

State of Colorado  
Oil and Gas Conservation Commission

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Report taken by:  
CHRIS CANFIELD

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: GREAT WESTERN OPERATING COMPANY LLC	Operator No: 10110	Phone Numbers Phone: (720) 595-2132 Mobile: ( )
Address: 1001 17TH STREET #2000		
City: DENVER	State: CO	Zip: 80202
Contact Person: Jason Davidson	Email: jdavidson@gwp.com	

PROJECT, PURPOSE & SITE INFORMATION

**PROJECT INFORMATION**  
Remediation Project #: 12785 Initial Form 27 Document #: 401970887

**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 checked="" 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 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: LOCATION	Facility ID: 320146	API #: _____	County Name: ADAMS
Facility Name: GREAT WESTERN BAILEY 1	Latitude: 39.996819	Longitude: -104.787039	
	** correct Lat/Long if needed: Latitude: 39.996800	Longitude: -104.787559	
QtrQtr: SWNW	Sec: 4	Twp: 1S	Range: 66W Meridian: 6 Sensitive Area? Yes

**SITE CONDITIONS**

General soil type - USCS Classifications SC Most Sensitive Adjacent Land Use Brighton Lateral in place approximately 115 feet to the west.

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**

Residences are approximately 840 feet to the north, 870 feet to the west, and 790 feet to the south.

## TYPE OF WASTE:

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

## DESCRIPTION OF IMPACT

Impacted?	Impacted Media	Extent of Impact	How Determined
Yes	SOILS	65' x 40' x 6'-13' deep	Characterization soils samples

## INITIAL ACTION SUMMARY

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

Potential soil impacts were discovered during the removal of a partially buried produced water vault on March 12, 2019 (Spill Release Point ID 463364). The vault was removed and addressed under a separate Form 27 (Doc #402034479). On March 12, 2019, six test pits were excavated to 10 feet below ground surface (bgs) to define the vertical and horizontal extent of potentially impacted soil. Five characterization soil samples were submitted to Origins Laboratory (Origins) for analysis based on the highest field screening readings using a photoionization detector (PID). Origins analyzed the soil samples for total petroleum hydrocarbons (TPH) gasoline range organics (GRO) and TPH diesel range organics (DRO) by U.S. EPA Methods 8260D and 8015C, respectively. Concentrations of TPH-GRO and TPH-DRO were all reported either below laboratory reporting limits or below COGCC Table 910-1 concentrations levels. On May 30, 2019, sixteen soil borings were advanced during a limited subsurface investigation (LSI) conducted to further define vertical and horizontal extent of potentially impacted soil at the Site. The soil borings were advanced to 15 feet bgs except for boring SB01, which was advanced to 20 feet bgs. Stained soil was observed from approximately 6 feet to 13 feet bgs around the former produced water vault and crude oil storage tank. Twelve characterization soil samples were submitted to Origins for analysis of TPH-GRO and TPH-DRO by the same methods described above. Concentrations of TPH-GRO and TPH-DRO were added to calculate TPH. TPH concentrations were reported above the Table 910-1 concentration level of 500 milligrams per kilogram (mg/kg) in five of the samples. The analytical results from the test pit excavation and LSI are summarized on the attached Table 1 and Figures 2 and 3. Copies of the laboratory reports are also attached. Please refer to the Proposed Groundwater Sampling section below.

## 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 ):

Great Western proposes to conduct excavation activities to remediate the impacted source area soil. Impacted soils will be excavated and transported offsite for disposal at a licensed disposal facility. Confirmation soil samples will be collected from the walls and base of the excavation and analyzed for benzene, toluene, ethylbenzene, and total xylene (BTEX) by U.S. EPA Method 8260D and for TPH-GRO and TPH-DRO by the same methods described above. The number and location of soil samples shall be appropriate to confirm remediation. The excavation activities are planned to commence within 90 days of approval of this Form 27.

### Proposed Groundwater Sampling

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

Groundwater was not encountered during the test pit excavation investigation or during the LSI. However, saturated soil was encountered in a silty sand lens at approximately 6 feet to 10 feet bgs in seven borings across the Site. Consequently, one monitoring well (MW-1) was installed to 15 feet bgs adjacent to boring SB01 on May 30, 2019. The location of MW-1 is illustrated on the attached Figure 3 and the boring log for SB01/MW-1 is also attached. The well was dry during installation. Two inches of water were measured in the well on June 4, 2019. No samples were collected due to an insufficient amount of water. Please refer to the Additional Investigative Actions section below.

### 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 ):

On November 20, 2019, depth to water was measured in monitoring well MW-1 at 7.34 feet below top of casing, equivalent to approximately 6.7 feet bgs. Approximately ¼ inch of light non-aqueous phase liquid (LNAPL) was measured on the groundwater in the well. To determine the source of the water and LNAPL and the rate of recharge in the well, a baildown test was conducted. The well was bailed dry by evacuating approximately 1.5 gallons (one casing volume) of water using a new polyethylene bailer and nylon cord. Immediately following well evacuation activities, depth to water was measured over a 2-hour period. Over the first hour, 5.16 inches of water recharged in the well and over the second hour, 1.80 inches of water recharged. LNAPL was not measured in the well during recharge. Please refer to the Operator Comments section in the Submit tab of this Form 27 for a discussion of the results of the baildown test.

