FORM 27 Rev 3/16

# State of Colorado
# Oil and Gas Conservation Commission

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## 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 INFORMATON

Name of Operator: KERR MCGEE OIL & GAS ONSHORE LP Operator No: 47120
Address: P O BOX 173779
City: DENVER State: CO Zip: 80217-3779
Contact Person: Phil Hamlin Email: Phil_Hamlin@oxy.com

**Phone Numbers**
Phone: (970) 336-3500
Mobile: ( )

## PROJECT, PURPOSE & SITE INFORMATION

### PROJECT INFORMATION

Remediation Project #: 9644 Initial Form 27 Document #: 200439512

### PURPOSE INFORMATION

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

### SITE INFORMATION

N Multiple Facilites ( in accordance with Rule 909.c. )

Facility Type: SPILL OR RELEASE Facility ID: 444847 API #: County Name: WELD
Facility Name: SPILL/RELEASE POINT Latitude: 40.225381 Longitude: -104.727598
** correct Lat/Long if needed: Latitude: Longitude:
QtrQtr: SENW Sec: 13 Twp: 3N Range: 66W Meridian: 6 Sensitive Area? Yes

### SITE CONDITIONS

General soil type - USCS Classifications SM
Most Sensitive Adjacent Land Use Agriculture
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 875 feet (ft) northeast, surface water approximately 100 ft northeast, occupied building approximately 510 ft east, livestock approximately 980 ft northeast, and groundwater approximately 7 ft below ground surface (bgs).

## SITE INVESTIGATION PLAN

## TYPE OF WASTE:

- [x] **E&P Waste**
  - [x] Produced Water
  - [ ] Oil
  - [ ] Condensate
  - [ ] Drilling Fluids
  - [ ] Drill Cuttings
- [ ] **Other E&P Waste**
  - [ ] Workover Fluids
  - [ ] Tank Bottoms
  - [ ] Pigging Waste
  - [ ] Rig Wash
  - [ ] Spent Filters
  - [ ] Pit Bottoms
  - [ ] Other (as described by EPA) _____
- [ ] **Non-E&P Waste** _____

## DESCRIPTION OF IMPACT

| Impacted? | Impacted Media | Extent of Impact | How Determined |
|---|---|---|---|
| Yes | GROUNDWATER | See Attached Data | Groundwater Samples/Lab Analysis |
| Yes | SOILS | 85' N-S X 178' E-W X 19' bgs (max) | 2016 and 2019 Excavations; 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 February 2016, a negative trend on the partially-buried produced water vessel was detected by the operator during a site visit at the HSR-63N66W/13SENW tank battery facility. Upon examination, a corrosion hole in the water dump line was discovered. The petroleum hydrocarbon impacted soil was excavated in February and March 2019.

Based on the groundwater analytical results and measurable free product in multiple monitoring wells, additional excavation of source area was conducted between April and June 2019. The general site layout and 2016 and 2019 excavation footprints are depicted on the Excavation Site Map provided as Figure 1.

## PROPOSED SAMPLING PLAN

### Proposed Soil Sampling

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

Between February 8 and March 17, 2016, eight soil samples were collected from the 2016 excavation for laboratory analysis of total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, and total xylenes (BTEX), pH, and specific conductivity (EC). Laboratory analytical results indicated that TPH, BTEX, pH, and EC levels were in full compliance with Colorado Oil and Gas Conservation Commission (COGCC) Table 910-1 allowable levels at the extent of the excavation.

Between April 30 and June 12, 2019, 33 soil samples were collected from the 2019 excavation for laboratory analysis of TPH, BTEX, and naphthalene. The base soil samples were also analyzed for pH, EC, and sodium adsorption ratio (SAR). Laboratory results indicated that TPH, BTEX, naphthalene, pH, EC, and SAR levels were in full compliance with COGCC Table 910-1 allowable levels at the extent of the excavation. The soil sample analytical results are summarized in Table 1. The soil sample locations are depicted on Figure 1.

### Proposed Groundwater Sampling

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

On February 8, 2016, groundwater sample GW01 was collected from the 2016 excavation and submitted for BTEX analysis. Laboratory results indicated sample GW01 exceeded the COGCC Table 910-1 allowable levels for benzene, toluene, and total xylenes at concentrations of 3,630 micrograms per liter (µg/L), 6,090 µg/L, and 3,200 µg/L, respectively. Following the removal of impacted groundwater, sample GW02 was collected from the excavation. Laboratory results indicated sample GW01 exceeded the COGCC allowable levels for benzene, toluene, and total xylenes at concentrations of 603 µg/L, 1,930 µg/L, and 3,040 µg/L, respectively.

