

State of Colorado
Oil and Gas Conservation Commission

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Receive Date:

Report taken by:

Site Investigation and Remediation Workplan (Supplemental Form)

This form shall be submitted to the Director for approval prior to the initiation of site investigation and remediation activities. However, this shall not preclude the Operator from taking immediate action to protect public health or safety, the environment, wildlife, or livestock.

This Form 27 describes site conditions as currently understood by the Operator; approval of this Form 27 by COGCC is based on the site conditions accurately described herein; any changes in site conditions identified during or subsequent to the performance of the approved workplan may necessitate additional investigation or remediation which shall be described on a supplemental Form 27.

This Form 27 is intended to provide basic information regarding the proposed site investigation and remediation actions, but the workplan may be more fully described in attached documentation.

Refer to Rules 340, 905, 906, 907, 908, 909, and 910

OPERATOR INFORMATION

| | | | |
|---|---------------------------------|----------------------|-----------------------|
| Name of Operator: KERR MCGEE OIL & GAS ONSHORE LP | Operator No: 47120 | Phone Numbers | |
| Address: P O BOX 173779 | | | Phone: (970) 336-3500 |
| City: DENVER State: CO Zip: 80217-3779 | | | Mobile: () |
| Contact Person: Phil Hamlin | Email: Phil.Hamlin@anadarko.com | | |

PROJECT, PURPOSE & SITE INFORMATION

PROJECT INFORMATION

Remediation Project #: 3562 Initial Form 27 Document #: 1393864

PURPOSE INFORMATION

| | |
|--|--|
| <input type="checkbox"/> 901.e. Sensitive Area Determination | <input type="checkbox"/> 909.c.(5), Rule 910.b.(4): Remediation of impacted ground water |
| <input type="checkbox"/> 909.c.(1), Rule 905: Pit or PW vessel closure | <input type="checkbox"/> Rule 909.e.(2)A.: Notice completion of remediation in accordance with Rule 909.b. |
| <input type="checkbox"/> 909.c.(2), Rule 906: Spill/Release Remediation | <input checked="" type="checkbox"/> Rule 909.e.(2)B.: Closure of remediation project |
| <input type="checkbox"/> 909.c.(3), Rule 907.e.: Land treatment of oily waste | <input type="checkbox"/> Rule 906.c.: Director request |
| <input type="checkbox"/> 909.c.(4), Rule 908.g.: Centralized E&P Waste Management Facility closure | <input type="checkbox"/> Other _____ |

SITE INFORMATION N Multiple Facilities (in accordance with Rule 909.c.)

| | | | |
|--------------------------------|--|------------------------|--|
| Facility Type: WELL | Facility ID: _____ | API #: 123-16635 | County Name: WELD |
| Facility Name: HSR-BLANK 15-5A | Latitude: 40.248397 | Longitude: -104.799056 | |
| | ** correct Lat/Long if needed: Latitude: 40.247937 | Longitude: -104.792258 | |
| QtrQtr: SWSE | Sec: 5 | Twp: 3N | Range: 66W Meridian: 6 Sensitive Area? Yes |

SITE CONDITIONS

General soil type - USCS Classifications SP Most Sensitive Adjacent Land Use Agriculture and Wetlands

Is domestic water well within 1/4 mile? Yes Is surface water within 1/4 mile? Yes

Is groundwater less than 20 feet below ground surface? Yes

Other Potential Receptors within 1/4 mile

Water well approximately 1,200 feet (ft) southeast, wetlands and surface water approximately 50 ft north, livestock approximately 150 ft southeast, building approximately 920 ft south-southeast, and groundwater approximately 1 ft below ground surface (bgs).

SITE INVESTIGATION PLAN

TYPE OF WASTE:

- | | | |
|--|--|--|
| <input checked="" type="checkbox"/> E&P Waste | <input type="checkbox"/> Other E&P Waste | <input type="checkbox"/> Non-E&P Waste |
| <input checked="" type="checkbox"/> Produced Water | <input type="checkbox"/> Workover Fluids | _____ |
| <input checked="" type="checkbox"/> Oil | <input type="checkbox"/> Tank Bottoms | |
| <input type="checkbox"/> Condensate | <input type="checkbox"/> Pigging Waste | |
| <input type="checkbox"/> Drilling Fluids | <input type="checkbox"/> Rig Wash | |
| <input type="checkbox"/> Drill Cuttings | <input type="checkbox"/> Spent Filters | |
| | <input type="checkbox"/> Pit Bottoms | |
| | <input type="checkbox"/> Other (as described by EPA) | _____ |

DESCRIPTION OF IMPACT

| Impacted? | Impacted Media | Extent of Impact | How Determined |
|-----------|----------------|-------------------------------|----------------------------------|
| Yes | GROUNDWATER | See Attached Data | Groundwater Samples/Lab Analysis |
| Yes | SOILS | 35ft N-S X 36ft E-W X 6ft bgs | Soil Samples/Lab Analysis |

INITIAL ACTION SUMMARY

Description of initial action or emergency response measures take to abate, investigate, and/or remediate impacts associated with E&P Waste.

