

November 13, 2018

**TECHNICAL MEMORANDUM**

**To:** Steve Clough  
Nevada Environmental Response Trust

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

**Re:** **RI Phase 2 Modification No. 15**  
**Nevada Environmental Response Trust Site**  
**Henderson, Nevada**  
**Ramboll Project No. 1690006943-011**

This Technical Memorandum presents Ramboll’s recommended Modification No. 15 to the scope of work for the Remedial Investigation (RI) Phase 2 Investigation currently in progress at the Nevada Environmental Response Trust Site (the “Site”) located in Henderson, Nevada. This recommended modification proposes additional deeper investigation borings and deeper monitoring wells in Area 1 (the former AP-5 Pond) at the NERT Site to better delineate the vertical extent of perchlorate and other COPCs in the subsurface. AP-5 Pond closure activities were completed by Tetra Tech in September 2018. NERT is currently working with the Nevada Division of Environmental Protection, Bureau of Water Pollution Control on the administrative closure of the pond.

The AP-5 Pond was designated as additional soil investigation Area 1 in the NERT 2014 RI/FS Work Plan. The scope of work for future investigation at the AP-5 Pond following its closure was presented in the 2014 Field Sampling Plan (FSP). The proposed investigation consisted of eight (8) soil borings (RISB-1 through RISB-8) advanced to the groundwater table, and soil sampling at nominal five-foot intervals to the water table followed by collection of a one-time groundwater grab sample at each of eight investigation locations.

Several new shallow groundwater monitoring wells have been installed in the vicinity of the former AP-5 Pond as part of treatability studies conducted by Tetra Tech. Three of these wells (DFW-03, DFW-04, DFW-05) are located immediately south (upgradient) of the former AP-5 Pond, and well cluster UFMW-06S/-06I/-06D is located to west in the former AP Plant area (see Figure 1). The depth to groundwater in this part of the Site is approximately 30-35 feet below ground surface (bgs), and the deepest of these wells is screened from 45-50 feet bgs. Since additional data are now available for shallow groundwater in this area, the original AP-5 Pond sampling plan will be modified to include deeper investigation locations, as described below. The investigation locations are shown on Figure 1.

- Five borings (RISB-1 through RISB-5) will be advanced and sampled as presented in the 2014 FSP. One-time groundwater samples will be collected at the water table at

each of the five investigation locations. The sampling and analysis plan (excerpted from the 2014 FSP) is presented in Table 1.

- Three deeper borings (RIDB-34, RIDB-35, RIDB-36) will be drilled to a total depth of 150 feet bgs. Soil samples will be collected generally at 10-foot intervals for chemical analysis to provide data to assess the vertical extent of COPCs, particularly in the Upper Muddy Creek Formation (UMCf). The sampling and analysis plan is presented in Table 2 and is based on the sampling plan for RI Phase 2 on-site deep borings.
- Boring RIDB-35 is positioned over the projected location of a paleochannel that extends beneath the former AP-5 Pond. Gravels likely associated with the paleochannel were identified between depths of 30-39 feet bgs at the upgradient well locations DFW-04 and DFW-05. Following completion of boring RIDB-35, up to three clustered monitoring wells will be installed at this location to assess both shallow and deeper groundwater beneath the former AP-5 Pond. Table 3 presents the planned well construction and proposed analytical scheme, which are consistent with the analytical parameters chosen for the Phase 2 RI groundwater investigation within the Site. However, the planned well screens may be adjusted if permeable zones in the UMCf are encountered in soil boring RIDB-35.

Please contact us should you have any questions about the recommended modifications to the former AP-5 Pond investigation locations.