On May 7, 2019, groundwater sample GW01 was collected from the 2019 excavation. Laboratory results indicated sample GW01 exceeded the COGCC Table 910-1 allowable levels for benzene and total xylenes at concentrations of 282 µg/L and 2,420 µg/L, respectively. The groundwater sample locations are depicted on Figure 1, and the analytical results are summarized in Table 2.

### 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: 41
Number of soil samples exceeeding 910-1: 9
Was the areal and vertical extent of soil contamination delineated? Yes
Approximate areal extent (square feet): 10260

**NA / ND**

-- Highest concentration of TPH (mg/kg): 4185
-- Highest concentration of SAR: 6.71
BTEX > 910-1: Yes
Vertical Extent > 910-1 (in feet): 17

**Groundwater**

Number of groundwater samples collected: 102
Was extent of groundwater contaminated delineated? No
Depth to groundwater (below ground surface, in feet): 7`
Number of groundwater monitoring wells installed: 52
Number of groundwater samples exceeding 910-1: 51

-- Highest concentration of Benzene (µg/l): 16900
-- Highest concentration of Toluene (µg/l): 19900
-- Highest concentration of Ethylbenzene (µg/l): 2870
-- Highest concentration of Xylene (µg/l): 32200
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?

Petroleum hydrocarbon impacts to soil were identified in the field west of the former tank battery. Petroleum hydrocarbon impacts to groundwater were identified in the rangeland west and southwest of the former tank battery, and in the agricultural field west-northwest of the former tank battery.

☒ Were background samples collected as part of this site investigation?

A background soil sample was submitted to the laboratory and placed on hold for analysis. Laboratory analytical results indicated that pH and EC levels were compliant at the extent of the excavation; therefore, the background soil sample was not submitted for laboratory analysis.

☐ 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?

The extent of groundwater contamination has not yet been delineated. Additional monitoring wells will be installed to the west-northwest to establish points of compliance.

# 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 190 cubic yards of petroleum hydrocarbon impacted soil was excavated from the 2016 excavation and 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 current groundwater table due to seasonal fluctuations. Approximately 31 barrels of impacted groundwater were removed from the 2016 excavation and transported to a licensed injection facility for disposal.

Based on the groundwater analytical results from the quarterly groundwater monitoring program and measurable free product in three of the monitoring wells, additional excavation of source area was conducted between April and June 2019. Approximately 4,520 cubic yards of petroleum hydrocarbon impacted soil were excavated from the 2019 excavation and transported to the Kerr-McGee Land Treatment Facility in Weld County, Colorado, for recycling, and to Front Range Landfill in Erie, Colorado, for disposal. Approximately 1,491 barrels of impacted groundwater were removed from the 2019 excavation and transported to the Aggregate Recycle Facility in Weld County, Colorado, for recycling.

The general site layout and 2016 and 2019 excavation footprints are depicted on the Excavation Site Map provided as Figure 1.

## REMEDIATION 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.

While backfilling the 2016 excavation, 800 pounds of COGAC®, a carbon-based bioremediation product designed to capture and degrade petroleum hydrocarbons via chemical oxidation and passive bio-stimulation, were applied to the clean backfill in a series of lifts in the capillary and phreatic horizons. While backfilling the 2019 excavation, 1,500 pounds of COGAC® were applied to the clean excavation backfill.

During the December 2018 monitoring event, free product was measured in monitoring wells MW02, MW06, and MW09. Between April and June 2019, additional petroleum hydrocarbon impacted soil was excavated in the vicinity of monitoring wells MW02, MW06, and MW09. Following the completion of excavation activities, replacement monitoring wells MW02R, MW06R, and MW09R were installed in August 2019. Free product was not measured in the replacement monitoring wells during the September 2019 monitoring event.

In June 2019, a groundwater flow-through treatment zone (GFTZ) was installed to prevent or limit any further hydrocarbon migration. The carbon barrier, as depicted on Figure 1, was designed based on the benzene analytical results for the December 13, 2018, groundwater monitoring event. A total of 2,400 pounds of activated carbon were mixed with pea gravel over 100 linear feet of trench. The carbon loading was based upon site-specific conditions. The objective of the activated carbon is to trap hydrocarbons in the carbon structure matrix where hydrocarbons are treated/degraded via the facultative microbes. As the hydrocarbons are metabolized, the carbon is trapping and removing dissolved hydrocarbons in groundwater that flows through the carbon barrier. The GFTZ is depicted on the Excavation Site Map provided as Figure 1.

