

State of Colorado  
Oil and Gas Conservation Commission

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Report taken by:  
PETER GINTAUTAS

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: <u>KERR MCGEE OIL &amp; GAS ONSHORE LP</u>	Operator No: <u>47120</u>	<b>Phone Numbers</b>
Address: <u>P O BOX 173779</u>		Phone: <u>(970) 336-3500</u>
City: <u>DENVER</u>	State: <u>CO</u>	Zip: <u>80217-3779</u>
Contact Person: <u>Phillip Hamlin</u>	Email: <u>Phil.Hamlin@anadarko.com</u>	Mobile: <u>(970) 515-1161</u>

PROJECT, PURPOSE & SITE INFORMATION

**PROJECT INFORMATION**  
Remediation Project #: 9675 Initial Form 27 Document #: 200439575

**PURPOSE INFORMATION**

<input type="checkbox"/> 901.e. Sensitive Area Determination	<input checked="" 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 checked="" type="checkbox"/> 909.c.(2), Rule 906: Spill/Release Remediation	<input 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 Facilites ( in accordance with Rule 909.c. )

Facility Type: <u>TANK BATTERY</u>	Facility ID: <u>440852</u>	API #: _____	County Name: <u>WELD</u>
Facility Name: <u>SPILL/RELEASE POINT</u>	Latitude: <u>40.268799</u>	Longitude: <u>-104.723004</u>	
** correct Lat/Long if needed: Latitude: _____		Longitude: _____	
QtrQtr: <u>NWNE</u>	Sec: <u>36</u>	Twp: <u>4N</u>	Range: <u>66W</u>
Meridian: <u>6</u>	Sensitive Area? <u>Yes</u>		

**SITE CONDITIONS**

General soil type - USCS Classifications SM Most Sensitive Adjacent Land Use Non-Crop Land

Is domestic water well within 1/4 mile? Yes Is surface water within 1/4 mile? No

Is groundwater less than 20 feet below ground surface? Yes

**Other Potential Receptors within 1/4 mile**

A livestock pasture is located approximately 100 feet southwest of the release location.

# 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 sampling and laboratory analysis
Yes	SOILS	100' (N-S) x 80' (E-W) x 19' bgs	Soil boring, excavation, soil sampling, and laboratory 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.

On February 9, 2015, historical hydrocarbon impacts were discovered during abandonment activities at the HSR-Corvi 64N66W36NWNWNE production facility. The facility was shut in, associated infrastructure removed, and excavation activities were initiated. Groundwater was not encountered during excavation activities. The COGCC has issued Spill/Release Point ID 440852 for this release.

## 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 ):

Soil samples were collected as described in the Initial Form 27. Due to the presence of multiple active subsurface lines, impacted soil was left in-place in the vicinity of excavation soil samples N01@15', S01@15', W01@15', and B01@18'. Between March 5 and 10, 2015, multiple soil borings were advanced around the excavation area, in order to complete delineation of soil impacts. These borings were advanced to the limit of the soil impacts observed during drilling; soil samples collected from borings W-BH02 and NW-BH06 exhibited constituent concentrations out of compliance with COGCC standards. Based on the results of assessment activities, remaining impacted soil extends from approximately 10 feet below ground surface (bgs) to the current groundwater table. Soil sample locations and the estimated areal extent of remaining soil impacts are illustrated on Figure 1.

### Proposed Groundwater Sampling

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

The soil borings advanced between March 5 and 10, 2015 yielded groundwater, and as such borings S-BH01, W-BH02, N-BH03, N-BH04, W-BH05, and NW-BH06 were converted to temporary groundwater monitoring wells BH01-BH06. Samples collected from these locations indicated that groundwater impacts out of compliance with COGCC standards were present at the site. Between August 17 and 25, 2015, 5 additional temporary monitoring wells (BH07-BH11) were installed to further assess the extent of groundwater impacts. Quarterly groundwater monitoring was initiated on March 11, 2015, and is ongoing at the eleven (11) temporary monitoring wells on site. Groundwater samples are collected from the temporary monitoring wells on a quarterly basis and analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX). Groundwater analytical data is presented in Table 1, and the groundwater sample locations are illustrated on Figure 2. Laboratory analytical reports are provided as Attachment A.

