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ENVIRONMENT
& HEALTH

July 17, 2018

**TECHNICAL MEMORANDUM**

To: Steve Clough
Nevada Environmental Response Trust

From: John Pekala, CEM#2347, Expires 9/20/2018, Ramboll
Elizabeth Miesner, Jessica Donovan, Kun Zhao and Shuo Yu, Ramboll

**Re: RI Phase 2 Modification No. 12**
**Recommended Soil, Soil Gas and Groundwater Sampling in Parcel E**
**Nevada Environmental Response Trust Site**
**Henderson, Nevada**
**Ramboll Project No. 1690006608-020**

This Technical Memorandum presents Ramboll US Corporation's (Ramboll) recommended Modification No. 12 to the scope of work for the Remedial Investigation (RI) Phase 2 Investigation currently in progress at the Nevada Environmental Response Trust (NERT) Site (the "Site") located in Henderson, Nevada. This recommended modification proposes soil, soil gas and groundwater sampling at locations identified in Parcel E to fill data needs for the Baseline Health Risk Assessment (BHRA) for Parcel E. Since 1985, Parcel E has been occupied with the southeastern portion of an extraction well field and the recharge trench for the groundwater treatment system (GWTS) operated by Olin Chlor-Alkali/Stauffer/ Syngenta/Montrose (OSSM) as required by OSSM's April 4, 1983 Consent Order with the State of Nevada, Department of Conservation and Natural Resources, Division of Environmental Protection to treat impacts to groundwater trespassing on Parcel E from the OSSM properties. OSSM was provided with the proposed locations for soil, soil gas and groundwater sampling on Parcel E and did not have any comments.

As described in the 2014 BHRA Work Plan[1], potentially complete human exposure pathways for Parcel E have been identified as inhalation of volatile organic compounds (VOCs) migrating from soil gas and groundwater to indoor air, outdoor air, and trench air, as well as direct contact with surface and sub-surface soils (i.e., ingestion, dermal contact, inhalation of soil particulates).

## Proposed Soil Investigation in Parcel E

Collecting surface and sub-surface soil samples will fill the data gaps for evaluating relevant exposures to soil in the BHRA for Parcel E, and benefit the analysis in the Refined

[1] ENVIRON. 2014. Baseline Health Risk Assessment Work Plan, Revision 0, Nevada Environmental Response Trust Site, Henderson, Nevada. February 28. NDEP approved on May 20, 2014.

Screening-Level Ecological Risk Assessment (SLERA) being conducted for Operable Unit 1 (OU-1)[2]. As shown on Figure 1, seven soil sampling locations are proposed in Parcel E. These soil samples include four judgmental locations adjacent to existing shallow groundwater monitoring wells and three additional locations in Parcel E for better spatial coverage. Both surface (0-1.5 feet bgs) and sub-surface (10-11.5 feet bgs) soil samples are proposed to fulfill the data needs for evaluating relevant exposures to soil in both the BHRA and the SLERA. These soil sample locations are summarized in Table 1 and discussed in further detail below:

- Four judgmental soil sample locations (RISB-EJ-01, RISB-EJ-02, RISB-EJ-03, and RISB-EJ-04) adjacent to existing shallow groundwater monitoring wells MC-09R, MC-29, MC-94, and MC-97, respectively, are proposed.
- Three additional soil sample locations (RISB-ER-01, RISB-ER-02, and RISB-ER-03) are proposed.

