ENVIRONMENTAL WORKS

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December 2, 2022

Dave Brazeal
Dale Hunt
Director of Operations
Taproot Energy Partners
518 17th Street, Suite 1800
Denver, Colorado 80202

Submitted via e-mail to dhunt@taprootep.com

**RE: Confirmation Soil Sampling Following Produce Water Release**
**Spill/Release ID Point 482854 near Briggsdale, Colorado**

Dear Mr. Brazeal and Mr. Hunt,

Environmental Works, Inc. (EWI) is pleased to submit this letter report summarizing the additional investigation activities completed in conjunction with the initial release response on September 5, 2022, and follow-up confirmation sampling completed on September 8th, September 12th, and November 10th through 11th, 2022 at the Big Mountain Viper (BMV) Spill/Release Point ID 482854 near Briggsdale, Colorado (the Site). The purpose of this report is to aid with the submission of the Final Form 19 supplemental to the Colorado Oil and Gas Conservation Commission (COGCC) and to satisfy the requirements to achieve Site closure in accordance with COGCC Guidance Rule 913.

## Summary of Work Completed

Following excavation activities, EWI mobilized to the Site on September 5, 2022 to direct excavation activities and collect initial soil samples from select locations within the primary excavation area immediately following the release. Confirmation sampling of the shallow excavated areas and retention pond were completed on September 8th and September 12th. Surveying of maximum impacted aerial extent was completed hours after the release by Avery Technical Resources. GPS coordinates, sample names, and sample depths are recorded in Appendix A in accordance with COGCC Guidance Rule 915. Sample locations, the produced water line, excavation extents, and select site features for reference are depicted on Figure 1A and 1B.

Based on evaluation of Site survey data, the following samples were recommended in accordance COGCC Guidance Table 915-1:

- 11 sidewall samples (SW1 through SW11) for the primary excavation where the release occurred. Six initial sidewall samples, and 5 following additional excavation on November 10-11, 2022.
- Two floor samples were collected at two separate depths (FS1 and FS2) for the primary excavation where the release occurred of less than 500 square feet (sq. ft.). The floor samples were collected from the bottom of the excavation (from 7.5-10 feet below ground surface [bgs])

from the area where the highest impacts to soil would be expected, in accordance with COGCC Guidance Rule 915.

- 15 surface samples (SS1 through SS11) were collected from areas within the footprint of shallow impacted soil. Samples were collected from areas where approximately 0.5' of soil were removed. Approximately 25,000 sq ft. of impacted soil was initially observed.
- Three background samples (BS1 through BS3) were collected from soil outside the impacted area representative of native soil conditions.

Soil borings for sidewall samples were advanced with a hand auger while the excavations remained open following the initial release. Continuous soil screening for the presence of volatile organic compounds (VOCs) was also conducted on sidewall sample borings using a photoionization detector (PID) to aid in understanding Site conditions. Following sampling, soil borings were abandoned with clean soil cuttings and the hand auger was decontaminated between borings.

Samples were immediately placed on ice and delivered to Origins lab to a COGCC approved lab for analysis. All samples collected initially were analyzed for the full list of Table 915-1 analytes. Table 1 presents the full analytical results and compares them with the Residential Soil Screening Level Concentrations (RSSLs) and the Protection of Groundwater Soil Screening Level Concentrations listed in Table 915-1. According to COGCC Rule 915 RSSLs will be used unless otherwise required by the COGCC. Full Analytical Results are attached as Appendix B. Groundwater is located at an estimated 70 feet below ground surface based on topography and nearby well data. Well data backup was attached on previous Form 19 Supplemental reports.

A photographic log is attached as Appendix C to aid with the determination that appropriate action was taken to remove impacted material with the goal of achieving Site closure.

## Results and Proposed Sampling

Exceedances of the RSSLs were only observed for arsenic, boron, sodium absorption ration (SAR), and conductivity.

Boron was detected in initial samples at a concentration slightly above the soil suitability for reclamation standard of 2 mg/kg in SW1 (2.04 mg/kg) and SW5 (2.43). Additional excavation surrounding the primary release location was completed on 11/10 and 11/11 to address these impacts. SW8 and SW9 still exceeded table 915 for Boron following the additional excavation activities.

SAR exceeded the RSSL in FS1, FS2, SS6, SS7, S10, SS11, SW1, SW3, SW4, SW5, and SW6. Additional excavation was proposed in a supplemental Form 19 to address these exceedances. Following the additional excavation completed on 11/10 and 11/11 limited exceedances for SAR remained in the primary excavation and surrounding SS10 and SS11..

Conductivity exceeded the RSSL of 4 mmhos/cm in several initial samples surrounding the primary excavation at a maximum concentration of 10.5 mmhos/cm. Secondary excavations have been completed, and follow-up sampling results displayed lower but still elevated levels in several locations. Due to facility infrastructure a reclamation plan will be developed to allow limited exceedances to be left in place below the root zone.

Arsenic was detected at concentrations above the RSSL in all soil samples that were analyzed, including the background samples, (8.41 milligrams per kilogram [mg/kg] in BS1 and 6.45 mg/kg in BS2).

Concentrations of arsenic can vary significantly within a vertical section of soil due to natural variations within soil types. Although arsenic was elevated in many samples, concentrations were highest in the background sample. Additional background samples are required at the depths of sidewall and floor samples. The concentrations observed at the Site are similar to elevated arsenic levels found in soils across the state and should not be a barrier to Site closure.

No semi-volatile or volatile compounds were detected in any soil samples above RSSLs. Limited total petroleum hydrocarbon (TPH) compounds were detected above the laboratory reporting limit, but well below the Cleanup Standards.

Soil samples at the Site following the initial excavation exhibited several exceedances of the RSSLs and Protection of Groundwater Screening Level Concentrations, primarily for reclamation parameters. A secondary excavation was completed around the primary excavation to address the initial exceedances, however some exceedances for reclamation parameters still remained. Vertical delineation is complete surrounding the primary excavation based on deeper samples from FS1 and FS2, but spatial delineation of soil within the root zone may still be required. Additional shallow soil excavation around SS6 and SS7 in the southwest portion of the Site is planned, as well as around SS10 and SS11.

Following additional excavation activities, confirmation soil samples will be collected to help delineate the vertical and horizontal extent of impacts at the Site where limited exceedances remain. A reclamation will be developed to address remaining impacts in and around infrastructure, as well as impacts below a feasible depth of excavation.
EWI believes a reduction in sample analysis to just Table 915 metals and reclamation parameters is warranted based on initial sample results.

We appreciate the opportunity to provide this letter report to Taproot Energy Partners. Please contact me at 507-475-2825 or akubat@environmentalworks.com if you have questions or we can be of further service.

Sincerely,

Adam Kubat
Project Geologist
Environmental Works, Inc.