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ENVIRONMENT
& HEALTH

May 17, 2019

TECHNICAL MEMORANDUM

To: Steve Clough
Nevada Environmental Response Trust

From: John Pekala, CEM#2347, Expires 9/20/2020, Ramboll
Elizabeth Miesner, Jessica Donovan, Kun Zhao, and Shuo Yu, Ramboll

Re: RI Phase 3 Modification No. 7
Recommended Soil Gas and Groundwater Sampling Locations in Operable Unit 3
Nevada Environmental Response Trust Site
Henderson, Nevada
Ramboll Project No. 1690011200-032

This Technical Memorandum presents Ramboll US Corporation's (Ramboll's) recommended Modification No. 7 to the scope of work for the Remedial Investigation (RI) Phase 3 Investigation currently in progress at the Nevada Environmental Response Trust ("NERT") Site (the "Site") located in Henderson, Nevada. This recommended modification proposes soil gas and groundwater sampling for volatile organic compounds (VOCs) at locations identified in Operable Unit 3 (OU-3) West of Pabco Road[1]. Soil gas sampling has not been conducted in OU-3 previously by NERT and is necessary to collect data for use in the Baseline Health Risk Assessment (BHRA) for OU-3. VOCs have been identified during sampling of shallow groundwater that has been conducted in OU-3 West of Pabco Road since 2015 as part of the Phase 1 RI, Phase 2 RI, and the groundwater monitoring program (GWMP) sampling events. As described in the NERT Remedial Investigation and Feasibility Study (RI/FS) Work Plan[2], the BHRA will address the vapor inhalation pathways for off-site receptors that could be potentially exposed to site-related VOCs migrating from groundwater or soil gas in OU-3 west of Pabco Road. As VOC data in groundwater was recently evaluated for the BHRA, it became evident that soil gas data and additional shallow groundwater data would be needed for the following reasons:

- To provide multiple lines of evidence for the analysis of vapor inhalation pathways in accordance with current vapor intrusion guidance[3];
- To confirm the previous VOC results in shallow groundwater sampling; and
- To provide improved spatial coverage and characterization of the VOCs in soil gas and shallow groundwater in OU-3 West of Pabco Road.

[1] NERT is not responsible for impacts associated with VOCs in groundwater in OU-3 east of Pabco Road.
[2] ENVIRON. 2014. Remedial Investigation and Feasibility Study Work Plan, Revision 2, Nevada Environmental Response Trust Site, Henderson Nevada, June 19. NDEP approved July 2, 2014.
[3] USEPA. 2015. OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air. EPA9200.2-154. June.

Soil gas sample results, along with groundwater sample results, will be used in the BHRA for OU-3 to evaluate potential health risk from vapor migration from the subsurface to indoor or ambient air.

Proposed Soil Gas Investigation

To evaluate the vapor intrusion pathway in the planned BHRA, soil gas samples are proposed to better characterize the concentrations of VOCs in soil gas in the vicinity of the chloroform plume in groundwater downgradient of the Site. As shown on Figure 1, soil gas samples are proposed to be collected from 17 locations in OU-3 West of Pabco Road. These samples are summarized in Table 1 and discussed in further detail below. The depth to groundwater decreases significantly from south to north, approaching the Las Vegas Wash. The average depth to groundwater ranges from approximately 25 feet below ground surface (bgs) in the south to approximately 13 feet bgs in the north. Therefore, it is proposed to collect soil gas samples at both 5 and 15 feet bgs at locations in the southern portion of OU-3 West of Pabco Road, and at both 5 and 10 feet bgs at locations in the northern portion of OU-3 west of Pabco Road (as shown on Figure 1 and discussed below):

- Two soil gas sample locations (RISG-35 and RISG-36) are proposed to better understand the lateral extent of VOCs in soil gas downgradient of the Site in the western portion of the Off-Site Study Area in OU-3. The proposed locations are adjacent to the shallow groundwater monitoring wells PC-191 and PC-103, respectively and are located on City of Henderson property. Soil gas samples are proposed to be collected at both 5 and 15 feet bgs at these locations.