## Proposed Soil Gas Investigation in Parcel E

One soil gas sample (SG-17) was collected in Parcel E, at a depth of 5 feet below ground surface (bgs), during the 2008 site-wide soil gas survey. The soil gas sampling approach was consistent with current United States Environmental Protection Agency (USEPA) guidance, as described in the Phase B Source Area Investigation Work Plan Soil Gas Survey[3], which was approved by the Nevada Division of Environment Protection (NDEP) on March 26, 2008. The 2008 soil gas sample location is shown on Figure 1. The results are considered acceptable for use in the BHRA and are discussed in the 2010 Site-Wide Soil Gas Human Health Risk Assessment Report[4]. However, additional soil gas samples are recommended to fulfill the data needs to evaluate human health risks through the vapor inhalation pathways in the BHRA. As shown on Figure 1, four soil gas sampling locations (RISG-31, RISG-32, RISG-33, and RISG-34) are proposed in Parcel E. These soil gas samples have been proposed at locations adjacent to existing shallow groundwater monitoring wells in Parcel E, and to obtain both shallow (5 feet bgs) and deeper soil gas samples (15 feet bgs), consistent with current vapor intrusion guidance[5] recommending samples closer to the source (i.e., VOCs in groundwater). These sample locations are summarized in Table 2 and discussed in further detail below:

- One soil gas sample location (RISG-31) is proposed to confirm concentrations of VOCs at a previous soil gas sample location (SG-17) in the southeastern portion of Parcel E. A soil gas sample was previously collected at 5 feet bgs at this location. This proposed location is adjacent to existing shallow groundwater monitoring well MC-97 and proposed soil sample location RISB-EJ-04.

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[2] ENVIRON. 2015. Refined Screening-Level Ecological Risk Assessment Work Plan, Revision 2. Nevada Environmental Response Trust Site, Henderson, Nevada. July. NDEP approved on August 14, 2015.

[3] ENSR. 2008. Phase B Source Area Investigation Work Plan, Soil Gas Survey, Tronox LLC Facility, Henderson, Nevada, March. NDEP approved on March 26, 2008.

[4] Northgate and Exponent. 2010. Site-Wide Soil Gas Human Health Risk Assessment, Tronox LLC, Henderson, Nevada, November 22.

[5] USEPA. 2015. OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air. EPA9200.2-154. June.

- One soil gas sample location (RISG-32) is proposed in the northeastern portion of Parcel E. This soil gas sample location was not previously sampled. It is adjacent to existing shallow groundwater monitoring well MC-94 and proposed soil sample location RISB-EJ-03.
- One soil gas sample location (RISG-33) is proposed in the southern portion of Parcel E. This soil gas sample location was not previously sampled. It is adjacent to existing shallow groundwater monitoring well MC-29 and proposed soil sample location RISB-EJ-02.
- One soil gas sample location (RISG-34) is proposed in the northwestern portion of Parcel E. This soil gas sample location was not previously sampled. It is adjacent to existing shallow groundwater monitoring well MC-09R and proposed soil sample location RISB-EJ-01.

## Proposed Groundwater Investigation in Parcel E

VOC data has been collected at four monitoring wells (MC-09R, MC-29, MC-97, and MC-111) in Parcel E (Figure 1) since 2014, as part of the RI Phase 1, the NERT annual groundwater monitoring program implementation, or OSSM's annual groundwater monitoring sampling events[6]. It is recommended that groundwater samples be collected concurrent with the soil gas samples. As shown on Figure 1 and as summarized on Table 3, there are five existing monitoring wells in Parcel E. Wells MC-09R, MC-29, MC-97, and MC-111 have all been sampled in recent years (most in 2017 with MC-97 last sampled in 2015); MC-94 was last sampled in 2009. It is proposed that groundwater samples be collected from these five monitoring wells during this investigation, unless they will be collected in the same timeframe under another program (e.g., OSSM already plans to sample them as part of their sampling program).

## Laboratory Analysis

As described in the RI Phase 1 Field Sampling Work Plan[7] and the NERT RI Quality Assurance Project Plan[8], the soil sample analyses will be conducted by NDEP-certified laboratories following the standard USEPA analytical methods listed below:

- USEPA Method 9056, 300, or 300.1 (chlorate)
- USEPA Method 314.0 (perchlorate)
- USEPA Method 6020 or 6010 (metals)
- USEPA Method 7199 or 7196A (chromium VI)
- USEPA Method 7471 (mercury)
- USEPA Method 350.1 or SM 4500 (ammonia)

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[6] Montrose. 2017. 2017 Comprehensive Groundwater Data Evaluation Report. Former Montrose and Stauffer Facilities and Current Olin Facility, Henderson, Nevada, November 7.