### 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 ):

Groundwater samples have been intermittently collected from select site remediation wells, as needed, for remediation system monitoring and optimization purposes.

# SITE INVESTIGATION REPORT

## SAMPLE SUMMARY

### Soil

Number of soil samples collected 14  
Number of soil samples exceeding 910-1 7  
Was the areal and vertical extent of soil contamination delineated? Yes  
Approximate areal extent (square feet) 6600

### NA / ND

-- Highest concentration of TPH (mg/kg) 2650  
NA Highest concentration of SAR           
BTEX > 910-1 Yes  
Vertical Extent > 910-1 (in feet) 19

### Groundwater

Number of groundwater samples collected 168  
Was extent of groundwater contaminated delineated? Yes  
Depth to groundwater (below ground surface, in feet) 14'  
Number of groundwater monitoring wells installed 30  
Number of groundwater samples exceeding 910-1 67

-- Highest concentration of Benzene (µg/l) 13900  
-- Highest concentration of Toluene (µg/l) 20500  
-- Highest concentration of Ethylbenzene (µg/l) 760  
-- Highest concentration of Xylene (µg/l) 15200  
NA Highest concentration of Methane (mg/l)         

### Surface Water

0 Number of surface water samples collected  
0 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 out of compliance with COGCC standards were historically detected in off-Site monitoring well BH01. Remaining soil impacts may potentially extend into the adjacent property to the south of the site, as illustrated on Figure 1.

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?

Hydrocarbon impacted soil and groundwater remain at the site. The 11 temporary groundwater monitoring wells (BH01 - BH11) will continue to be sampled on a quarterly basis and submitted for laboratory analysis of BTEX until concentrations remain in full compliance with COGCC standards for four consecutive quarters. Additional confirmation soil samples will be collected from the final impacted soil area extent, subsequent to the completion of soil remediation activities.

# 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.

On February 9, 2015, approximately 150 cubic yards of impacted material were excavated and transported to the Buffalo Ridge Landfill in Keenesburg, Colorado for disposal. Remaining impacted soil left in place (as previously described) is being addressed as described below.

## 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.

As described, impacted soil and groundwater remain at the site. Kerr-McGee has selected air sparging (AS) and soil vapor extraction (SVE) as the remedial technologies to address remaining hydrocarbon impacts to soil and groundwater at the site. Between November 29, 2017 and February 26, 2018, a total of nine AS remediation wells (AS-01 - AS-09) and 10 SVE remediation wells (SVE-01 - SVE-10) were installed at the site for use in a dedicated on-site remediation system. Trenching and construction activities for the AS/SVE system were initiated during the First Quarter 2018 and completed during the Second Quarter 2018. AS/SVE system start-up and optimization activities were initiated on May 11, 2018, and the system was running full-time as of June 5, 2018. On-going operations, monitoring, and maintenance (OM&M) events are conducted on the remediation system on a bi-weekly basis, in order to continue to optimize the system performance. The as-built locations of the remediation system wells are illustrated on Figure 3, and estimated SVE and AS radius of influence maps are included as Figures 4 and 5, respectively. The remediation well completion logs are provided as Attachment B. The approved USEPA Underground Injection Control permit for AS activities was included in the previous Form 27-Supplemental Annual Update. Quarterly groundwater monitoring is ongoing, and will be continued until concentrations remain in full compliance with COGCC standards for four consecutive quarters. Estimated time to attain NFA is TBD based on the groundwater concentrations, the extent of impacted soil and groundwater, and the efficacy of the selected remedial technologies.