- Five soil gas sample locations (RISG-37 through RISG-41) are proposed to better characterize the concentrations of VOCs in soil gas beneath the City of Henderson Water Reclamation Facility where exposures for commercial/industrial workers through inhalation of soil vapors migrating to indoor or ambient air could occur. RISG-37 is located adjacent to shallow groundwater piezometer PZ-2S, as well as an existing building at the southwestern corner of the facility. RISG-38 is located adjacent to the proposed new shallow groundwater monitoring well PC-200 (see next section below), as well as an existing building in the central portion of the facility. RISG-39 and RISG-40 are located near existing buildings; they are not adjacent to any shallow groundwater monitoring wells. RISG-37 through RISG-40 are located on City of Henderson property. RISG-41 is located near the eastern portion of the facility, but on Basic Environmental Company LLC (BEC) property. This location is not adjacent to any existing buildings or shallow monitoring wells. Soil gas samples are proposed to be collected at both 5 and 15 feet bgs at these locations.

- Three soil gas sample locations (RISG-42, RISG-43, and RISG-44) are proposed to better characterize the concentrations of VOCs in soil gas north of the City of Henderson Water Reclamation Facility where chloroform concentrations were previously detected in shallow groundwater. RISG-42 is located adjacent to the shallow groundwater monitoring well PC-4 and RISG-44 is located adjacent to the shallow groundwater monitoring well PC-53. RISG-43 is located between these two sampling locations adjacent to the shallow groundwater monitoring well PC-2. These three proposed locations are located on City of Henderson property. Soil gas samples are proposed to be collected at both 5 and 15 feet bgs at these locations.

- Two soil gas sample locations (RISG-45 and RISG-46) are proposed in the central portion and east central portion of the NERT Off-Site Study Area in OU-3, respectively. RISG-45 is on City of Henderson property adjacent to the proposed new shallow groundwater monitoring well PC-201 (see next section below). RISG-46 is located near the shallow monitoring well HM-2 on BEC property. Soil gas samples are proposed to be collected at both 5 and 15 feet bgs at these locations.

- Three soil gas sample locations (RISG-47, RISG-48, and RISG-49) are proposed to better characterize the concentrations of VOCs in soil gas downgradient of the Site and north of the City of Henderson Water Reclamation Facility. RISG-47 is adjacent to the proposed new shallow groundwater monitoring well PC-202 (see next section below). RISG-48 and RISG-49 are adjacent to the shallow groundwater monitoring wells PC-56 and PC-94, respectively. All three proposed locations are on BEC property. Soil gas samples are proposed to be collected at both 5 and 10 feet bgs at these locations due to the relatively shallower groundwater depth in this area.

- Two soil gas sample locations (RISG-50 and RISG-51) are proposed to better characterize the concentrations of VOCs in soil gas downgradient of the Site near the Las Vegas Wash. RISG-50 is located adjacent to groundwater monitoring well PC-155 A/B on Bureau of Reclamation (BOR) property. RISG-51 is located adjacent to shallow groundwater monitoring well PC-74 on Clark County property[4]. Soil gas samples are proposed to be collected at both 5 and 10 feet bgs at these locations.

- In addition, soil samples for physical properties testing, including soil classification (grain size distribution/Atterberg Limits), total organic carbon, bulk density, water content, and total porosity, will be collected:

    - ✓ at 5 feet bgs and 15 feet bgs at RISG-35 through RISG-46 in accordance with the proposed soil gas sample depth intervals; and

    - ✓ at 5 feet bgs and 10 feet bgs at RISG-47 through RISG-51 in accordance with the proposed soil gas sample depth intervals.

