

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> | Mobile: <u>()</u> |
| Contact Person: <u>Karen Olson</u> | | Email: <u>Karen.Olson@pdce.com</u> | |

PROJECT, PURPOSE & SITE INFORMATION

PROJECT INFORMATION

Remediation Project #: 10537Initial Form 27 Document #: 401398541

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 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 Facilities (in accordance with Rule 909.c.)

| | | | |
|---|----------------------------|---|---|
| Facility Type: <u>SPILL OR RELEASE</u> | Facility ID: <u>451446</u> | API #: _____ | County Name: <u>WELD</u> |
| Facility Name: <u>J&L Farms 14, 24-29</u> | | Latitude: <u>40.451510</u> | Longitude: <u>-104.467790</u> |
| | | ** correct Lat/Long if needed: Latitude: <u>40.451510</u> | Longitude: <u>-104.467790</u> |
| QtrQtr: <u>SWSW</u> | Sec: <u>29</u> | Twp: <u>6N</u> | Range: <u>63W</u> Meridian: <u>6</u> Sensitive Area? <u>Yes</u> |

SITE CONDITIONS

General soil type - USCS Classifications SMMost Sensitive Adjacent Land Use Ranch landIs domestic water well within 1/4 mile? YesIs surface water within 1/4 mile? NoIs groundwater less than 20 feet below ground surface? Yes

Other Potential Receptors within 1/4 mile

Residential buildings are located approximately 975 feet northwest of the tank battery location. Ranch land and livestock are located approximately 1520 feet east of the tank battery 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 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 | Not defined. | Completion of the Site Investigation Plan |
| Yes | SOILS | Refer to Figure 2 and Table 1. | Completion of excavation activities. |

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 July 19, 2017, historic impacts were discovered beneath the produced water vessel during plug and abandonment activities at the J&L Farms 14, 24-29 production facility. Approximately 860 cubic yards of impacted material were removed and transported to the North Weld Landfill in Ault, Colorado for disposal under PDC waste manifests. A Supplemental Form 19 was submitted to the COGCC on July 28, 2017, under document #401357340. The COGCC issued Spill Point ID# 451446 to the project.

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 July 17 and August 24, 2017, eight (8) soil samples were collected from the sidewalls of the final extent of the excavation at approximately 16 feet below ground surface (bgs). Soil samples were submitted to Summit Scientific Laboratories (Summit) in Golden, Colorado for analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX), naphthalene, total petroleum hydrocarbons (TPH) - gasoline range organics (GRO) by United States Environmental Protection Agency (USEPA) Method 8260, and TPH - diesel range organics (DRO) by USEPA Method 8015. Analytical results indicated all soil samples collected from the final extent of the excavation were in compliance with COGCC Table 910-1 standards. Based on soil analytical results, the lateral extent of petroleum hydrocarbon impacts within the unsaturated interval were successfully defined and removed during excavation activities. No further soil sampling is required.

Proposed Groundwater Sampling

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

Two (2) groundwater samples (GW01 and GW02) were collected from the excavation area on August 31 and September 5, 2017. Samples were submitted for laboratory analysis of BTEX by USEPA Method 8260B. Analytical results indicated benzene concentrations were in exceedance of COGCC Table 910-1 standards in both groundwater 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):

Six (6) temporary monitoring wells will be installed via direct push drilling methods to delineate the extent of dissolved-phase hydrocarbon impacts.

SITE INVESTIGATION REPORT

SAMPLE SUMMARY

Soil

Number of soil samples collected 10

Number of soil samples exceeding 910-1 2

Was the areal and vertical extent of soil contamination delineated? Yes

Approximate areal extent (square feet) 2235

NA / ND

-- Highest concentration of TPH (mg/kg) 2310

NA Highest concentration of SAR

BTEX > 910-1 No

Vertical Extent > 910-1 (in feet) 15

Groundwater

Number of groundwater samples collected 2

Was extent of groundwater contaminated delineated? No

Depth to groundwater (below ground surface, in feet) 18'

Number of groundwater monitoring wells installed 0

Number of groundwater samples exceeding 910-1 2

-- Highest concentration of Benzene (µg/l) 60

-- Highest concentration of Toluene (µg/l) 3.4

-- Highest concentration of Ethylbenzene (µg/l) 2.2

-- Highest concentration of Xylene (µg/l) 170

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) 840

Volume of liquid waste (barrels) 220

☒ Is further site investigation required?

