned Sampling Intervals in feet bgs	Soil Sample Analyses				Well Depth in feet bgs	Well Diameter <sup>(2)</sup>	Well Screen in feet bgs <sup>(3)</sup>	Sand Pack Interval in feet bgs <sup>(4)</sup>	Geology and Approximate Distance from Pertinent Features
			Chlorate	Perchlorate	Total Chromium	Moisture Content					
NERT3.70N1	90	10, 20, 30, 40, 50, 60, 70, 80, 90	X	X	X	X	40	4"	20 - 40	18 - 40	This proposed well is in the Thumb formation. It is about 150 feet north of Three Kids Weir. Although there was not a warm water anomaly detected the high surface water concentration indicates that there is perchlorate entering LVW in this area.
NERT3.40S1	90	10, 20, 30, 40, 50, 60, 70, 80, 90	X	X	X	X	60	4"	40 - 60	38 - 60	This proposed well is about 180 feet southeast of LVW. It is about 280 southwest of Proposed well NERT3.35S1. This proposed well is in alluvium overlying the Horse Spring formation. Some Las Vegas Wash conglomerate may also be present. The actual depth and screened interval of the proposed well will be dependent on the ground surface elevation where the proposed well is drilled and the depth to groundwater.
NERT3.35S1	90	10, 20, 30, 40, 50, 60, 70, 80, 90	X	X	X	X	35	4"	15 - 35	13 - 35	This proposed wells is about 250 feet southeast of LVW. This proposed well is in alluvium overlying the Horse Spring formation. Some Las Vegas Wash conglomerate may also be present. The actual depth and screened interval of the proposed well will be dependent on the ground surface elevation where the proposed well is drilled and the depth to groundwater.
<b>Proposed Observation Wells</b>											
4 wells around NERT4.64S1	55	NA	NA	NA	NA	NA	55	2"	35 - 55	33 - 55	4 observation wells, no sampling needed, depths depend on the pumping well final depth (names will be OBS4.64S1A,B,C,D)
4 wells around NERT3.60S1	40	NA	NA	NA	NA	NA	40	2"	20 - 40	18 - 40	4 observation wells, no sampling needed, depths depend on the pumping well final depth (names will be OBS3.60S1A,B,C,D)
4 wells around NERT3.58S1	35	NA	NA	NA	NA	NA	35	2"	15 - 35	13 - 35	4 observation wells, no sampling needed, depths depend on the pumping well final depth (names will be OBS3.58S1A,B,C,D)

**Notes:**

- (1) Borehole depth is similar to other NERT offsite RI wells to provide stratigraphic information at comparable depths.
- (2) The borehole is 8 inches in diameter and sealed with bentonite from the total depth to the planned well screen.
- (3) Well casing is 4 inch schedule 40 PVC and well screen slot size is 0.02 inches except for observation wells, which are 2" diameter.
- (4) Sand Pack size is No. 3.

NA - Not applicable

µg/L: micrograms per liter

bgs: below ground surface

Soil sample depths may be altered or additional samples may be collected based on observations of the field geologist.

Selected samples will be collected for soil physical properties testing.

**RI Phase 3 Modification No. 6  
AECOM Phase II Downgradient  
Study Area Well Installations**

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

**Nevada Environmental Response Trust (Trust) 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 the Trust. Based on my own involvement and/or my inquiry of the person or persons who manage the system(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, Inc., not individually, but solely in its representative capacity as the Nevada Environmental Response Trust Trustee

**Signature:** Jay A Steinberg, not individually but solely as Pres. Serv, 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:** 2/22/18

**RI Phase 3 Modification No. 6  
AECOM Phase II Downgradient  
Study Area Well Installations**

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

**Responsible Certified Environmental Manager (CEM) for this project**

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 provided 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.



February 22, 2019

---

**John M. Pekala, PG  
Principal**

---

**Date**

Certified Environmental Manager  
Ramboll US Corporation  
CEM Certificate Number: 2347  
CEM Expiration Date: September 20, 2020