In August 2005, a corrosion hole in a partially buried produced water sump resulted in a petroleum hydrocarbon release at the HSR-Blank 15-5, HSR-Cabral 16-5 facility. The petroleum hydrocarbon impacted soil was excavated.

PROPOSED SAMPLING PLAN

Proposed Soil Sampling

Will soil samples be collected as part of this investigation? (Number, type (grab/composite), analyses, and locations of samples):

On August 4, 2005, five soil samples were collected from the sidewalls of the excavation and submitted for laboratory analysis of total petroleum hydrocarbons (TPH). Laboratory analytical results for the soil samples indicated that TPH concentrations were in full compliance with Colorado Oil and Gas Conservation Commission (COGCC) Table 910-1 allowable levels at the lateral extent of the excavation. The soil sample locations are depicted on the Excavation Site Map provided as Figure 1. The soil sample analytical results are summarized in Table 1.

Proposed Groundwater Sampling

Will groundwater samples be collected as part of this investigation? (Number, analyses, and locations of samples):

On August 4, 2005, one groundwater sample (BCW01) was collected from the excavation and submitted for laboratory analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX). Laboratory analytical results for excavation groundwater sample GW01 indicated that benzene, toluene, and total xylenes concentrations exceeded the COGCC Table 910-1 allowable levels at concentrations of 1,700 micrograms per liter (µg/L), 4,000 µg/L, and 10,800 µg/L, respectively. The excavation groundwater sample location is depicted on the Excavation Site Map provided as Figure 1. The excavation groundwater sample analytical results are summarized in Table 2.

Groundwater monitoring has been conducted on a quarterly basis since September 2005.

Proposed Surface Water Sampling

Will surface water samples be collected as part of this investigation? (Number, analyses, and locations of samples):

Additional Investigative Actions

Additional alternative investigative actions described in attached Site Investigation Plan (summary):

SITE INVESTIGATION REPORT

SAMPLE SUMMARY

Soil

Number of soil samples collected 5
Number of soil samples exceeding 910-1 1
Was the areal and vertical extent of soil contamination delineated? Yes
Approximate areal extent (square feet) 1260

NA / ND

-- Highest concentration of TPH (mg/kg) 1600
NA Highest concentration of SAR
BTEX > 910-1 Yes
Vertical Extent > 910-1 (in feet) 4

Groundwater

Number of groundwater samples collected 196
Was extent of groundwater contaminated delineated? Yes
Depth to groundwater (below ground surface, in feet) 1'
Number of groundwater monitoring wells installed 6
Number of groundwater samples exceeding 910-1 33

-- Highest concentration of Benzene (µg/l) 1700
-- Highest concentration of Toluene (µg/l) 4000
-- Highest concentration of Ethylbenzene (µg/l) 500
-- Highest concentration of Xylene (µg/l) 10800
NA Highest concentration of Methane (mg/l)

Surface Water

0 Number of surface water samples collected
 Number of surface water samples exceeding 910-1
If surface water is impacted, other agency notification may be required.

OTHER INVESTIGATION INFORMATION

Were impacts to adjacent property or offsite impacts identified?

Were background samples collected as part of this site investigation?

Was investigation derived waste (IDW) generated as part of this investigation?

Volume of solid waste (cubic yards) Volume of liquid waste (barrels)

Is further site investigation required?

REMEDIAL ACTION PLAN

Does this Supplemental Form 27A include changes to a previously approved Remedial Action Plan? No

SOURCE REMOVAL SUMMARY

Describe how source is to be removed.

Approximately 210 cubic yards of petroleum hydrocarbon impacted soil was transported to the Kerr-McGee Land Treatment Facility in Weld County, Colorado, for recycling. The impacted soil was excavated into the capillary and phreatic zones to address potential hydrocarbon impacts that may have been present below the groundwater table due to past seasonal fluctuations. Approximately 80 barrels of impacted groundwater were transported to a licensed injection facility for disposal. The general site layout and excavation footprint are depicted on the Excavation Site Map provided as Figure 1.