### **Attachments**

- |          |   |
|----------|---|
| Table 1  | Soil and Grab Groundwater Sampling in Area 1 Shallow Borings                          |
| Table 2  | Soil Sampling at New Deep Soil Borings – On-Site NERT RI Study Area                   |
| Table 3  | Groundwater Sampling at New Groundwater Monitoring Wells – On-Site NERT RI Study Area |
| Figure 1 | Phase 2 RI Investigation – Modification No. 15  |

**TABLE 1. SOIL AND GRAB GROUNDWATER SAMPLING IN AREA 1 SHALLOW BORINGS**

**Phase 2 RI Investigation - Modification No. 15**

**Nevada Environmental Response Trust Site; Henderson, Nevada**

Boring or Test Pit IDs	Area Number and Location Description	Rationale	Anticipated Approximate Depth to Groundwater (ft bgs)	Sampling Intervals (ft bgs)				
					Chlorates <sup>1</sup>	Common Metals <sup>2</sup>	Hexavalent Chromium	General Chemistry <sup>3</sup>
<b>SOIL BORINGS</b>								
RISB-1 through RISB-5	AREA 1 Pond AP-5	Assessment of impacts to subsurface beneath pond (to be completed after pond decommissioning)	30	0-0.5	X	X	X	X
				5-5.5	X	X	X	X
				10-10.5	X	X	X	X
				Additional 5' intervals as necessary to capillary fringe	X	X	X	X
				Capillary fringe	X	X	X	X
				Grab GW	X	X	X	X

**Notes:**

ft bgs: feet below ground surface

GW: Groundwater

1. Includes perchlorate and chlorate.
2. Includes aluminum, antimony, arsenic, barium, boron, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, and zinc.
3. Includes ammonia, bromide, carbonate, chloride, nitrate, nitrite, phosphorus (total), ortho-phosphate, silicon, sulfate, and sulfur.

Source: TABLE 2, SOIL AND GRAB GROUNDWATER SAMPLING IN BORINGS AND EXPLORATORY TEST PITS, Field Sampling Plan, Revision 1, July 18, 2014.

**TABLE 2. SOIL SAMPLING AT NEW DEEP SOIL BORINGS - ON-SITE NERT RI STUDY AREA**  
**Phase 2 RI Investigation - Modification No. 15**  
**Nevada Environmental Response Trust Site; Henderson, Nevada**

Boring Number	NERT On-Site Location	Rationale for Sampling	Planned Samples*		Soil Analytical Testing Program [1]													
			Boring Depth (ft bgs)	Planned Soil Sample Depths (ft bgs)	Perchlorate	Chlorate	Chromium, total	Nitrate, Nitrite	VOCs	Moisture Content	Other Metals <sup>2</sup>	SVOCs <sup>3</sup>	PAHs <sup>4</sup>	PCBs <sup>5</sup>	Dioxins/Furans	OCPs <sup>6</sup>	Radio-nuclides <sup>7</sup>	
RIDB-34	AREA 1 - Former AP-5 Pond	Investigation of the presence, lateral extent, and vertical extent of COPCs	150	1, 5, 10, 20, 30	X	X	X	X	X	X	X	X	X	X	X	X	X	
				40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150	X	X	X	X	X									
150			1, 5, 10, 20, 30	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
			40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150	X	X	X	X	X										
RIDB-35			150	1, 5, 10, 20, 30	X	X	X	X	X	X	X	X	X	X	X	X	X	X
				40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150	X	X	X	X	X									
RIDB-36	150	1, 5, 10, 20, 30	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
		40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150	X	X	X	X	X											

**Notes:**

\* Sample depths may be modified based on subsurface lithologies encountered during drilling.

ft bgs: feet below ground surface

VOCs: Volatile organic compounds

[1] Approximately 20% of the soil samples will be tested for physical properties, including Atterberg Limits and/or grain size distribution, porosity, bulk density, and fraction organic carbon (foc). Approximately 5% of the soil samples will be selected for vertical permeability testing.