Temporary monitoring wells will be installed to delineate the extent of petroleum hydrocarbon impacts in groundwater and establish point of compliance in all directions. Proposed well locations are illustrated on Figure 3.

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 July 19, 2017, historic impacts were discovered beneath the produced water vessel during the plug and abandonment activities at the J&L Farms 14, 24-29 production facility. The lateral and vertical extent of the excavation was determined in the field using a photoionization detector (PID) to measure volatile organic compound (VOC) concentrations in soil. Approximately 840 cubic yards of impacted material were removed and transported to the North Weld County Landfill in Ault, Colorado for disposal under PDC waste manifests. Eight (8) soil samples (SS03 - SS10) were collected from the sidewalls of the final extent of excavation at approximately 16 feet below ground surface (bgs). Samples were submitted to Summit Scientific Laboratories in Golden, Colorado for laboratory analysis of benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene, total petroleum hydrocarbons (TPH) - gasoline range organics (GRO) by USEPA Method 8260B, and TPH - diesel range organics (DRO) by USEPA Method 8015. Analytical results indicated constituent concentrations were below COGCC Table 910-1 soil standards in the samples collected from the final extent of the excavation. The final excavation extent and sample locations are illustrated on Figure 2. Soil analytical data is summarized in Table 1.

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.

Groundwater was encountered during excavation activities at approximately 18 feet below ground surface (bgs). The two (2) groundwater samples (GW01 and GW02) collected from the excavation area exhibited benzene concentrations in exceedance of COGCC Table 910-1 standards. Consequently, six (6) temporary monitoring wells (BH01 - BH06) were installed via direct-push drilling methods in all cardinal directions of the former excavation extent. On March 22, 2018, three (3) additional monitoring wells (BH07 - BH09) were installed to establish cross- and down-gradient point of compliance. Monitored natural attenuation (MNA) was selected as the remediation strategy at the beginning of fourth quarter 2017 and will remain the selected remediation strategy through the second quarter 2018.

Soil Remediation Summary

☐ In Situ

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

☒ Ex Situ

Yes _____ Excavate and offsite disposal
If Yes: Estimated Volume (Cubic Yards) _____ 840
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
Yes _____ 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.

Groundwater sampling will be conducted at the nine site monitoring wells (BH01 - BH09) on a quarterly basis at the site monitoring wells using USEPA Method 8260. Quarterly groundwater monitoring will be completed until four consecutive quarters of BTEX concentrations in compliance with COGCC standards are achieved.

REMEDATION 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:

No beneficial use.

Volume of E&P Waste (solid) in cubic yards _____ 840

E&P waste (solid) description E&P contaminated 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 Petroleum hydrocarbon impacted groundwater _____

COGCC Disposal Facility ID #, if applicable: _____

Non-COGCC Disposal Facility: Licensed 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.

The excavation was backfilled and re-contoured to match pre-existing conditions. The produced water vessel and associated production infrastructure were decommissioned following excavation activities.

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). 07/19/2017

Date of commencement of Site Investigation. 07/20/2017

Date of completion of Site Investigation. _____

REMEDIAL ACTION DATES

Date of commencement of Remediation. 07/20/2017

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: Senior EHS Manager

Submit Date: 04/30/2018

Email: Karen.Olson@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: 05/08/2018

Remediation Project Number: 10537

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

| | |
|-----------|--------------------------------|
| 401624898 | FORM 27-SUPPLEMENTAL-SUBMITTED |
| 401624899 | MONITORING REPORT |

Total Attach: 2 Files

General Comments

User Group

Comment

Comment Date

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

Total: 0 comment(s)