

State of Colorado Oil and Gas Conservation Commission

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Report taken by:

RICK ALLISON

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: <u>PDC ENERGY INC</u> | Operator No: <u>69175</u> | Phone Numbers |
| Address: <u>1775 SHERMAN STREET - STE 3000</u> | | Phone: <u>(303) 860-5800</u> |
| City: <u>DENVER</u> | State: <u>CO</u> | Zip: <u>80203</u> |
| Contact Person: <u>Karen Olson</u> | Email: <u>COGCCSpillRemediation@pdce.com</u> | Mobile: <u>()</u> |

PROJECT, PURPOSE & SITE INFORMATION

PROJECT INFORMATION

Remediation Project #: 16159Initial Form 27 Document #: 402542237

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 checked="" type="checkbox"/> Other <u>Tank Battery Closure</u> |

SITE INFORMATION

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

| | | | |
|----------------------------------------|----------------------------|-----------------------------------------------------------|-------------------------------|
| Facility Type: <u>LOCATION</u> | Facility ID: <u>472904</u> | API #: <u></u> | County Name: <u>WELD</u> |
| Facility Name: <u>Owl Creek 7; 7-5</u> | | Latitude: <u>40.513460</u> | Longitude: <u>-104.564984</u> |
| | | ** correct Lat/Long if needed: Latitude: <u>40.513434</u> | Longitude: <u>-104.565277</u> |
| QtrQtr: <u>NESE</u> | Sec: <u>5</u> | Twp: <u>6N</u> | Range: <u>64W</u> |
| | | Meridian: <u>6</u> | Sensitive Area? <u>Yes</u> |

SITE CONDITIONS

General soil type - USCS Classifications SMMost Sensitive Adjacent Land Use AgricultureIs domestic water well within 1/4 mile? YesIs surface water within 1/4 mile? YesIs groundwater less than 20 feet below ground surface? No

Other Potential Receptors within 1/4 mile

A domestic water well is located approximately 1,492 feet northwest of the location. Surface water is located approximately 315 feet southeast of the location. Occupied housing is located approximately 90 feet east of the location. FWS wetlands classified as a riverine are located approximately 425 feet southeast of the location. There are no High Priority Habitats located within a 1/4 mile radius of the location. Livestock are located approximately 788 feet south of the location.

SITE INVESTIGATION PLAN

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 |
|--------------|----------------|------------------------------------|-----------------------------------------------|
| UNDETERMINED | GROUNDWATER | Refer to Figure 3 and Table 5 | Implementation of Groundwater Assessment Plan |
| Yes | SOILS | Ref. to Figures 1-2 and Tables 1-6 | Confirmation Soil Sampling |

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 January 28, 2021, field screening and confirmation soil sampling was conducted in accordance with the COGCC Rule 911 during the decommissioning and closure of the Owl Creek 7, 7-5 tank battery. Based on the initial results, a historic release was discovered below the produced water vessel on January 29, 2021. Following the discovery, mitigation activities were initiated to delineate and remove remaining hydrocarbon impacts. During the removal of the produced water vessel, groundwater was observed in the excavation at approximately 7 feet below ground surface (bgs). Approximately 2,154 cubic yards of impacted material were excavated and transported to the North Weld Waste Management Facility for disposal under PDC waste manifests.

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):

On January 28, 2021, the soil sample (PWV01-W) that was collected from the source area (adjacent to the produced water vessel) at approximately 2.5 feet below ground surface (bgs) was submitted to Summit Scientific Laboratories (Summit) for analysis of the full COGCC Table 915-1 analyte list. Preliminary analytical results indicate that site specific containments of concern (COCs) include benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene, total petroleum hydrocarbons (TPH C6-C36), 1,2,4-trimethylbenzene (TMB), fluorene, and 1-methylnaphthalene (M). Between February 16 and February 22, 2021, 50 soil samples (SS01 - SS50) were collected from the sidewalls and base of the excavation at depths ranging between 3 feet and 7.5 feet bgs and were submitted for laboratory analysis of the above referenced COCs. Analytical results are summarized in Tables 1 through 4. The laboratory reports are included in Attachment A.

Proposed Groundwater Sampling

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

On February 22, 2021, one groundwater sample (GW01) was collected from the excavation following the completion of source mass removal activities and submitted for laboratory analysis of BTEX, naphthalene, 1,2,4-TMB, and 1,3,5-TMB. Analytical results indicated that constituent concentrations were below the applicable COGCC Table 915-1 groundwater standards.

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):

The source soil sample (PWV01-W) exhibited arsenic and selenium concentrations and pH levels in exceedance of the applicable COGCC Table 915-1 standards. Therefore, a background sample (BKG-TB) collected within the shallow soil horizon and submitted for laboratory analysis of the COGCC Table 915-1 metals and soil suitability including pH, electrical conductivity, sodium adsorption ratio (SAR), and boron.

SITE INVESTIGATION REPORT

SAMPLE SUMMARY

Soil

Number of soil samples collected 52
Number of soil samples exceeding 910-1 2
Was the areal and vertical extent of soil contamination delineated? Yes
Approximate areal extent (square feet) 6868

NA / ND

-- Highest concentration of TPH (mg/kg) 2580
-- Highest concentration of SAR 2.8
BTEX > 910-1 No
Vertical Extent > 910-1 (in feet) 7

Groundwater

Number of groundwater samples collected 1
Was extent of groundwater contaminated delineated? No
Depth to groundwater (below ground surface, in feet) 7'
Number of groundwater monitoring wells installed 0
Number of groundwater samples exceeding 910-1 0

ND Highest concentration of Benzene (µg/l)
ND Highest concentration of Toluene (µg/l)
-- Highest concentration of Ethylbenzene (µg/l) 2.9
-- Highest concentration of Xylene (µg/l) 5.9
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?