**Other Soil Chemicals of Potential Concern (COPCs)**

2. Other metals - antimony, arsenic, barium, boron, cadmium, chromium VI, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, niobium, phosphorus (total), silver, strontium, thallium, and tungsten.
3. SVOCs - analysis for the COPCs hexachlorobenzene, 1-methylnaphthalene, and octachlorostyrene.
4. PAHs - analysis for the COPCs benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, and phenanthrene.
5. PCBs - analysis for the COPC Arochlor 1260.
6. Organochlorine Pesticides (OCPs) - analysis for the COPCs beta-BHC, 4,4-DDE, and 4,4-DDT
7. Radionuclides - analysis for the COPCs radium-226, radium-228, thorium-228, thorium-230, and thorium-232.

Source: Adapted from TABLE 7-2. SOIL SAMPLING AT NEW DEEP SOIL BORINGS - ON-SITE NERT RI STUDY AREA, Technical Memorandum, Remedial Investigation Data Evaluation, May 2, 2016

**TABLE 3. GROUNDWATER SAMPLING AT NEW GROUNDWATER MONITORING WELLS - ON-SITE NERT RI STUDY AREA**  
**Phase 2 RI Investigation - Modification No. 15**  
**Nevada Environmental Response Trust Site; Henderson, Nevada**

Monitoring Well ID	NERT On-Site Location	Rationale for Sampling	Well Construction Details for New Wells*						Groundwater Analytical Testing Program						
			Pilot Boring Depth (ft bgs)	Casing Diameter and Type	Screen Size (inches)	Screened Interval (ft bgs)	Sand Pack Interval (ft bgs)	Sand Pack Size	Chlorates <sup>1</sup>	Dissolved Metals <sup>2</sup>	VOCs <sup>3</sup>	PCBs <sup>4</sup>	Radio-nuclides <sup>5</sup>	Major Ions <sup>6</sup>	Geochemical Parameters <sup>7</sup>
<b>Former AP-5 Pond</b>															
M-256	Adjacent to new boring RIDB-35	Well cluster to monitor groundwater in the Shallow and Middle WBZ UMCf	71	4" PVC	0.01	60-70	58-70	No. 2/12	X	X	X	X	X	X	X
M-257			91	4" PVC	0.01	80-90	78-90	No.2/12	X	X	X	X	X	X	X
M-258			111	4" PVC	0.01	100-110	98-110	No. 2/12	X	X	X	X	X	X	X

**Notes:**

\* Well construction details may be modified based on subsurface lithologies encountered during drilling.

ft bgs: feet below ground surface

VOCs: Volatile organic compounds

1. Includes perchlorate and chlorate.

2. Dissolved metals analysis includes aluminum, arsenic, boron, total chromium, hexavalent chromium, iron, lead, magnesium, manganese, total phosphorus, and strontium.

