

December 6, 2018

**Re: Remediation Summary Attachment
Kerr-McGee Oil and Gas Onshore, LP
HSR-Dreyer 5-5
Form 27 Document # 401787151
COGCC Remediation # 4891
Facility ID # 320405
SWNW Sec 5-T1S-R65W
Adams County, Colorado**

The partially buried produced water sump at the HSR-Dreyer 5-5 tank battery floated following a heavy rain event. The produced water sump was removed and it was discovered that the dumphline threads connecting to the sump were partially stripped, releasing an unknown volume of oil and produced water. The petroleum hydrocarbon impacted soil was excavated. Approximately 230 cubic yards of petroleum hydrocarbon impacted soil were removed from the excavation and transported to Buffalo Ridge Landfill in Keenesburg, Colorado, for disposal. Approximately 58 barrels of petroleum hydrocarbon impacted groundwater were removed from the excavation and transported to a licensed injection facility for disposal. While backfilling the excavation, five gallons of MicroBlaze[®], a concentrated solution of facultative microbes, nutrients, and surfactants designed to bioremediate petroleum hydrocarbons, were applied to the excavation groundwater immediately prior to backfilling.

2013-2014 Free Product Purging

Between June 2013 and October 2014, monitoring wells MW01, MW07, MW09, MW10, MW16, MW19, and MW20 were purged of free product once every two weeks using a disposable bailer. Purging was discontinued after the October 2014 event due to lack of measurable product. A total of approximately 368 gallons of free product mixed with groundwater were purged from the wells. The quarterly depth to water and depth to product measurements are summarized in Table 1.

AS/SVE System

Due to persistent, elevated benzene, toluene, ethylbenzene, and total xylenes concentrations in multiple site monitoring wells, an air sparging (AS) and soil vapor extraction (SVE) system was installed at the site to remediate the dissolved-phase petroleum hydrocarbon plume. The AS/SVE system was designed to introduce ambient air into the subsurface water column to promote volatilization and aerobic microbial decomposition of dissolved-phase petroleum hydrocarbons. Kerr-McGee submitted a UIC Permit Application to Region 8 of the United States Environmental Protection Agency in February 2018 and was subsequently approved on March 6, 2018. A copy of the UIC Permit Application and the March 2018 Rule Authorization: Aquifer Remediation Well approval letter from Region 8 are attached.

Installation of the full-scale AS/SVE system occurred in March 2018. The system is comprised of 28 AS wells and 10 SVE wells connected by subsurface high-density polyethylene piping to a remediation trailer powered by an electrical drop. The remediation system includes valves at all the AS wellheads to allow for uninterrupted flow control, measurement, and adjustment. AS will

be accomplished using a 15-horsepower driven Rietschle Thomas DLR 150 rotary claw compressor and SVE will be accomplished using a Roots 47 U-RAI DSL rotary lobe blower that are housed within the remediation trailer. Electrical service will be installed at the site upon completion of a right-of-way agreement for the electrical trench to cross a canal. The AS/SVE system will start up following the installation of the electrical service. The layout of the AS/SVE system is depicted on the Site Map attached as Figure 1. Boring logs for the AS and SVE wells are included as an attachment to the eForm 27.