FORM 27 Rev 4/21

State of Colorado
Oil and Gas Conservation Commission

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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.
Closure request is not available for an Initial Site Investigation and Remediation Workplan.

OPERATOR INFORMATON

Name of Operator: PDC ENERGY INC Operator No: 69175
Address: 1775 SHERMAN STREET - STE 3000
City: DENVER State: CO Zip: 80203
Contact Person: Karen Olson Email: COGCCSpillRemediation@pdce.com

Phone Numbers
Phone: (303) 860-5800
Mobile: ( )

PROJECT, PURPOSE & SITE INFORMATION

PROJECT INFORMATION

Remediation Project #: 17005 Initial Form 27 Document #: 402606512

PURPOSE INFORMATION

- [ ] Rule 913.c.(1): Pit or Cuttings Trench closure.
- [X] Rule 913.c.(2): Buried or partially buried vessel closure, which will be by removal.
- [ ] Rule 913.c.(3): Remediation of Spill and Releases pursuant to Rule 912.
- [ ] Rule 913.c.(4): Land treatment of Oily Waste pursuant to Rule 905.e.
- [ ] Rule 913.c.(5): Closure of Centralized E&P Waste Management Facilities pursuant to Rule 907.h.
- [ ] Rule 913.c.(6): Remediation of impacted Groundwater pursuant to Rule 915.e.(3).D, and the contaminant concentrations in Table 915-1.
- [ ] Rule 913.c.(7): Investigation and remediation of natural gas in soil or Groundwater.
- [ ] Rule 913.c.(8): When requested by the Director due to any potential risk to soil, Groundwater, or surface water.
- [X] Rule 913.c.(9): Decommissioning of Oil and Gas Facilities.
- [ ] Rule 913.g: Changes of Operator.
- [ ] Rule 915.b: Request to leave elevated inorganics in situ.
- [X] Other: Tank Battery Closure

SITE INFORMATION

No Multiple Facilities

Facility Type: LOCATION Facility ID: 472330 API #: County Name: WELD
Facility Name: Anderson 12-13 Latitude: 40.488336 Longitude: -104.614693
** correct Lat/Long if needed: Latitude: Longitude:
QtrQtr: SENW Sec: 13 Twp: 6N Range: 65W Meridian: 6 Sensitive Area? Yes

SITE CONDITIONS

General soil type - USCS Classifications: SM
Most Sensitive Adjacent Land Use: Cropland
Is domestic water well within 1/4 mile? No
Is surface water within 1/4 mile? Yes
Is groundwater less than 20 feet below ground surface? No

Other Potential Receptors within 1/4 mile

Surface Water: Freshwater pond – 52 feet E, Occupied Buildings – 1,260 feet WNW, Livestock – 406 feet NW, FWS Wetlands – Freshwater Pond – 52 feet E, HP Habitat - location within Aquatic Native Species Conservation Easement

SITE INVESTIGATION PLAN

TYPE OF WASTE:

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

DESCRIPTION OF IMPACT

Impacted?	Impacted Media	Extent of Impact	How Determined
UNDETERMINED	GROUNDWATER	Refer to Table 5 and Figure 3	Implementation of Groundwater Assessment Plan
Yes	SOILS	Refer to Tables 1-6 and Figures 1&2	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 March 31, 2021, field screening and confirmation soil sampling was conducted in accordance with the COGCC Rule 911 during the decommissioning and closure of the Anderson 12-13 Tank Battery (Figure 1). During decommissioning activities, a reportable release was discovered. Following the discovery, mitigation activities were initiated to delineate and remove remaining hydrocarbon impacts. During excavation activities, groundwater was observed in the excavations at approximately 6 feet below ground surface (bgs). Approximately 706 cubic yards (CY) of impacted material were removed and transported to the North Weld Waste Management Facility for disposal under PDC waste manifests.

PROPOSED SAMPLING PLAN

Proposed Soil Sampling

[X] Will soil samples be collected as part of this investigation? (Number, type (grab/composite), analyses, and locations of samples):

On April 1, 2021, one soil sample (SS03) was collected from the source area at approximately 4 feet bgs and submitted to Summit Scientific Laboratories for analysis of the full COGCC Table 915-1 analyte list. Preliminary analytical results indicate that site specific containments of concern (COCs) include BTEX, naphthalene,1,2,4-trimethylbenzene (TMB), 1,3,5-TMB, naphthalene, TPH (C6-C36), anthracene, 1-methylnaphthalene (M), 2-M, arsenic, and selenium. Between March 31 and April 7, 40 soil samples (SS01 – SS30 and SS32 – SS41) were collected from the sidewalls and base of the excavation at depths ranging from 3 feet to 7 feet bgs and were submitted for laboratory analysis of the above referenced COCs. In addition, one sample (SS31) was collected at approximately 2.5 feet bgs was submitted for analysis of Table 915-1 soil suitability constituents.The final excavation extent and sample locations are illustrated on Figure 2. Analytical results are summarized in Tables 1 through 4

Proposed Groundwater Sampling

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

On April 7, 2021, one groundwater sample (GW01) was collected from the excavation following 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 organic compound concentrations were in compliance with applicable COGCC Table 915-1 groundwater standards. The groundwater sample location is illustrated on Figure 2 and the analytical results are summarized on Table 5.