Proposed Shallow Groundwater Investigation

VOCs have been identified in shallow groundwater in OU-3 West of Pabco Road since 2015 during sampling events conducted as part of the Phase 1 RI, Phase 2 RI, and the ongoing GWMP. Existing shallow groundwater monitoring wells are shown on Figure 1. To supplement data previously obtained during the RI and the GWMP, additional groundwater sampling locations are proposed as part of Phase 3 RI Modification No. 7. These data will be used to better characterize VOCs in shallow groundwater and provide better spatial coverage to assist evaluation of the vapor intrusion pathway in the planned BHRA. The additional proposed locations are discussed below and detailed in Table 2.

- One shallow groundwater sample is proposed to be collected from an existing shallow groundwater piezometer PZ-2S. The proposed location is adjacent to proposed soil gas sampling location RISG-37 and is located on City of Henderson property.

[4] The proposed soil gas sample location near PC-74 will be reviewed prior to initiating the soil gas drilling program and if access is limited an alternate location to sample is adjacent to shallow groundwater monitoring well PC-79.

- One new shallow groundwater monitoring well (PC-200) is proposed to be installed in the central portion of the City of Henderson Water Reclamation Facility. The proposed location of new well PC-200 is adjacent to proposed soil gas sampling location RISG-38 and is located on City of Henderson property. The well will be screened across the water table and a sample of first encountered groundwater will be collected.

- One new shallow groundwater monitoring well (PC-201) is proposed to be installed in the central portion of the NERT Off-Site Study Area in OU-3. The proposed location of new well PC-201 is adjacent to proposed soil gas sampling location RISG-45 and is located on City of Henderson property. The well will be screened across the water table and a sample of first encountered groundwater will be collected.

- One new shallow groundwater monitoring well (PC-202) is proposed to be installed in the eastern portion of the NERT Off-Site Study Area in OU-3. The proposed location of new well PC-202 is adjacent to proposed soil gas sampling location RISG-47 and is located on BEC property. The well will be screened across the water table and a sample of first encountered groundwater will be collected.

Laboratory Analysis

VOCs in soil gas will be analyzed using USEPA Method TO-15 and VOCs in groundwater will be analyzed using USEPA Methods 8260B and 8260-SIM, as described in the RI Phase 1 Field Sampling Work Plan[5] and the NERT RI Quality Assurance Project Plan[6]. The drilling and sampling methods to be used will follow those provided in the RI Phase 1 Field Sampling Work Plan.

Closing

The proposed soil gas and groundwater data will be evaluated in the BHRA for OU-3 that is currently planned for submittal to NDEP in 2020.

Please contact us should you have any questions about the recommended soil gas and groundwater sampling plan.