# SITE INVESTIGATION REPORT

## SAMPLE SUMMARY

### Soil

Number of soil samples collected 17  
Number of soil samples exceeding 910-1 5  
Was the areal and vertical extent of soil contamination delineated? Yes  
Approximate areal extent (square feet) 2600

### NA / ND

--          Highest concentration of TPH (mg/kg) 2640  
NA          Highest concentration of SAR           
BTEX > 910-1 No  
Vertical Extent > 910-1 (in feet) 13

### Groundwater

Number of groundwater samples collected 0  
Was extent of groundwater contaminated delineated? Yes  
Depth to groundwater (below ground surface, in feet) 20'  
Number of groundwater monitoring wells installed 1  
Number of groundwater samples exceeding 910-1 0

         Highest concentration of Benzene (µg/l)           
         Highest concentration of Toluene (µg/l)           
         Highest concentration of Ethylbenzene (µg/l)           
         Highest concentration of Xylene (µg/l)           
         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?

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.

Please refer to the Proposed Soil Sampling section in the Site Investigation Plan tab of this Form 27.

## **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.

Please refer to the Proposed Soil Sampling section in the Site Investigation Plan tab of this Form 27 and to the Groundwater Monitoring section below.

## **Soil Remediation Summary**

### In Situ

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

### Ex Situ

- \_\_\_\_\_ Excavate and offsite disposal
- \_\_\_\_\_ If Yes: Estimated Volume (Cubic Yards) \_\_\_\_\_
- \_\_\_\_\_ Name of Licensed Disposal Facility or COGCC Facility ID # \_\_\_\_\_
- \_\_\_\_\_ Excavate and onsite remediation
- \_\_\_\_\_ Land Treatment
- \_\_\_\_\_ Bioremediation (or enhanced bioremediation)
- \_\_\_\_\_ Chemical oxidation
- \_\_\_\_\_ Other \_\_\_\_\_

## **Groundwater Remediation Summary**

- \_\_\_\_\_ Bioremediation ( or enhanced bioremediation )
- \_\_\_\_\_ Chemical oxidation
- \_\_\_\_\_ Air sparge / Soil vapor extraction
- \_\_\_\_\_ Natural Attenuation
- \_\_\_\_\_ 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.

As discussed in the Additional Investigative Actions section in the Site Investigation tab of this Form 27, groundwater is not anticipated to be encountered during remediation activities. However, if groundwater is encountered during remediation in the base of the excavation, Chemically Oxygenated Granular Activated Carbon (COGAC™) will be applied and thoroughly mixed in prior to backfill with clean overburden and imported material. Up to four monitoring wells may be installed to determine if and to what extent groundwater is impacted.

## REMEDIATION PROGRESS UPDATE

### PERIODIC REPORTING

**Frequency:**  Quarterly  Semi-Annually  Annually  Other Following remediation

**Report Type:**  Groundwater Monitoring  Land Treatment Progress Report  O&M Report  
 Other Remediation Progress Report

### WASTE DISPOSAL INFORMATION

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

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

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

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

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

Non-COGCC Disposal Facility: \_\_\_\_\_

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

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? No

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? No

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.

If necessary, the site will be reclaimed 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. 03/11/2019

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

### **SITE INVESTIGATION DATES**

Date of Initial Actions described in Site Investigation Plan (start date). 03/12/2019

Date of commencement of Site Investigation. 05/30/2019

Date of completion of Site Investigation. 11/20/2019

### **REMEDIAL ACTION DATES**

Date of commencement of Remediation. 02/24/2020

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

### **SITE RECLAMATION DATES**

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

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

**OPERATOR COMMENT**

The slow recharge rate during the baildown test indicates that surface water infiltration is the most likely source of water encountered in the monitoring well. The presence of LNAPL measured prior to baildown is a result of surface water infiltrating the permeable vadose zone and saturating the sandy source zone soils freeing residual hydrocarbons. The relatively impermeable clay soils at approximately 10 feet bgs in the immediate vicinity of MW-1 serve as an aquitard and gravity combined with capillary pressure, forces the LNAPL into the well.

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

Signed: Jason Davidson

Title: Senior EHS Specialist

Submit Date: 11/26/2019

Email: jdavidson@gwp.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: CHRIS CANFIELD

Date: 12/04/2019

Remediation Project Number: 12785

**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.

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

402248710	FORM 27-SUPPLEMENTAL-SUBMITTED
402248714	SOIL SAMPLE LOCATION MAP
402248715	SOIL SAMPLE LOCATION MAP
402248716	ANALYTICAL RESULTS
402248718	ANALYTICAL RESULTS
402248719	LOGS
402248720	ANALYTICAL RESULTS

Total Attach: 7 Files

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

		Stamp Upon Approval
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Total: 0 comment(s)