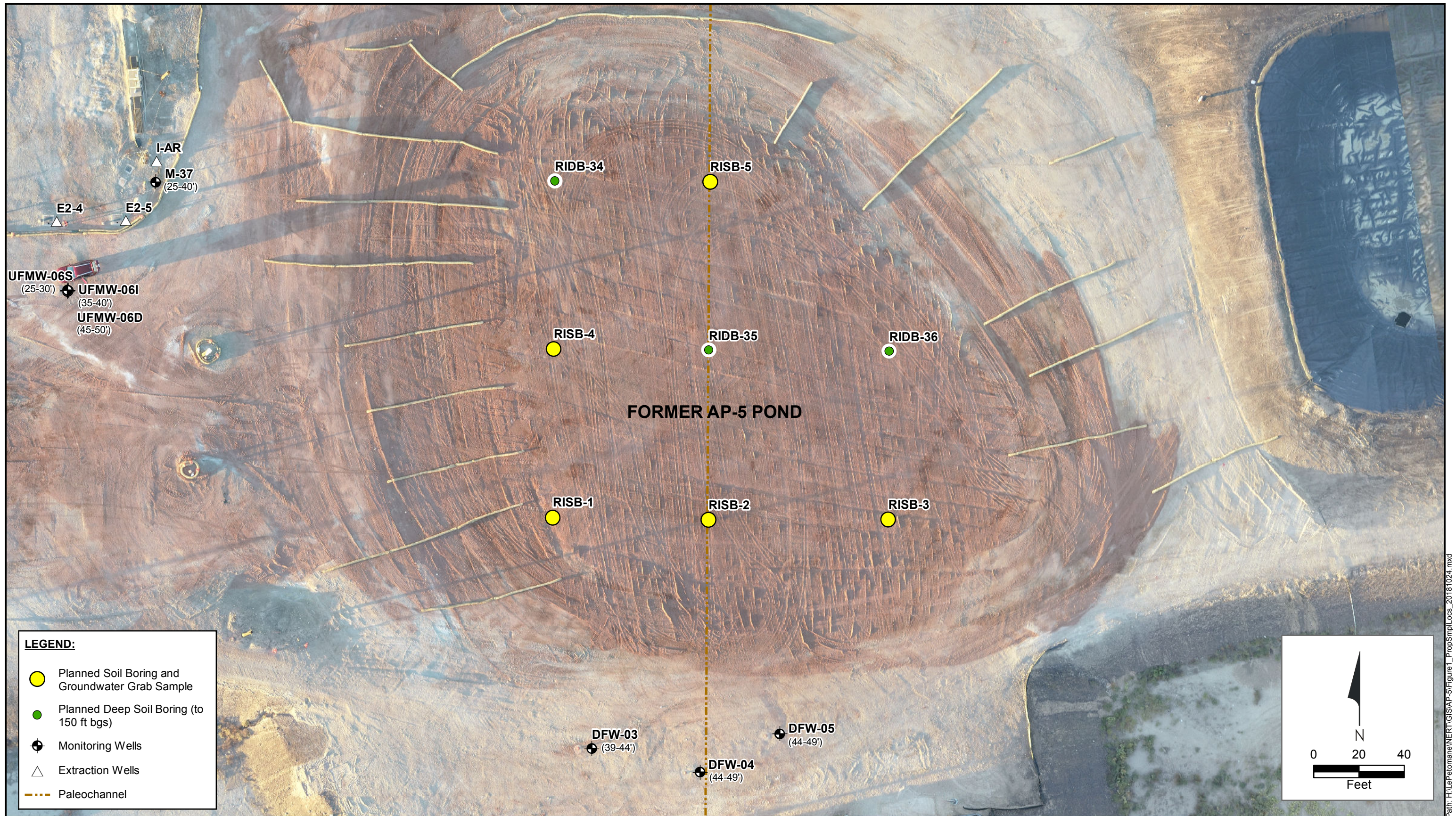
3. VOCs analysis by EPA Method 8260B; 1,2,3-trichloropropane analysis by EPA Method 8260SIM.

4. PCBs - analysis for the COPC Arochlor 1260.

5. Radionuclides - analysis for the COPC Total Uranium.

6. Major ions include pH, total dissolved solids (TDS), electrical conductivity (EC), and major dissolved ions (calcium, sodium, potassium, sulfate, nitrate, chloride, bicarbonate/carbonate alkalinity, hydroxide).

7. Geochemical parameters include field parameters (dissolved oxygen, redox potential, temperature, turbidity, ferrous iron, sulfide), dissolved organic carbon, bromide, phosphate, nitrite, and sulfide.



**LEGEND:**

- Planned Soil Boring and Groundwater Grab Sample
- Planned Deep Soil Boring (to 150 ft bgs)
- Monitoring Wells
- Extraction Wells
- Paleochannel

N

0    20    40

Feet



**Phase 2 RI Investigation - Modification No. 15**  
 Nevada Environmental Response Trust Site  
 Henderson, Nevada

Figure  
**1**

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**RI Phase 2 Modification No. 15**

**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. Tr.  
not individually but solely as Pres. Tr.

**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:** 11-13-18

**RI Phase 2 Modification No. 15**

**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.



November 13, 2018

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**John M. Pekala, PG**  
**Principal**

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**Date**

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