## Soil Remediation Summary

☐ **In Situ**

- ____ Bioremediation ( or enhanced bioremediation )
- ____ Chemical oxidation
- ____ Air sparge / Soil vapor extraction
- ____ Natural Attenuation
- ____ Other ____

☒ **Ex Situ**

- Yes Excavate and offsite disposal
  - If Yes: Estimated Volume (Cubic Yards) 190
  - Name of Licensed Disposal Facility or COGCC Facility ID # 149007
- No Excavate and onsite remediation
  - ____ 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 and COGAC® Application (2016 and 2019)

## 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.

In August 2019, 21 additional groundwater monitoring wells (MW24 through MW44) and nine replacement monitoring wells (MW02R, MW06R, MW08R, MW09R, MW10R, MW11R, MW13R, MW18R, and MW19R) were installed at the site. Boring logs with monitoring well completion diagrams are included as an attachment.

Groundwater monitoring wells MW01 through MW44 are sampled on a quarterly basis and submitted for laboratory analysis for BTEX by United States Environmental Protection Agency Method 8260D. The monitoring well locations are depicted on Figure 2. A Groundwater Elevation Contour Map generated using the September 2019 survey data is provided as Figure 3. The groundwater analytical results are summarized in Table 2, and the laboratory analytical reports for the March 2019, June 2019, and September 2019 groundwater monitoring events are attached.

Additional monitoring wells will be installed to the west-northwest to establish points of compliance. Groundwater monitoring will continue on a quarterly basis until a No Further Action status request is warranted.

# REMEDIATION PROGRESS UPDATE

## PERIODIC REPORTING

**Frequency:** [X] Quarterly [ ] Semi-Annually [ ] Annually [ ] Other

**Report Type:** [X] Groundwater Monitoring [ ] Land Treatment Progress Report [ ] O&M Report [ ] Other

## 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:

The petroleum hydrocarbon impacted soil from the 2016 and 2019 excavations were transported to the Kerr-McGee Land Treatment Facility in Weld County, Colorado, for recycling, and to Front Range Landfill in Erie, Colorado, for disposal. The petroleum hydrocarbon impacted groundwater from the 2019 excavation was transported to the Aggregate Recycle Facility in Weld County, Colorado, for recycling.

Volume of E&P Waste (solid) in cubic yards: 4710

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

COGCC Disposal Facility ID #, if applicable: 149007

Non-COGCC Disposal Facility: Kerr-McGee Land Treatment Facility in Weld County, CO and Front Range Landfill in Erie, CO

Volume of E&P Waste (liquid) in barrels: 1522

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

COGCC Disposal Facility ID #, if applicable: 434766

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? No

Is additional groundwater monitoring to be conducted? Yes

# 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 Kerr-McGee tank battery was deconstructed. The site will be reclaimed in accordance with COGCC 1000 Series Reclamation Rules.

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. 02/09/2016

Actual Spill or Release date, if known. 02/09/2016

### SITE INVESTIGATION DATES

Date of Initial Actions described in Site Investigation Plan (start date). 02/08/2016

Date of commencement of Site Investigation. 02/08/2016

Date of completion of Site Investigation.

### REMEDIAL ACTION DATES

Date of commencement of Remediation. 02/09/2016

Date of completion of Remediation.

### SITE RECLAMATION DATES

Date of commencement of Reclamation.

Date of completion of Reclamation.

### OPERATOR COMMENT

Form 27 update reports will be submitted to the COGCC on a quarterly basis until the extent of subsurface impacts has been fully delineated.

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 Environmental Rep.

Submit Date:` 12/30/2019

Email: Phil_Hamlin@oxy.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: PETER GINTAUTAS

Date: 12/30/2019

Remediation Project Number: 9644

| COA Type | Description |
|---|---|
| | Submit reports of site investigation and progress of remediation including results of sampling and analysis at a minimum on a quarterly basis until adequate points of compliance related to impacted groundwater are in place. |

## 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 |
|---|---|
| 402221449 | FORM 27-SUPPLEMENTAL-SUBMITTED |
| 402222379 | ANALYTICAL RESULTS |
| 402223659 | SOIL SAMPLE LOCATION MAP |
| 402223662 | SITE MAP |
| 402223664 | GROUND WATER ELEVATION MAP |
| 402238779 | LOGS |

Total Attach: 6 Files

## General Comments

| User Group | Comment | Comment Date |
|---|---|---|
| | | Stamp Upon Approval |

Total: 0 comment(s)