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December 22, 2016

Mr. Peter Gintautas  
Environmental Protection Specialist  
Colorado Oil and Gas Conservation Commission  
1120 Lincoln Street, Suite 801  
Denver, Colorado 80203

**Re: Update Report  
UPRR 53 Pan Am J #1  
Remediation # 4493  
SWNE Sec 11-T2N-R65W  
Weld County, Colorado**

Dear Mr. Gintautas:

Kerr-McGee Oil and Gas Onshore LP (Kerr-McGee) is submitting this letter report as an update to the Form 27 submitted on July 2, 2009, for the UPRR 53 Pan Am J #1. This report describes the supplemental groundwater assessment, monitoring, and remediation activities completed since the July 2009 submittal.

#### Site Background

On January 12, 2009, soil with historical petroleum hydrocarbon impact was encountered by field crews while removing the production tank and upgrading the tank battery. The volume of the release is unknown. The petroleum hydrocarbon impacted soil was excavated. A topographic Site Location Map showing the geographical setting of the release is provided as Figure 1.

Between January 16 and February 4, 2009, twenty confirmation soil samples were collected from the excavation sidewalls. The soil samples were submitted for laboratory analysis of total petroleum hydrocarbons (TPH) by United States Environmental Protection Agency (USEPA) Method 8015. The analytical results confirmed that TPH concentrations were less than the Colorado Oil and Gas Conservation Commission (COGCC) sensitive area allowable level of 1,000 milligrams per kilogram (mg/kg) at the extent of excavation. The soil samples were not analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX) as the samples were collected prior to the April 1, 2009 COGCC rule changes. The confirmation soil sample analytical results are summarized in Table 1.

Impacted groundwater was encountered in the excavation at approximately 14 feet below ground surface. A groundwater sample (GW01) was collected from the open excavation and submitted for laboratory analysis of BTEX by USEPA Method 8260B. Analytical results for excavation groundwater sample GW01 indicated that BTEX concentrations exceeded the COGCC Table

910-1 allowable levels. Based on the analytical results, approximately 80 barrels of impacted groundwater were removed from the excavation using a vacuum truck and transported to a licensed injection facility for disposal. On February 5, 2009, a second groundwater sample (GW02) was collected from the excavation. Laboratory analytical results for groundwater sample GW02 indicated that benzene, toluene, and total xylenes concentrations continued to exceed the COGCC allowable levels at concentrations of 2,600 micrograms per liter ( $\mu\text{g/L}$ ), 3,100  $\mu\text{g/L}$ , and 3,600  $\mu\text{g/L}$ , respectively. The excavation groundwater sample analytical results are summarized in Table 2.

Approximately 4,500 cubic yards of petroleum hydrocarbon impacted soil were excavated and transported to the Kerr-McGee Land Treatment Facility in Weld County, Colorado. Prior to backfilling the excavation, 15 gallons of MicroBlaze<sup>®</sup>, a concentrated solution of facultative microbes, nutrients, and surfactants designed to bioremediate petroleum hydrocarbons, was applied to the excavation groundwater. The excavation area was backfilled with clean fill material, and the backfilled area was restored to its pre-release grade. The general site layout, excavation footprint, and soil and groundwater sample locations are depicted on the Excavation Site Map provided as Figure 2.

#### Groundwater Assessment Activities

Following source removal activities, Kerr-McGee contracted LT Environmental, Inc. (LTE) to install groundwater monitoring wells, conduct groundwater monitoring, and track the laboratory analytical results. Between April 2009 and April 2012, thirty monitoring wells (MW01 through MW30) were installed to assess the extent and magnitude of the residual dissolved-phase groundwater impacts and establish points of compliance (POC) at the site. The monitoring well locations are depicted on the Site Map provided as Figure 3. Soil boring logs with monitoring well completion diagrams are provided as Attachment 1.

Monitoring wells MW03 and MW06 were destroyed as of the April 2012 and October 2013 monitoring events, respectively. Well MW03 was not replaced as the well was not needed to maintain POC and the remaining monitoring wells provided adequate and representative groundwater monitoring points. Well MW06 was not replaced based on fourteen consecutive quarters of fully compliant BTEX analytical results prior to its destruction.

On July 30, 2015, monitoring well MW18 was abandoned due to damage and replaced with monitoring well MW18R. A soil boring log with a monitoring well completion diagram for well MW18R is provided as Attachment 1.

#### Groundwater Remediation – Mechanical System Installation

Due to persistent, elevated BTEX 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. Kerr-McGee contracted LTE to design, pilot test, install, and operate the AS/SVE system.

