

State of Colorado  
Oil and Gas Conservation Commission

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Document Number:  
401177048

Receive Date:  
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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	<b>Phone Numbers</b>
Address: P O BOX 173779		Phone: (720) 929-6726
City: DENVER	State: CO	Zip: 80217-3779
Contact Person: Paul Schneider	Email: Paul.Schneider@Anadarko.com	Mobile: ( )

PROJECT, PURPOSE & SITE INFORMATION

**PROJECT INFORMATION**

Remediation Project #: 4493 Initial Form 27 Document #: 1944350

**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 checked="" type="checkbox"/> Other Monitoring Well Reduction Request

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

Facility Type: TANK BATTERY	Facility ID: 318506	API #:	County Name: WELD
Facility Name: UPRR 53 PAN AM J-62N65W 11SWNE	Latitude: 40.156061	Longitude: -104.627281	
** correct Lat/Long if needed: Latitude: 40.153336		Longitude: -104.621928	
QtrQtr: SWNE	Sec: 11	Twp: 2N	Range: 65W Meridian: 6 Sensitive Area? Yes

**SITE CONDITIONS**

General soil type - USCS Classifications CL Most Sensitive Adjacent Land Use Livestock approximately 2,300 feet south

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**

GROUNDWATER AT 14' 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 checked="" 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	100' N-S X 120' E-W X 15' BGS	SAMPLES/SCREENING/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.

FIELD CREWS ENCOUNTERED HISTORICAL PETROLEUM HYDROCARBON IMPACTED SOIL WHILE REMOVING THE PRODUCTION TANK AND UPGRADING THE TANK BATTERY. THE WELLS WERE SHUT IN AND 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 ):

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. A topographic Site Location Map showing the geographical setting of the release is provided as Figure 1. The general site layout, excavation dimensions, and soil sample locations are depicted on the Excavation Site Map provided as Figure 2. The excavation 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 ):

Impacted groundwater was encountered in the excavation at approximately 14 feet below ground surface. An excavation groundwater sample (GW01) was submitted for laboratory analysis of BTEX by USEPA Method 8260B. Analytical results for sample GW01 indicated that concentrations of all four BTEX constituents exceeded the COGCC Table 910-1 allowable levels. Based on the analytical results, approximately 80 barrels of impacted groundwater were removed from the excavation 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. The excavation groundwater sample locations are depicted on Figure 2 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 20  
Number of soil samples exceeding 910-1 8  
Was the areal and vertical extent of soil contamination delineated? Yes  
Approximate areal extent (square feet) 12000

### NA / ND

-- Highest concentration of TPH (mg/kg) 4160  
NA Highest concentration of SAR           
BTEX > 910-1 No  
Vertical Extent > 910-1 (in feet) 10

### Groundwater

Number of groundwater samples collected 28  
Was extent of groundwater contaminated delineated? No  
Depth to groundwater (below ground surface, in feet) 8'  
Number of groundwater monitoring wells installed 28  
Number of groundwater samples exceeding 910-1 2

-- Highest concentration of Benzene (µg/l) 67.4  
-- Highest concentration of Toluene (µg/l) 2.5  
-- Highest concentration of Ethylbenzene (µg/l) 111  
-- Highest concentration of Xylene (µg/l) 382  
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 4500 CUBIC YARDS OF PETROLEUM HYDROCARBON IMPACTED SOIL WERE REMOVED FROM THE EXCAVATION. LABORATORY RESULTS FOR THE CONFIRMATION SOIL SAMPLES INDICATED THAT TPH CONCENTRATIONS WERE BELOW THE FORMER COGCC 1000 MG/KG SENSITIVE AREA ALLOWABLE LEVEL AT THE EXTENT OF THE EXCAVATION.

Soil was excavated into the phreatic zone to address potential hydrocarbon impacts that may have been present below the current groundwater table due to past seasonal fluctuations. Prior to backfilling the excavation, 15 gallons of MicroBlaze®, a concentrated solution of facultative microbes, nutrients, and surfactants designed to bioremediate petroleum hydrocarbons, was applied to the excavation groundwater.

## 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.

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. 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 through 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 attached.

As of the October 2016 monitoring event, system operation has reduced site-wide benzene concentrations by 97% percent. Further details are presented in the attached Update Report.

### Soil Remediation Summary

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

### Groundwater Remediation Summary

Yes          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 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 attached.

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. The monitoring well locations are depicted on the Site Map provided as Figure 3.

On December 2, 2013, monitoring wells MW01, MW02, MW04, MW05, and MW07 through MW30 were surveyed to obtain 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. A Groundwater Elevation Contour Map is provided as Figure 4. The relative groundwater elevations are provided in Table 2.

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 POC. A well reduction request letter is attached.

# 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:

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.

Volume of E&P Waste (solid) in cubic yards \_\_\_\_\_ 4500

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

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

Non-COGCC Disposal Facility: \_\_\_\_\_ Kerr-McGee Land Treatment Facility

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

E&P waste (liquid) description \_\_\_\_\_ Transported to a licensed injection facility for disposal

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. KERR-MCGEE'S PRODUCTION FACILITY REMAINS ON SITE. Interim reclamation was completed to 1,000 Series Rules post-excavation.

Is the described reclamation complete? Yes \_\_\_\_\_

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. 01/12/2009

## SITE INVESTIGATION DATES

Date of Initial Actions described in Site Investigation Plan (start date). 01/16/2009

Date of commencement of Site Investigation. 01/12/2009

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

## REMEDIAL ACTION DATES

Date of commencement of Remediation. 01/12/2009

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

## SITE RECLAMATION DATES

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

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

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

Signed: Paul Schneider

Title: HSE Manager

Submit Date: \_\_\_\_\_

Email: Paul.Schneider@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: 4493

### COA Type

### Description

<u>COA Type</u>	<u>Description</u>

## Attachment Check List

<u>Att Doc Num</u>	<u>Name</u>
401177053	ANALYTICAL RESULTS
401177065	LOGS
401180989	SOIL SAMPLE LOCATION MAP
401180990	SITE MAP
401180993	GROUND WATER ELEVATION MAP
401182568	MAP
401189388	FORM 27 (SUPPLEMENTAL)

Total Attach: 7 Files

## General Comments

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

Total: 0 comment(s)