



March 3, 2017

Mr. Kyle Waggoner
Whiting Oil and Gas Corporation
208 Racquette Drive
Fort Collins, Colorado 80524

**RE: Confirmation Sampling and Soil Remediation
CR 118 East Gathering Pipeline Release
Weld County, Colorado
Project # 701530.096.01**

Mr. Waggoner:

From December 21, 2016, to January 11, 2017, Talon/LPE conducted confirmation soil sampling during the excavation of a crude oil release on the County Road 118 East Gathering Pipeline (site) in Weld County, Colorado.. The purpose of the sampling event was to ensure that all hydrocarbon impacted soil had been removed to the extent required by the Colorado Oil and Gas Conservation Commission (COGCC). The site is identified by the COGCC as Spill/Release Point ID 448793.

On December 21, 2016, seventeen (17) grab samples (SP-1 @ 6" through SP-17 @ 6") were collected in a ditch where crude oil had migrated down gradient. A site map with the sample locations is presented in Figure 1.

The collected samples were analyzed for Total Petroleum Hydrocarbons (TPH) via Gasoline Range Organics (GRO) method EPA8260B and Diesel Range Organics (DRO) method 8015, and for Benzene, Toluene, Ethyl-benzene, and Xylenes (BTEX) via method EPA8260B at Summit Scientific (Summit) in Golden, Colorado. Fifteen (15) of the seventeen (17) samples were below COGCC Table 910-1 thresholds for TPH and BTEX. Samples SP-7 @ 6" and SP-13 @ 6" were reported to have to have BTEX concentrations below COGCC Table 910-1; however, their TPH concentrations exceeded COGCC Table 910-1 thresholds for TPH. Soil concentration maps are presented in Figures 2a, 2b, and 2c, a topographic map is presented in Figure 3, and a breakdown of the confirmation sampling soil analytical data is presented in Table 1.

On December 22, 2016, Talon/LPE collected eleven (11) grab samples (Uphill Perimeter North @ 0', East @ 0', South @ 0', and West @ 0', Uphill BH-1 @ 6" and



BH-2 @ 6", Downhill Perimeter North @ 0', East @ 0', South @ 0', and West @ 0', and Downhill BH-3 @ 1') from around the release source area (uphill) and from an area where the crude oil had pooled (downhill). These samples were analyzed for TPH and BTEX at Summit. Ten (10) of the eleven (11) samples were below COGCC Table 910-1 thresholds for TPH and BTEX. Sample Downhill Perimeter West @ 0' exhibited BTEX concentrations below COGCC Table 910-1, but its TPH concentration was above the COGCC Table 910-1 threshold for TPH.

Based on the collected analytical data, further excavation was performed by Whiting contractors in the areas where sample results were above COGCC Table 910-1. On December 29, 2016, Talon/LPE collected six (6) grab samples (Downhill Perimeter West 2 @ 0', SP-6.5 @ 12", SP-7 @ 12", SP-7.5 @ 12", SP-12.5 @ 12", and SP-13 @ 12") and had them analyzed for TPH and BTEX at Summit. Four (4) of the six (6) samples were below COGCC Table 910-1 thresholds for TPH and BTEX. Samples SP-7.5 @ 12" and SP-13 @ 12" exhibited BTEX concentrations below COGCC Table 910-1; however, their TPH concentrations exceeded COGCC Table 910-1 thresholds.

As the excavation progressed, Talon/LPE collected three (3) additional samples on January 2, 2017. These samples (SP-13.5 @ 12", Downhill Perimeter South 2 @ 0', and Downhill Perimeter West @ 12") were analyzed for TPH and BTEX at Summit. Two (2) of the three (3) samples were below COGCC Table 910-1 thresholds for TPH and BTEX. Benzene and TPH concentrations from sample SP-13.5 @ 12" were above COGCC Table 910-1; however, its toluene, ethyl-benzene, and xylenes concentrations were below the COGCC Table 910-1 thresholds.

On January 11, 2017, Talon/LPE collected six (6) additional grab samples (SP-7.5 @ 2', SP-13 @ 2', SP-13.5 @ 2', SW-1 @ 2', SW-2 @ 2', and SW-3 @ 2') after the excavation had been completed. These samples were analyzed for TPH and BTEX at Summit. All of the samples were reported to be below COGCC Table 910-1 thresholds for TPH and BTEX.

On February 9, 2017, Talon/LPE utilized a Royer Model 364 soil shredding machine to remediate four hundred fifteen (415) cubic yards of hydrocarbon impacted soil generated from the excavation activities. The Royer Model 364 soil shredding machine pulverized the impacted soil which increased the surface area of the soil and allowed maximum volatilization of the hydrocarbons. Additionally, while shredding the impacted soils, Talon/LPE applied a 10-15% hydrogen peroxide solution to chemically oxidize the hydrocarbons.



After remediating the impacted soils, Talon/LPE collected confirmation samples (SP-1, SP-2, SP-3, and SP-4) on February 22, 2017, to confirm all hydrocarbons had been removed to the extent required by the COGCC. The collected samples were analyzed for TPH and BTEX at Summit. All four (4) samples were reported to exhibit TPH and BTEX concentrations below COGCC Table 910-1 concentration levels. A breakdown of the remediated soil analytical data is presented in Table 2.

Based upon the collected analytical data and actions conducted, Talon/LPE believes that the hydrocarbon impacted soils have been removed and remediated to the extent required by the COGCC and no further corrective action is necessary. If you have any questions or comments, please do not hesitate to call me at (970) 818-5330.

Respectfully Submitted,

Colby Sterling
District Manager
Talon/LPE