

State of Colorado Oil and Gas Conservation Commission

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Report taken by:

ROB YOUNG

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: 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@gwogco.com | |

PROJECT, PURPOSE & SITE INFORMATION

PROJECT INFORMATION

Remediation Project #: 8430 Initial Form 27 Document #: 2148921

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 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 checked="" type="checkbox"/> Other Remediation of previously closed pit (Facility ID 115604) |

SITE INFORMATION

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

| | | | |
|---------------------------|--------------|--|---|
| Facility Type: WELL | Facility ID: | API #: 121-06411 | County Name: WASHINGTON |
| Facility Name: FLESSNER 9 | | Latitude: 39.945350 | Longitude: -103.693070 |
| | | ** correct Lat/Long if needed: Latitude: 39.947185 | Longitude: -103.695874 |
| QtrQtr: SWSE | Sec: 19 | Twp: 1S | Range: 56W Meridian: 6 Sensitive Area? No |

SITE CONDITIONS

General soil type - USCS Classifications CL Most Sensitive Adjacent Land Use Agricultural

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

Is groundwater less than 20 feet below ground surface? No

Other Potential Receptors within 1/4 mile

None identified

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 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 | SOILS | 6.3 acres by 6" to 36" deep | Soil sampling and visual/gps survey |

INITIAL ACTION SUMMARY

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

COGCC mapped an area of stressed or lacking crops in the agricultural field to the east of the tank battery using GPS on 7/27/15. The area measured 6.3 acres in size. Please refer to the attached aerial image for an illustration of COGCC's mapped area. On 3/27/17, twenty soil samples, including two background samples, were collected at depths ranging from 6" to 36" below ground surface (bgs) in the agricultural field to the north and east of the tank battery. Please refer to the attached A.G. Wassenaar Figure 1 for the sample locations, depths, and analytical results. A copy of the laboratory analytical report is also attached. On 6/3/19, twenty additional soil samples, including two background samples, were collected in the same general locations and depths of the 3/27/17 samples. Compared to the 3/27/17 analytical results, there is a noticeable decrease in electrical conductivity (EC) and pH at depths of 6", 18", and 36" bgs to concentrations below their respective COGCC Table 910-1 levels. Sodium Absorption Ratio (SAR) also decreased at depths of 18" and 36", but some SAR values increased at a depth of 6" bgs. The increasing SAR at shallower depths could be an indication of upward migration of salt by capillary action resulting in the observed surface damage. Please refer to the attached CGRS Soil Analytical Results Figure for the locations, depths, and analytical results of the 6/3/19 sampling event. A copy of the laboratory analytical report is also attached.

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):

To monitor soil conditions, sampling activities will be conducted on an annual basis for up to three years or following two consecutive years of analytical results below COGCC Table 910-1 concentration levels for pH, EC, and SAR. The first annual sampling round is scheduled for June 2020. Up to twenty soil samples will be collected during each sampling event at the same general locations and depths of the 3/27/17 and 6/3/19. Samples will be analyzed for pH by EPA Method 9045D, EC by EPA Modified Method 9050A, and SAR by 20B Saturated Paste.

Proposed Groundwater Sampling

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

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 40

Number of soil samples exceeding 910-1 26

Was the areal and vertical extent of soil contamination delineated? No

Approximate areal extent (square feet) 27500
0

NA / ND

ND Highest concentration of TPH (mg/kg)

-- Highest concentration of SAR 37.29

BTEX > 910-1 No

Vertical Extent > 910-1 (in feet) 36

Groundwater

Number of groundwater samples collected 0

Was extent of groundwater contaminated delineated? No

Depth to groundwater (below ground surface, in feet)

Number of groundwater monitoring wells installed

Number of groundwater samples exceeding 910-1

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?

Please refer to the attached COGCC – Area of Stressed or Lacking Crops Figure (7/27/15) for an illustration of the impacts to the adjacent agricultural field.

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

Four background soil samples were collected. Please refer to the attached A.G. Wassenaar Figure 1 and the CGRS Soil Analytical Results Figure for the locations, depths, and analytical results.

☐ 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 Remediation Summary 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.

Soil conditions have notably improved between the past two sampling events in 2017 and 2019. In addition, SAR values are relatively low, ranging from 12.67 to 37.29. To facilitate contact of precipitation with the salt and to enhance soil permeability, Great Western plans to cultivate in up to 36 tons of hay in the agricultural field to the north and east of the tank battery to depths ranging from the surface to approximately 6" to 12" bgs. Hay stimulates soil biota and nutrient cycling which aids in revegetation. Biodegradation of the hay improves soil structure by enhancing aggregate formation which in turn improves soil permeability. Based on the improved soil conditions over the past two years and relatively low SAR values, Great Western believes this remediation approach will reduce the residual levels of SAR to below the COGCC Table 910-1 concentration value of < 12. The work is planned for late-fall/early winter 2019. The estimated time to attain NFA status is two to three years following the June 2020 soil sampling event.

Soil Remediation Summary

☒ **In Situ**

_____ Bioremediation (or enhanced bioremediation)
_____ Chemical oxidation
_____ Air sparge / Soil vapor extraction
Yes _____ Natural Attenuation
Yes _____ Other _____ Enhanced permeability _____

☐ **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.

Not applicable.

REMEDATION PROGRESS UPDATE

PERIODIC REPORTING

Frequency: ☐ Quarterly ☐ Semi-Annually ☒ Annually ☐ Other _____

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: _____

REMEDATION COMPLETION REPORT

REMEDATION 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.

Following NFA status, Great Western will return the land to the landowner to reseed and farm the area. 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. _____

Actual Spill or Release date, if known. _____

SITE INVESTIGATION DATES

Date of Initial Actions described in Site Investigation Plan (start date). _____

Date of commencement of Site Investigation. 01/10/2014

Date of completion of Site Investigation. 06/03/2019

REMEDIAL ACTION DATES

Date of commencement of Remediation. 11/30/2019

Date of completion of Remediation. _____

SITE RECLAMATION DATES

Date of commencement of Reclamation. _____

Date of completion of Reclamation. _____

OPERATOR COMMENT

There are two COGCC remediation project numbers associated with this facility - #4916 and #8430. Remediation #4916 was administratively closed by the COGCC without a letter on 8/29/16. Great Western will direct all correspondence to #8430.

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 Supervisor

Submit Date: 10/24/2019

Email: jdavidson@gwogco.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: ROB YOUNG

Date: 10/24/2019

Remediation Project Number: 8430

COA Type

Description

| | |
|--|--|
| | |
|--|--|

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

| | |
|-----------|--------------------------------|
| 402165049 | FORM 27-SUPPLEMENTAL-SUBMITTED |
| 402165822 | SOIL SAMPLE LOCATION MAP |
| 402165843 | ANALYTICAL RESULTS |
| 402165844 | SOIL SAMPLE LOCATION MAP |
| 402165845 | ANALYTICAL RESULTS |
| 402165848 | AERIAL IMAGE |

Total Attach: 6 Files

General Comments

User Group

Comment

Comment Date

| | | |
|---------------|---|------------|
| Environmental | The 2019 soil sampling locations tend to be north of the former produced water pit locations. | 10/24/2019 |
|---------------|---|------------|

Total: 1 comment(s)