## Soil Remediation Summary

In Situ

No \_\_\_\_\_ Bioremediation ( or enhanced bioremediation )

No \_\_\_\_\_ Chemical oxidation

Yes \_\_\_\_\_ Air sparge / Soil vapor extraction

Yes \_\_\_\_\_ Natural Attenuation

No \_\_\_\_\_ Other \_\_\_\_\_

Ex Situ

Yes \_\_\_\_\_ Excavate and offsite disposal

If Yes: Estimated Volume (Cubic Yards) \_\_\_\_\_ 150

Name of Licensed Disposal Facility or COGCC Facility ID # \_\_\_\_\_

No \_\_\_\_\_ Excavate and onsite remediation

\_\_\_\_\_ Land Treatment

\_\_\_\_\_ Bioremediation (or enhanced bioremediation)

\_\_\_\_\_ Chemical oxidation

\_\_\_\_\_ Other \_\_\_\_\_

## Groundwater Remediation Summary

No \_\_\_\_\_ Bioremediation ( or enhanced bioremediation )

No \_\_\_\_\_ Chemical oxidation

Yes \_\_\_\_\_ Air sparge / Soil vapor extraction

Yes \_\_\_\_\_ Natural Attenuation

No \_\_\_\_\_ Other \_\_\_\_\_

## 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.

Between March 5, 2015 and November 29, 2017, 11 temporary groundwater monitoring wells (BH01 - BH11) were installed at the site to assess the extent of groundwater impacts. The 11 temporary monitoring wells will continue to be sampled on a quarterly basis and submitted for laboratory analysis of BTEX until concentrations remain in full compliance with COGCC standards of four consecutive quarters. Groundwater sample locations are illustrated on Figure 2, and a potentiometric surface contour map for the Fourth Quarter 2018 is presented as Figure 6. Well completion logs for the temporary monitoring and remediation wells are provided as Attachment B.

## 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:

NA

Volume of E&P Waste (solid) in cubic yards \_\_\_\_\_ 150

E&P waste (solid) description Hydrocarbon impacted soil

COGCC Disposal Facility ID #, if applicable: \_\_\_\_\_

Non-COGCC Disposal Facility: Buffalo Ridge Landfill - Keenesburg, Colorado

Volume of E&P Waste (liquid) in barrels \_\_\_\_\_ 0

E&P waste (liquid) description \_\_\_\_\_

COGCC Disposal Facility ID #, if applicable: \_\_\_\_\_

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? \_\_\_\_\_

Does the previous reply indicate consideration of background concentrations? \_\_\_\_\_

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? \_\_\_\_\_

Is additional groundwater monitoring to be conducted? \_\_\_\_\_

## 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 has been restored to its pre-release grade. Kerr-McGee will consult with the surface owner to determine reclamation specifics to properly conduct reclamation activities in accordance with COGCC 1000 Series 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. \_\_\_\_\_

Actual Spill or Release date, if known. \_\_\_\_\_

### **SITE INVESTIGATION DATES**

Date of Initial Actions described in Site Investigation Plan (start date). 02/09/2015

Date of commencement of Site Investigation. 02/09/2015

Date of completion of Site Investigation. \_\_\_\_\_

### **REMEDIAL ACTION DATES**

Date of commencement of Remediation. 02/09/2015

Date of completion of Remediation. \_\_\_\_\_

### **SITE RECLAMATION DATES**

Date of commencement of Reclamation. \_\_\_\_\_

Date of completion of Reclamation. \_\_\_\_\_

**OPERATOR COMMENT**

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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 HSE Representative \_\_\_\_\_

Submit Date: 03/13/2019 \_\_\_\_\_

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: PETER GINTAUTAS \_\_\_\_\_

Date: 03/18/2019 \_\_\_\_\_

Remediation Project Number: 9675 \_\_\_\_\_

**COA Type****Description**

	Submit reports of site investigation and progress of remediation including results of sampling and analysis on an annual basis or more often until remediation is closed.
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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.

**Att Doc Num****Name**

401903958	INVESTIGATION/REMEDATION WORKPLAN (SUPPLEMENTAL)
401904556	LOGS
401904561	SOIL SAMPLE LOCATION MAP
401904564	GROUND WATER SAMPLE LOCATION
401904566	SITE MAP
401904568	ANALYTICAL RESULTS
401904571	ANALYTICAL RESULTS
401952201	SITE MAP
401952205	GROUND WATER ELEVATION MAP
401952238	SITE MAP
401975265	FORM 27-SUPPLEMENTAL-SUBMITTED

Total Attach: 11 Files

**General Comments****User Group****Comment****Comment Date**

		Stamp Upon Approval
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Total: 0 comment(s)