[7] ENVIRON. 2014. Remedial Investigation and Feasibility Study Work Plan, Revision 2, Nevada Environmental Response Trust Site, Henderson Nevada, June 19, 2014. NDEP approved July 2, 2014.

[8] Ramboll. 2017. Quality Assurance Project Plan, Revision 2. Nevada Environmental Response Trust Site, Henderson, Nevada. October 26, 2017. NDEP approved on November 8, 2017.

- USEPA Method 9056 or 300 (bromide, chloride, nitrate, nitrite, ortho-phosphate, and sulfate)
- USEPA Method 300.1 (chlorite)
- USEPA Method 300 (fluoride)
- Department of Energy (DOE) Environmental Measurements Laboratory (EML) Health and Safety Laboratory (HASL) 300 (thorium [Th], uranium [U])
- DOE EML HASL 300, USEPA Method 901.1, or USEPA Method 903.0/903.1 (radium [Ra]-226)
- DOE EML HASL 300, USEPA Method 901.1, or USEPA Method 904.0 (Ra-228)
- USEPA Method 540-R-97-028 (asbestos)
- USEPA Method 8290 (dioxins/furans)
- USEPA Method 8270 (organic acids)
- USEPA Method 8310, 8270 Selective Ion Monitoring (SIM), or 8270 (polycyclic aromatic hydrocarbons [PAHs])
- USEPA Method 8082 (polychlorinated biphenyls [PCB] Aroclors)
- USEPA Method 1668A (PCB congeners)
- USEPA Method 8081 or 8151 (organochlorine pesticides [OCPs])
- USEPA Method 8141A (organophosphorus pesticides [OPPs])
- USEPA Method 8270 (semi-volatile organic compounds [SVOCs])
- USEPA Method 8015 (total petroleum hydrocarbons [TPHs])
- USEPA Method 8260 (VOCs)

As described in the 2008 Phase B Source Area Investigation Work Plan, the RI Phase 1 Field Sampling Work Plan[9], and the NERT RI Quality Assurance Project Plan[10], soil gas samples will be analyzed by a NDEP-certified laboratory for VOCs using USEPA Method TO-15, and groundwater samples will be analyzed by a NDEP-certified laboratory for VOCs using USEPA Method SW-8260 or SW-8260 SIM.

The drilling and sampling methods to be used will follow those provided in the RI Phase 1 Field Sampling Work Plan[11]. Notice of Intents (NOI's) will be obtained prior to the installation of the soil gas probes as required by the State of Nevada.

[9] ENVIRON. 2014. Remedial Investigation and Feasibility Study Work Plan, Revision 2, Nevada Environmental Response Trust Site, Henderson Nevada, June 19, 2014. NDEP approved July 2, 2014.
[10] Ramboll Environ. 2017. Quality Assurance Project Plan, Revision 2. Nevada Environmental Response Trust Site, Henderson, Nevada. October 26, 2017. NDEP approved on November 8, 2017.
[11] With changes incorporated in the most recent version of the following document that is referenced in the 2014 RI Phase 1 Field Sampling Work Plan: California Environmental Protection Agency, Department of Toxic Substance Control (CalEPA/DTSC), Los Angeles Regional Water Quality Control Board, San Francisco Regional Water Quality Control Board, 2015. Advisory Active Soil Gas Investigations. July.

Please contact us should you have any questions about the recommended sampling plan for Parcel E.