Attachments

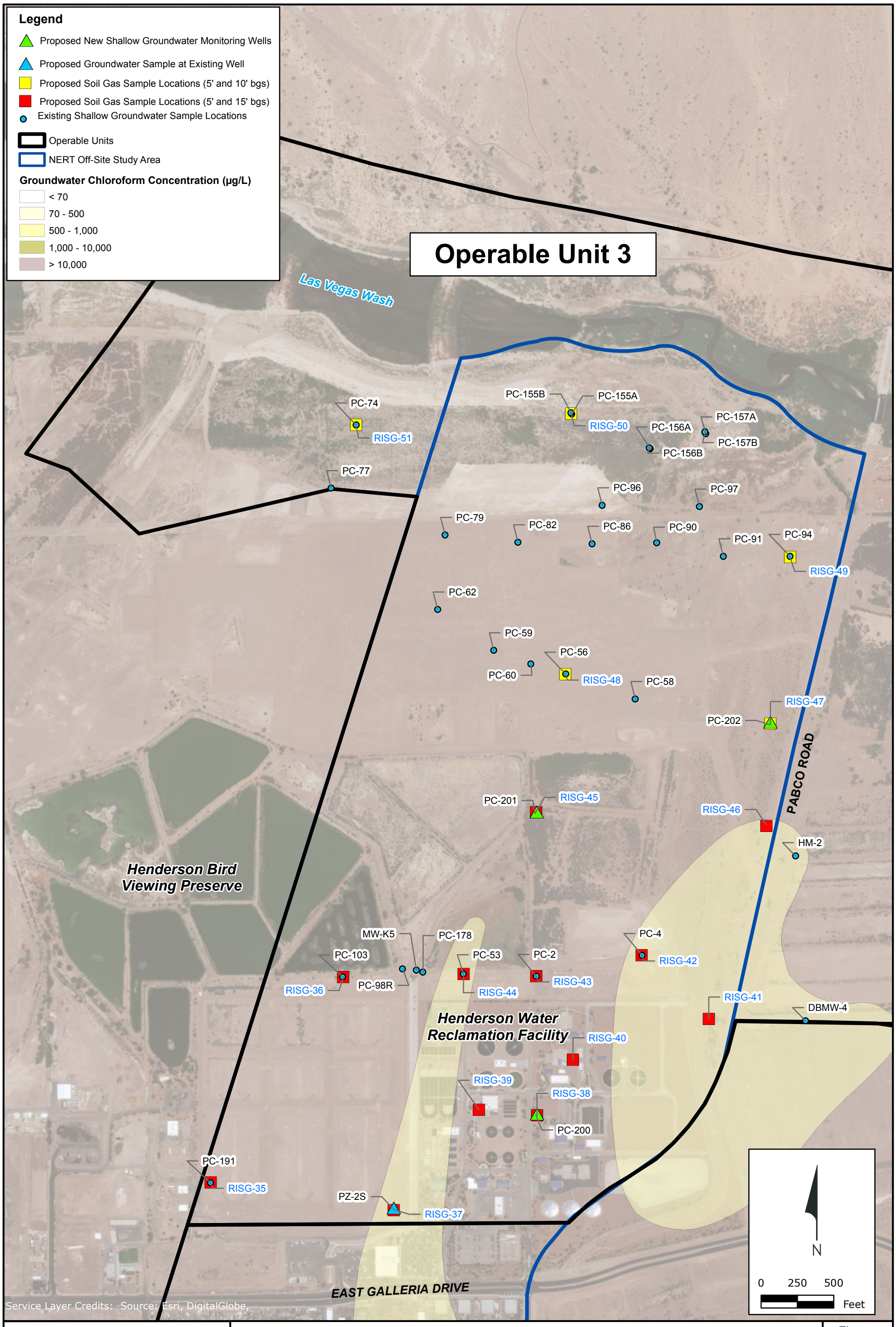
Table 1 Proposed Soil Gas Sampling in OU-3 West of Pabco Road

Table 2 Proposed Groundwater Sampling in OU-3 West of Pabco Road

Figure 1 Proposed Soil Gas and Groundwater Sample Locations in OU-3 West of Pabco Road

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

[6] Ramboll. 2019. Quality Assurance Project Plan, Revision 3. Nevada Environmental Response Trust Site, Henderson, Nevada. April 11. NDEP approved on April 17, 2019.



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Proposed Soil Gas and Groundwater Sample Locations in OU-3 West of Pabco Road (Chloroform Plume as Depicted in 2018)
Nevada Environmental Response Trust Site, Henderson, Nevada

Figure
1

Drafter: JA	Date: 4/19/2019	Contract Number: 169001 1200-050	Approved by:	Revised:

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Table 1. Proposed Soil Gas Sampling in OU-3 West of Pabco Road
RI Phase 3 Modification No. 7
Nevada Environmental Response Trust Site; Henderson, Nevada