REMEDICATION SUMMARY

Describe how remediation of existing impacts to soil and groundwater is to be accomplished (i.e. summarize remedial action plan). Provide a brief narrative description including: technical justification, schedule for implementation, estimated time to attain NFA status, plus plans and specifications for the selected remedial action technology.

Prior to 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 groundwater in the excavation.

As of the March 2010 quarterly monitoring event, monitoring well MW03 exceeded the COGCC Table 910-1 allowable level for benzene at 260 µg/L. Following the March 2010 monitoring event, Kerr-McGee contracted LT Environmental, Inc. (LTE) to design and implement a carbon slurry injection program to remediate the residual dissolved-phase BTEX impacts to groundwater. Kerr-McGee submitted an Underground Injection Control (UIC) Permit Application to Region 8 of the United States Environmental Protection Agency (USEPA) on May 6, 2010, which was subsequently approved in a Rule Authorization: Aquifer Remediation Well approval letter from Region 8 dated May 25, 2010.

The carbon slurry injection program was implemented, as outlined in the UIC Permit Application, with the objective of reducing the residual dissolved-phase BTEX concentrations in the injection area surrounding monitoring well MW03 to be compliant with the COGCC Table 910-1 allowable levels. In June 2010, LTE oversaw the injection of approximately 120 pounds (dry weight) of BOS 200® that was mixed with potable water and cultured facultative microbes to form an injectable carbon slurry. The BOS 200® product is designed to enhance petroleum hydrocarbon degradation by capturing the dissolved-phase petroleum hydrocarbons in a carbon matrix and promoting microbial metabolism of the hydrocarbons under both aerobic and anaerobic conditions. Post-injection groundwater monitoring continued on a quarterly basis. The June 2010 carbon slurry injection area is depicted on Figure 2.

Soil Remediation Summary

| | |
|---|--|
| <input type="checkbox"/> In Situ | <input checked="" type="checkbox"/> Ex Situ |
| _____ Bioremediation (or enhanced bioremediation) | Yes _____ Excavate and offsite disposal |
| _____ Chemical oxidation | _____ If Yes: Estimated Volume (Cubic Yards) _____ 210 |
| _____ Air sparge / Soil vapor extraction | _____ Name of Licensed Disposal Facility or COGCC Facility ID # _____ 149007 |
| _____ Natural Attenuation | No _____ Excavate and onsite remediation |
| _____ Other _____ | _____ Land Treatment |
| | _____ Bioremediation (or enhanced bioremediation) |
| | _____ Chemical oxidation |
| | _____ Other _____ |

Groundwater Remediation Summary

| | |
|-----------|--|
| Yes _____ | Bioremediation (or enhanced bioremediation) |
| Yes _____ | Chemical oxidation |
| No _____ | Air sparge / Soil vapor extraction |
| Yes _____ | Natural Attenuation |
| Yes _____ | Other Groundwater Removal (2005), MicroBlaze® Application (2005), BOS 200® Carbon Slurry Injection (2010) |

GROUNDWATER MONITORING

If groundwater has been impacted, describe proposed monitoring plan, including # of wells or sample points, monitoring schedule, analytical methods, points of compliance. Attach a groundwater monitoring location diagram.

Groundwater monitoring wells MW01 through MW07 and replacement well MW03R were installed at the site between September 2005 and November 2017. Groundwater monitoring continued on a quarterly basis. Monitoring wells MW01 and MW02 were removed from the groundwater monitoring program, as approved by the COGCC in the letters dated July 1, 2009, and June 8, 2011, respectively. The monitoring well locations are depicted on the Site Map attached as Figure 2. Boring logs with monitoring well completion diagrams are attached.

On December 6, 2013, monitoring wells MW02 through MW06 were surveyed to obtain the relative groundwater and top-of-casing well elevation data. The survey data indicated the groundwater flow direction at the site is to the north-northeast. On July 24, 2015 monitoring wells MW03 through MW06 were resurveyed, and on November 16, 2017, wells MW03R and MW07 were tied in to the July 2015 survey data. The survey data indicated the groundwater flow direction is to the north. The relative groundwater elevations are provided in Table 2. Groundwater Elevation Contour Maps for the fourth quarter 2017 through third quarter 2018 monitoring events are provided as Figures 3A through 3D, respectively.