On June 6 and 7, 2012, four pilot test wells (AS-1, AS-2, SVE-1, and SVE-2) and five observation wells (OB-1 and OB-5) were installed at the site. Pilot testing was conducted on June 27 through June 29, 2012. The pilot testing program successfully established the vacuum stimulus response relationship, anticipated radii of influence, and other parameters that were used to design the site-specific, full-scale AS/SVE system. The results of the pilot testing program and a proposed design for a full-scale AS/SVE system were presented to the COGCC in the Proposed Remediation Work Plan submitted on August 13, 2012.

Installation of the full-scale AS/SVE system occurred in October 2012. The final, as-built system was comprised of nineteen AS wells and nineteen SVE wells connected by a combination of surface and subsurface high-density polyethylene piping to a remediation trailer powered by an Arrow VRG330 (6-cylinder) natural gas engine. The remediation system included valves at all of the AS wellheads to allow for uninterrupted flow control, measurement, and adjustment. AS was accomplished using a 10 horsepower driven Rietschle Thomas DLR 100 rotary claw compressor and SVE was accomplished using a Roots 47 U-RAI DSL rotary lobe blower that were housed within the remediation trailer. The as-built layout of the full-scale AS/SVE system is displayed on the Remediation Site Map provided as Figure 3. Boring logs for AS wells AS-1 through AS-19, SVE wells SVE-1 through SVE-19, and observation wells OB-1 through OB-5 are provided as Appendix A.

System operation commenced in October 2012. Significant reductions in BTEX concentrations were recorded across the site in the first year of operation. Significant system down-time occurred between November 2013 and May 2014 when the production wells were either shut-in or well gas operations were reduced and the gas supply to the remediation trailer was variable. During this time, an Atlas Copco XAS185 tow-behind compressor was utilized one to three days per week for continued system operation. The remediation trailer was mobilized off-site in February 2016 and system operation has continued with the Atlas Copco XAS185 tow-behind compressor on a one to three days per week schedule. Site-wide compliance was achieved as of the October 2016 quarterly groundwater monitoring event, with the exception of monitoring wells MW07 and MW08.

### Site Survey

On December 2, 2013, monitoring wells MW01, MW02, MW04, MW05, and MW07 through MW30 were surveyed to obtain groundwater and top-of-casing well elevation data. The survey data indicated the groundwater flow direction at the site is to the north-northeast. A Groundwater Elevation Contour Map is provided as Figure 4. The relative groundwater elevations are provided in Table 2.

### Monitoring Summary

During the October 2016 quarterly monitoring event, groundwater samples were collected from monitoring wells MW01, MW02, MW04, MW05, and MW07 through MW30 for laboratory analysis of BTEX by USEPA Method 8260C. Laboratory analytical results indicated that BTEX concentrations in monitoring wells MW07 and MW08 exceeded the COGCC Table 910-1 allowable level for benzene at concentrations of 67.4 µg/L and 18.1 µg/L, respectively. BTEX

concentrations in the remaining wells were compliant with COGCC allowable levels for BTEX. Based on the groundwater analytical results, POC was established in April 2012 and has been maintained throughout. Groundwater monitoring will continue on a quarterly basis. The groundwater sample analytical results are summarized in Table 2. The laboratory analytical report for the October 2016 quarterly groundwater monitoring event is provided as Attachment 2.

#### Well Reduction Request

Based on the groundwater analytical data to date, Kerr-McGee submits that a reduction in the number of monitoring wells included in the groundwater monitoring program is warranted. BTEX concentrations have been compliant with COGCC Table 910-1 allowable levels for eleven or more consecutive quarterly groundwater monitoring events in monitoring wells MW21 through MW30. None of these wells currently serve or are needed as a point of compliance. It should also be noted that a well reduction request was submitted in August 2016 for wells MW22, MW26, and MW30, but as of the submittal of this update report, no response has been received.

#### Summary and Conclusions

Remedial actions conducted at the site have included excavation of the source area, application of the MicroBlaze® amendment to the excavation groundwater, and operation of an AS/SVE system. Twenty-eight monitoring wells (MW01, MW02, MW04, MW05, and MW07 through MW30) have been installed at the site, and POCs and groundwater flow direction have been established. Groundwater monitoring will continue on a quarterly basis until a No Further Action status request is warranted.

Feel free to contact me at 970-336-3500 if you have any questions regarding this information.

Sincerely,

Kerr-McGee Oil & Gas Onshore LP



Phillip L. Hamlin, REM, CSEM  
Senior HSE Representative

Attachments