Analytical results indicated that arsenic, selenium, and pH levels were in exceedance of the applicable regulatory standards in native soil.

☒ Was investigation derived waste (IDW) generated as part of this investigation?

Volume of solid waste (cubic yards) 2154 Volume of liquid waste (barrels) 220

☒ Is further site investigation required?

Twelve (12) monitoring wells will be installed via direct-push drilling methods to confirm the absence of dissolved-phase hydrocarbon impacts within and surrounding the former excavation extent. Lithologic descriptions and volatile organic compound (VOC) concentrations using a photoionization detector (PID) will be recorded for each borehole. If elevated VOC concentrations are encountered during the investigation, a sample will be collected from the interval exhibiting the highest VOC concentration from the borehole and submitted for laboratory analysis of benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene, total petroleum hydrocarbons (TPH C6-C36) by EPA Methods 8260B and 8015. Proposed monitoring well locations are illustrated on Figure 2.

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.

Between January 28 and February 22, 2021, approximately 2154 cubic yards of impacted material were excavated and transported to the North Weld Waste Management Facility in Ault, Colorado for disposal under PDC waste manifests. During excavation activities, groundwater was encountered within the excavation at approximately 7 feet below ground surface (bgs). Groundwater vacuum recovery activities were conducted concurrent with excavation activities and approximately 220 barrels of groundwater were removed and transported to the NGL Energy disposal facility for disposal.

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.

A remediation strategy will be selected following the evaluation of groundwater analytical results.

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.

Based on the analytical data collected during source mass removal activities, PDC will conduct quarterly groundwater monitoring at the 12 proposed monitoring wells until closure criteria are met. Groundwater samples will be submitted for laboratory analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX), naphthalene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene by EPA Method 8260B in accordance with Table 915-1. In addition, site-specific inorganic parameters, including total dissolved solids (TDS), chloride, and sulfate, will be evaluated at the source, up-and down-gradient monitoring wells during the second quarter 2021. Contingent on analytical results, inorganic parameter analysis will be discontinued after one sampling event.

REMEDIATION PROGRESS UPDATE

PERIODIC REPORTING

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

Report Type: ☐ Groundwater Monitoring ☐ Land Treatment Progress Report ☐ O&M Report

☒ Other Source Mass Removal and Confirmation Sampling Summary _____

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:

No beneficial use.

Volume of E&P Waste (solid) in cubic yards 2154

E&P waste (solid) description Hydrocarbon impacted soil.

COGCC Disposal Facility ID #, if applicable: _____

Non-COGCC Disposal Facility: North Weld Waste Management Facility

Volume of E&P Waste (liquid) in barrels 220

E&P waste (liquid) description Impacted groundwater

COGCC Disposal Facility ID #, if applicable: _____

Non-COGCC Disposal Facility: NGL Energy 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.

Reclamation will be conducted in accordance with COGCC 1004 Series Rules.

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. 11/18/2020

Actual Spill or Release date, if known. _____

SITE INVESTIGATION DATES

Date of Initial Actions described in Site Investigation Plan (start date). 01/18/2021

Date of commencement of Site Investigation. 01/28/2021

Date of completion of Site Investigation. _____

REMEDIAL ACTION DATES

Date of commencement of Remediation. 02/16/2021

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: Karen Olson

Title: Snr. Program Manager

Submit Date: 03/12/2021

Email: COGCCSpillRemediation@pdce.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: RICK ALLISON

Date: 03/12/2021

Remediation Project Number: 16159

COA Type**Description**

| | |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Since Fluorene exceeded the Groundwater SSL, Fluorene should be added to the groundwater sampling analyte list. The groundwater monitoring analyte list will include Organics in Table 915-1 (BTEX, Naphthalene, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene) plus Fluorene. Fluorene has a standard of 280 micrograms per liter in Regulation 41. At least one monitoring event will include total dissolved solids, sulfate and chloride. |
| | COGCC agrees with the proposed soil analyte list for organics TPH (C6-C36), BTEX, Naphthalene, 1,2,4-Trimethylbenzene, Fluorene, and 1-methylnaphthalene. |
| | Background for metals in soil will be calculated as 1.25 times the site-specific background. Based on data provided background will be 3.48 mg/kg, and the sample from the produced water vault with an Arsenic concentration of 5.35 mg/kg does not meet this background. Additional soil sampling for Arsenic is required to determine whether remaining soil is within background conditions at the location. |

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**

| | |
|-----------|--------------------------------|
| 402626548 | FORM 27-SUPPLEMENTAL-SUBMITTED |
| 402626553 | PHOTOS |
| 402627194 | SOIL SAMPLE LOCATION MAP |
| 402627195 | SITE INVESTIGATION PLAN |
| 402627237 | SOIL SAMPLE LOCATION MAP |
| 402627258 | ANALYTICAL RESULTS |

Total Attach: 6 Files

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

| | | |
|--|--|---------------------|
| | | Stamp Upon Approval |
|--|--|---------------------|

Total: 0 comment(s)