As of the September 2018 quarterly monitoring event, BTEX concentrations in monitoring wells MW03R through MW07 were in full compliance with COGCC Table 910-1 allowable levels for four consecutive quarterly monitoring events. The groundwater analytical results are summarized in Table 2. The laboratory analytical reports for the four compliant groundwater monitoring events are attached.

REMEDIATION PROGRESS UPDATE

PERIODIC REPORTING

Frequency: Quarterly Semi-Annually Annually Other Final Report

Report Type: Groundwater Monitoring Land Treatment Progress Report O&M Report
 Other NFA Status Request

WASTE DISPOSAL INFORMATION

Was E&P waste generated as part of this remediation? Yes

Describe beneficial use, if any, of E&P Waste derived from this remediation project:

Approximately 210 cubic yards of petroleum hydrocarbon impacted soil were transported to the Kerr-McGee Land Treatment Facility in Weld County, Colorado, for recycling.

Volume of E&P Waste (solid) in cubic yards 210

E&P waste (solid) description Petroleum hydrocarbon impacted soil

COGCC Disposal Facility ID #, if applicable: 149007

Non-COGCC Disposal Facility: _____

Volume of E&P Waste (liquid) in barrels 80

E&P waste (liquid) description Petroleum hydrocarbon impacted groundwater

COGCC Disposal Facility ID #, if applicable: 159443

Non-COGCC Disposal Facility: _____

REMEDIATION COMPLETION REPORT

REMEDIATION COMPLETION SUMMARY

Is this a Final Closure Request for this Remediation Project? No

Do all soils meet Table 910-1 standards? Yes

Does the previous reply indicate consideration of background concentrations? No

Are the only residual soil impacts pH, SAR, or EC at depths greater than 3 feet below ground surface? _____

Does Groundwater meet Table 910-1 standards? Yes

Is additional groundwater monitoring to be conducted? No

RECLAMATION PLAN

RECLAMATION PLANNING

Describe reclamation plan. Discuss existing and new grade recontouring; method and testing of compaction alleviation; and reseeding program, including location of new seed, seed mix and noxious weed prevention. Attach diagram or drawing.

The site was restored to its pre-release grade. The Kerr-McGee facility remains at the site.

Is the described reclamation complete? No

Does the reclamation described herein constitute interim or final reclamation of the Oil and Gas Location?

Interim? Final?

Did the Surface Owner approve the seed mix? _____

If NO, does the seed mix comply with local soil conservation district recommendations? _____

IMPLEMENTATION SCHEDULE

PRIOR DATES

Date of Surface Owner notification/consultation, if required. _____

Actual Spill or Release date, if known. 08/02/2005

SITE INVESTIGATION DATES

Date of Initial Actions described in Site Investigation Plan (start date). 08/02/2005

Date of commencement of Site Investigation. 08/03/2005

Date of completion of Site Investigation. 12/05/2017

REMEDIAL ACTION DATES

Date of commencement of Remediation. 08/03/2005

Date of completion of Remediation. 09/10/2018

SITE RECLAMATION DATES

Date of commencement of Reclamation. _____

Date of completion of Reclamation. _____

OPERATOR COMMENT

| |
|--|
| |
|--|

I hereby certify all statements made in this form are to the best of my knowledge true, correct, and complete.

Signed: Phil Hamlin

Title: Senior HSE Representative

Submit Date: _____

Email: Phil.Hamlin@anadarko.com

Based on the information provided herein, this Application for Site Investigation and Remediation Workplan complies with COGCC Rules and applicable orders and is hereby approved.

COGCC Approved: _____

Date: _____

Remediation Project Number: 3562

COA Type

Description

| <u>COA Type</u> | <u>Description</u> |
|-----------------|--------------------|
| | |

Attachment Check List

Upon approval, the approved Form 27 and all listed attachments will be indexed to the Remediation Project file. Only the approved Form 27 will also be indexed to the related Facilities.

Att Doc Num

Name

| | |
|-----------|----------------------------|
| 401769909 | LOGS |
| 401836994 | ANALYTICAL RESULTS |
| 401838370 | GROUND WATER ELEVATION MAP |
| 401838373 | SITE MAP |
| 401838377 | SOIL SAMPLE LOCATION MAP |

Total Attach: 5 Files

General Comments

User Group

Comment

Comment Date

| <u>User Group</u> | <u>Comment</u> | <u>Comment Date</u> |
|-------------------|----------------|---------------------|
| | | Stamp Upon Approval |

Total: 0 comment(s)