**Attachments**

Table 1 Proposed Soil Sampling in Parcel E
Table 2 Proposed Soil Gas Sampling in Parcel E
Table 3 Proposed Groundwater Sampling in Parcel E

Figure 1 Proposed Soil, Soil Gas and Groundwater Sample Locations in Parcel E

**Table 1. Proposed Soil Sampling in Parcel E**
RI Phase 2 Modification No. 12
Nevada Environmental Response Trust Site; Henderson, Nevada

| Soil Location ID | Status | Notes |
|---|---|---|
| RISB-EJ-01 | Proposed | Judgement sample; adjacent to existing shallow groundwater well MC-09R and proposed soil gas sample location RISG-34; 0-1.5 ft bgs and 10-11.5 ft bgs. |
| RISB-EJ-02 | Proposed | Judgement sample; adjacent to existing shallow groundwater well MC-29 and proposed soil gas sample location RISG-33; 0-1.5 ft bgs and 10-11.5 ft bgs. |
| RISB-EJ-03 | Proposed | Judgement sample; adjacent to existing shallow groundwater well MC-94 and proposed soil gas sample location RISG-32; 0-1.5 ft bgs and 10-11.5 ft bgs. |
| RISB-EJ-04 | Proposed | Judgement sample; adjacent to existing shallow groundwater well MC-97 and proposed soil gas sample location RISG-31; 0-1.5 ft bgs and 10-11.5 ft bgs. |
| RISB-ER-01 | Proposed | Random sample; no co-located or adjacent groundwater wells or soil gas sampling locations; 0-1.5 ft bgs and 10-11.5 ft bgs. |
| RISB-ER-02 | Proposed | Random sample; no co-located or adjacent groundwater wells or soil gas sampling locations; 0-1.5 ft bgs and 10-11.5 ft bgs. |
| RISB-ER-03 | Proposed | Random sample; no co-located or adjacent groundwater wells or soil gas sampling locations; 0-1.5 ft bgs and 10-11.5 ft bgs. |

**Notes:**
bgs = below ground surface
ft = foot

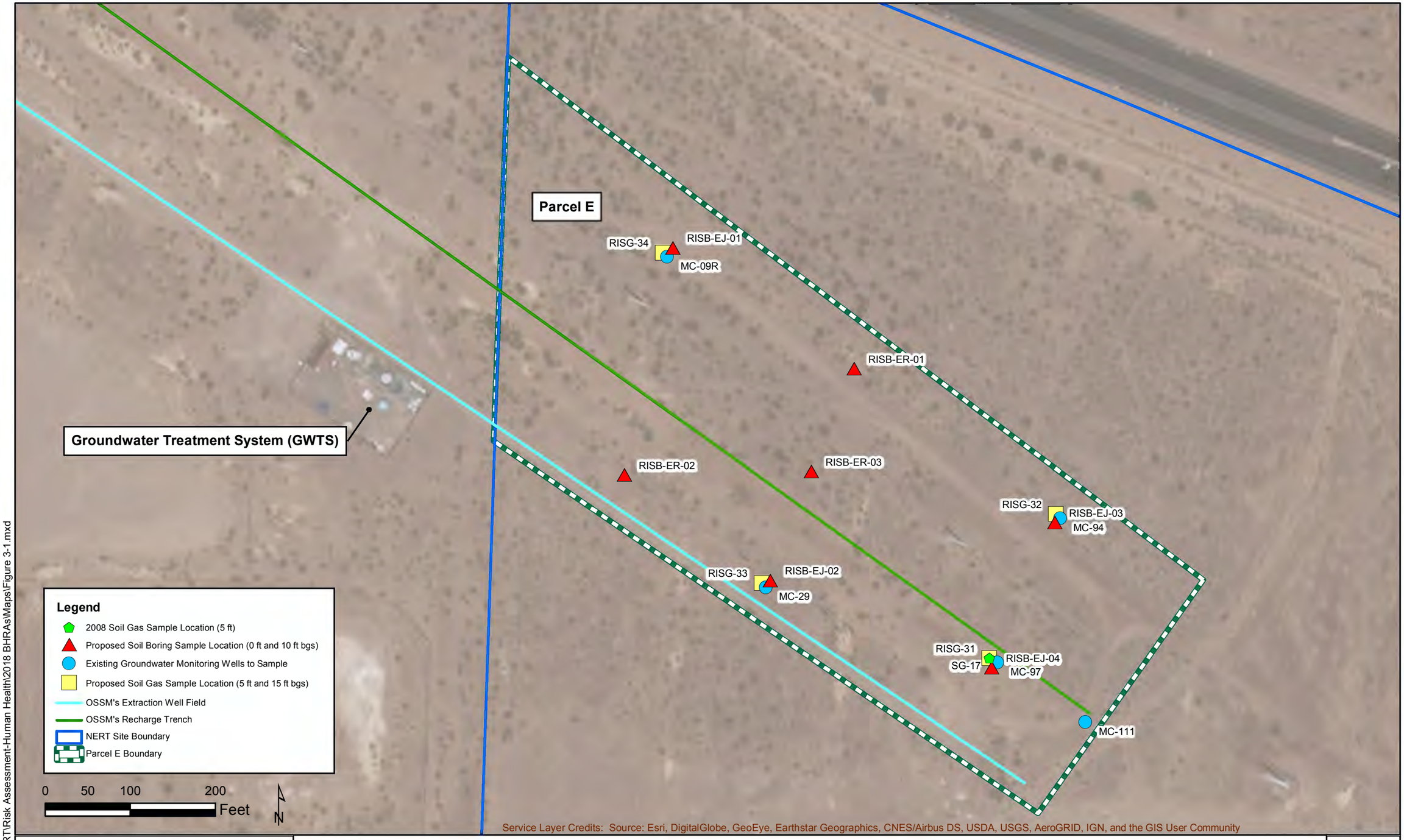
**Table 2. Proposed Soil Gas Sampling in Parcel E**
RI Phase 2 Modification No. 12
Nevada Environmental Response Trust Site; Henderson, Nevada