Soil Gas Location ID	Sampling Status	Notes
RISG-35	Proposed	Adjacent to shallow groundwater well PC-191; proposed to sample at 5 ft bgs and 15 ft bgs.
RISG-36	Proposed	Adjacent to shallow groundwater well PC-103; proposed to sample at 5 ft bgs and 15 ft bgs.
RISG-37	Proposed	Adjacent to shallow groundwater well PZ-2S; proposed to sample at 5 ft bgs and 15 ft bgs.
RISG-38	Proposed	Adjacent to proposed shallow groundwater well PC-200; near an existing building of the Henderson Water Reclamation Facility; proposed to sample at 5 ft bgs and 15 ft bgs.
RISG-39	Proposed	No adjacent shallow groundwater wells; near an existing building of the Henderson Water Reclamation Facility; proposed to sample at 5 ft bgs and 15 ft bgs.
RISG-40	Proposed	No adjacent shallow groundwater wells; near an existing building of the Henderson Water Reclamation Facility; proposed to sample at 5 ft bgs and 15 ft bgs.
RISG-41	Proposed	No adjacent shallow groundwater wells; near an existing building of the Henderson Water Reclamation Facility; proposed to sample at 5 ft bgs and 15 ft bgs.
RISG-42	Proposed	Adjacent to shallow groundwater well PC-4; proposed to sample at 5 ft bgs and 15 ft bgs.
RISG-43	Proposed	Adjacent to shallow groundwater well PC-2; proposed to sample at 5 ft bgs and 15 ft bgs.
RISG-44	Proposed	Adjacent to shallow groundwater well PC-53; proposed to sample at 5 ft bgs and 15 ft bgs.
RISG-45	Proposed	Adjacent to proposed shallow groundwater well PC-201; proposed to sample at 5 ft bgs and 15 ft bgs.
RISG-46	Proposed	Adjacent to shallow groundwater well HM-2; proposed to sample at 5 ft bgs and 15 ft bgs.
RISG-47	Proposed	Adjacent to proposed shallow groundwater well PC-202; proposed to sample at 5 ft bgs and 10 ft bgs.
RISG-48	Proposed	Adjacent to shallow groundwater well PC-56; proposed to sample at 5 ft bgs and 10 ft bgs.
RISG-49	Proposed	Adjacent to shallow groundwater well PC-94; proposed to sample at 5 ft bgs and 10 ft bgs.
RISG-50	Proposed	Adjacent to shallow groundwater wells PC-155A and PC-155B; proposed to sample at 5 ft bgs and 10 ft bgs.
RISG-51	Proposed	Adjacent to shallow groundwater well PC-74; proposed to sample at 5 ft bgs and 10 ft bgs. (This proposed soil gas sample location will be reviewed prior to initiating the soil gas drilling program and if access is limited an alternate location to sample is adjacent to shallow groundwater monitoring well PC-79.)

Notes:
bgs = below ground surface
ft = foot
NERT = Nevada Environmental Response Trust
OU-3 = Operable Unit 3
RI = Remedial Investigation

Table 2. Proposed Groundwater Sampling in OU-3 West of Pabco Road
RI Phase 3 Modification No. 7
Nevada Environmental Response Trust Site; Henderson, Nevada

Groundwater Location ID	Sampling Status	Notes
PZ-2S	Proposed	Existing shallow piezometer; adjacent to proposed soil gas sample location RISG-37.
PC-200	Proposed	Proposed new shallow groundwater monitoring well; adjacent to proposed soil gas sample location RISG-38; the well will be screened across the water table and a sample of first encountered groundwater will be collected.
PC-201	Proposed	Proposed new shallow groundwater monitoring well; adjacent to proposed soil gas sample location RISG-45; the well will be screened across the water table and a sample of first encountered groundwater will be collected.
PC-202	Proposed	Proposed new shallow groundwater monitoring well; adjacent to proposed soil gas sample location RISG-47; the well will be screened across the water table and a sample of first encountered groundwater will be collected.

Note:
ft = foot
NERT = Nevada Environmental Response Trust
OU-3 = Operable Unit 3
RI = Remedial Investigation

Phase 3 RI Modification No. 7
Recommended Soil Gas and Groundwater Sampling Locations in Operable Unit 3

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 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 President of the 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: 5/16/19

RI Phase 3 Modification No. 7
Recommended Soil Gas and Groundwater Sampling Locations in Operable Unit 3

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.

May 17, 2019

John M. Pekala, PG
Principal

Date

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