

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 Phone: (970) 336-3500 Mobile: ()
Address: P O BOX 173779		
City: DENVER	State: CO Zip: 80217-3779	
Contact Person: Phillip Hamlin	Email: Phil.Hamlin@Anadarko.com	

PROJECT, PURPOSE & SITE INFORMATION

PROJECT INFORMATION

Remediation Project #: 5645 Initial Form 27 Document #: 2213101

PURPOSE INFORMATION

- 901.e. Sensitive Area Determination
- 909.c.(1), Rule 905: Pit or PW vessel closure
- 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
- 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 Facilities (in accordance with Rule 909.c.)

Facility Type: LOCATION	Facility ID: 330278	API #: _____	County Name: WELD
Facility Name: HENRICKSON FEDERAL 35N-18HZ		Latitude: 40.236744	Longitude: -104.822456
		** correct Lat/Long if needed: Latitude: 40.233954	Longitude: -104.824653
QtrQtr: NESW	Sec: 7	Twp: 3N	Range: 66W Meridian: 6 Sensitive Area? Yes

SITE CONDITIONS

General soil type - USCS Classifications CL 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

Occupied building and water well approximately 650 feet (ft) east, and groundwater approximately 12 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	32' N-S X 18' E-W X 16' 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 January 2010, field crews were upgrading the HSR-MJ Farms 11, 12, 13, 14-7, Hildenbrandt Pooling GU #1 production facility and encountered historic petroleum hydrocarbon impacted soil associated with the old abandoned battery lines. 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):

In January 2010, soil samples were collected from the excavation and submitted for laboratory analysis of total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, and total xylenes (BTEX), pH, and specific conductivity (EC). Analytical results indicated that BTEX, TPH, pH, and EC concentrations and levels were compliant with Colorado Oil and Gas Conservation Commission (COGCC) Table 910-1 allowable levels at the lateral extent of the excavation. The excavation dimensions are depicted on the Site Map provided as Figure 1.

Proposed Groundwater Sampling

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

In January 2010, one groundwater sample (GW01) was collected from the excavation for laboratory analysis of BTEX. Laboratory analytical results indicated that sample GW01 exceeded the COGCC Table 910-1 allowable levels for benzene, toluene, and total xylenes. The groundwater sample location is depicted on Figure 1, and the laboratory analytical results are summarized on Table 1.

Groundwater monitoring has been conducted on a quarterly basis since June 2010.

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 8
Number of soil samples exceeding 910-1 4
Was the areal and vertical extent of soil contamination delineated? Yes
Approximate areal extent (square feet) 576

NA / ND

-- Highest concentration of TPH (mg/kg) 5400
NA Highest concentration of SAR
BTEX > 910-1 Yes
Vertical Extent > 910-1 (in feet) 9

Groundwater

Number of groundwater samples collected 647
Was extent of groundwater contaminated delineated? No
Depth to groundwater (below ground surface, in feet) 12'
Number of groundwater monitoring wells installed 59
Number of groundwater samples exceeding 910-1 253

-- Highest concentration of Benzene (µg/l) 29000
-- Highest concentration of Toluene (µg/l) 31000
-- Highest concentration of Ethylbenzene (µg/l) 915
-- Highest concentration of Xylene (µg/l) 13500
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?

Groundwater impacts were detected in the adjoining agricultural field north of the former tank battery.

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?

The extent of groundwater impacts has not yet been delineated. Additional monitoring wells will be installed to the northeast and 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.

Please refer to the Form 27 submitted to the COGCC on March 18, 2011.

Approximately 340 cubic yards of impacted soil were excavated 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. In addition, approximately 330 barrels of petroleum hydrocarbon impacted groundwater was removed from the excavation and transported to a licensed injection facility for disposal. The general site layout and excavation footprint are depicted on the 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.

While backfilling the excavation, ten gallons of MicroBlaze®, a concentrated solution of facultative microbes, nutrients, and surfactants designed to bioremediate petroleum hydrocarbons, was applied to the excavation groundwater immediately prior to backfilling. The excavation area was restored to its pre-release grade.