| Soil Gas Location ID | Status | Notes |
|---|---|---|
| RISG-31 | Proposed | Adjacent to shallow groundwater well MC-97; 5 ft bgs and 15 ft bgs; previously sampled at 5 ft bgs as SG-17. |
| RISG-32 | Proposed | Adjacent to shallow groundwater well MC-94; 5 ft bgs and 15 ft bgs. |
| RISG-33 | Proposed | Adjacent to shallow groundwater well MC-29; 5 ft bgs and 15 ft bgs. |
| RISG-34 | Proposed | Adjacent to shallow groundwater well MC-09R; 5 ft bgs and 15 ft bgs. |

**Notes:**
bgs = below ground surface
ft = foot

**Table 3. Proposed Groundwater Sampling in Parcel E**
RI Phase 2 Modification No. 12
Nevada Environmental Response Trust Site; Henderson, Nevada

| Groundwater Location ID | Status | Notes |
|---|---|---|
| MC-09R | Proposed | Existing groundwater monitoring well; adjacent to RISB-EJ-01 and RISG-23. |
| MC-29 | Proposed | Existing groundwater monitoring well; adjacent to RISB-EJ-02 and RISG-22. |
| MC-94 | Proposed | Existing groundwater monitoring well; adjacent to RISB-EJ-03 and RISG-21. |
| MC-97 | Proposed | Existing groundwater monitoring well; adjacent to RISB-EJ-04 and RISG-20. |
| MC-111 | Proposed | Existing groundwater monitoring well near the eastern boundary of Parcel E. |

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# Proposed Soil, Soil Gas and Groundwater Sample Locations in Parcel E

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure 1

| Drafter: RZ | Date: 6/18/2018 | Contract Number: 1690006943-012 | Approved by: | Revised: |
|---|---|---|---|---|

# RI Phase 2 Modification No. 12
# Recommended Soil, Soil Gas and Groundwater Sampling in Parcel E

**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.

July 17, 2018

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

**Date**

Certified Environmental Manager
Ramboll US Corporation
CEM Certificate Number: 2347
CEM Expiration Date: September 20, 2018

## RI Phase 2 Modification No. 12
## Recommended Soil, Soil Gas and Groundwater Sampling in Parcel E

**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. Trust, 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:** 7-17-18

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