Free product recovery (bailing) was conducted bi-weekly for wells MW01, MW02, MW04, and MW08 between June 2013 to October 2014 and discontinued due to lack of measurable product.

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. 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. Installation and operation of the full-scale AS/SVE system occurred between March and April 2016.

The AS/SVE system started up in July 2016. The system is comprised of 46 AS wells and 6 SVE wells connected by a combination of surface and subsurface high-density polyethylene piping to a remediation trailer powered by an electric drop. 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 housed within the remediation trailer. A diesel powered tow-behind air compressor was used periodically to increase AS system influence. The as-built layout of the full-scale AS/SVE system is depicted on the As-Built AS/SVE System Layout attached as Figure 2.

Soil Remediation Summary

In Situ

Ex Situ

<input type="checkbox"/> Bioremediation (or enhanced bioremediation)	Yes	Excavate and offsite disposal	
<input type="checkbox"/> Chemical oxidation		If Yes: Estimated Volume (Cubic Yards)	340
<input type="checkbox"/> Air sparge / Soil vapor extraction		Name of Licensed Disposal Facility or COGCC Facility ID #	149007
<input type="checkbox"/> Natural Attenuation	No	Excavate and onsite remediation	
<input type="checkbox"/> Other		Land Treatment	
		Bioremediation (or enhanced bioremediation)	
		Chemical oxidation	
		Other	

Groundwater Remediation Summary

Yes	Bioremediation (or enhanced bioremediation)
No	Chemical oxidation
Yes	Air sparge / Soil vapor extraction
Yes	Natural Attenuation
Yes	Other Groundwater Removal and MicroBlaze® Application

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 MW01R, MW04R, MW10, MW11, MW13, MW15, MW16, MW17, MW20, through MW26, MW29 through MW33, MW35 through MW39, MW41, MW42, MW44 through MW49, and MW51 are sampled quarterly, and MW02R, MW03R, MW05R through MW07R, MW08, MW09R, MW12, MW14, MW18, MW19, MW27, MW28, MW40, and MW43 are sampled annually. The groundwater samples are submitted for laboratory analysis of BTEX. The reduced monitoring schedule and the removal of monitoring well MW34 from the monitoring program were approved by the COGCC in electronic mail dated October 30, 2015. The monitoring well locations are depicted on Figure 1. The Groundwater Elevation Contour Map generated using the December 2018 survey data is provided as Figure 3. The groundwater analytical results are summarized in Table 1, and the laboratory analytical reports for the last four quarters of groundwater monitoring events are attached.

Groundwater monitoring will continue on a quarterly basis until a No Further Action status request is warranted.

REMEDIATION PROGRESS UPDATE

PERIODIC REPORTING

Frequency: Quarterly Semi-Annually Annually Other _____

Report Type: 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 was transported to the Kerr-McGee Land Treatment Facility in Weld County, Colorado, for recycling.

Volume of E&P Waste (solid) in cubic yards _____ 340

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 _____ 330

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? 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 site was restored to its pre-release grade. The Kerr-McGee production facility was deconstructed.

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. 01/13/2010

SITE INVESTIGATION DATES

Date of Initial Actions described in Site Investigation Plan (start date). 01/13/2010

Date of commencement of Site Investigation. 01/13/2010

Date of completion of Site Investigation. _____

REMEDIAL ACTION DATES

Date of commencement of Remediation. 01/13/2010

Date of completion of Remediation. _____

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: Phillip Hamlin

Title: Senior Environmental Rep.

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: 5645

COA Type

Description

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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.

<u>Att Doc Num</u>	<u>Name</u>
401912805	SITE MAP
401914812	MAP
401914824	GROUND WATER ELEVATION MAP
401930623	ANALYTICAL RESULTS

Total Attach: 4 Files

General Comments

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

Total: 0 comment(s)