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):

During initial closure activities conducted on April 27, 2021, soil encountered on site and below production equipment was visually inspected and field screened for volatile organic compound (VOC) concentrations using a photoionization detector (PID). Per the approved proposed soil sampling plan, samples were collected below and/or adjacent to the above ground storage tank (AST), separator flowline (SEP-FL), and produced water vessel (PWV). The samples were submitted for laboratory analysis of BTEX, naphthalene, 1,2,4-TMB, 1,3,5-TMB, and TPH (C6-C36). In addition, the excavation sidewall sample which exhibited the highest PID reading collected adjacent to the produced water vessel was submitted for analysis of Table 915-1 soil suitability constituents. Analytical results indicated that organic compounds and soil suitability constituents were in compliance with the applicable COGCC Table 915-1 Protection of Groundwater SSLs in all laboratory sample locations.

SITE INVESTIGATION REPORT

SAMPLE SUMMARY

Soil

Number of soil samples collected: 46
Number of soil samples exceeeding 915-1: 25
Was the areal and vertical extent of soil contamination delineated? No
Approximate areal extent (square feet): 2706

NA / ND

-- Highest concentration of TPH (mg/kg): 380
-- Highest concentration of SAR: 3.27
BTEX > 915-1: Yes
Vertical Extent > 915-1 (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): 6`
Number of groundwater monitoring wells installed: 0
Number of groundwater samples exceeding 915-1: 0

ND Highest concentration of Benzene (µg/l):
ND Highest concentration of Toluene (µg/l):
ND Highest concentration of Ethylbenzene (µg/l):
-- Highest concentration of Xylene (µg/l): 2.3
NA Highest concentration of Methane (mg/l):

Surface Water

0 Number of surface water samples collected
Number of surface water samples exceeding 915-1
If surface water is impacted, other agency notification may be required.

OTHER INVESTIGATION INFORMATION

[ ] Were impacts to adjacent property or offsite impacts identified?

[X] Were background samples collected as part of this site investigation?

On March 31, 2021, one background soil sample (BKG01) was collected at approximately 2.5 feet bgs from native material topographically up-gradient of the tank battery and submitted for analysis of COGCC Table 915-1 metals. Analytical results indicated that arsenic, barium, and selenium were in exceedance of the applicable regulatory standards in native soil.

[X] Was investigation derived waste (IDW) generated as part of this investigation?

Volume of solid waste (cubic yards): 706
Volume of liquid waste (barrels): 0

[X] Is further site investigation required?

Eight (8) 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 BTEX, naphthalene, total petroleum hydrocarbons (TPH C6-C36), 1,2,4-TMB, and 1,3,5-TMB anthracene, 1-M, 2-M, arsenic, and selenium by EPA Methods 8260B and 8015. Proposed monitoring 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.

Between March 31 and April 6, 2021, approximately 706 CY of impacted material were removed from the excavation and transported to the North Weld Waste Management Facility in Ault, Colorado for disposal under PDC waste manifests.

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.

On July 27, 2021, eight monitoring wells (BH01 – BH08) were installed to confirm the absence of dissolved-phase hydrocarbon impacts within and adjacent to the former excavation extent. Lithologic descriptions and volatile organic compound (VOC) concentrations measured using a photoionization detector (PID) were recorded for each monitoring well. Per the condition of approval (COA) issued by the COGCC on July 2, 2021, soil samples were collected from each borehole to confirm the absence of hydrocarbon impacts as well as delineate arsenic levels on site. Soil samples were collected from each boring (BH01 – BH08) at depths ranging from 1-2 feet to 11-12 feet below ground surface (bgs). In addition, one background soil boring (BKG02) was advanced to a depth of 7 feet bgs and samples were collected at 3-4 feet and 6-7 feet bgs. Eight soil samples were submitted to Summit Scientific Laboratories (Summit) for analysis of benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene, total petroleum hydrocarbons (TPH) [C6-C36], 1,2,4-trimethylbenzene (TMB), 1,3,5-TMB, 1-methynaphthalene (M), 2-M, arsenic, and selenium. Additionally, two background samples were submitted for laboratory analysis of arsenic and selenium. Soil analytical results collected during monitoring well installation activities indicated that organic compound concentrations were below the applicable COGCC Table 915-1 standards in all boreholes. The arsenic concentration was in exceedance of the applicable regulatory soil standard but within 1.25x the background concentration in all boreholes. Additionally, selenium concentrations were in exceedance of the regulatory soil standard and above 1.25x the background concentration in boreholes BH01, BH02, BH04, and BH07.

Based on the analytical results, monitored natural attenuation (MNA) was selected as the remediation strategy for this site for the third quarter 2021 and will remain the selected remediation strategy through the fourth quarter 2021.

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) 706
  - 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.

Based on the analytical data collected during source mass removal activities, PDC will conduct quarterly groundwater monitoring at the site eight monitoring wells (BH01 - BH08). Groundwater samples will be submitted for laboratory analysis of BTEX, naphthalene, 1,2,4-TMB, and 1,3,5-TMB by EPA Method 8260B in accordance with Table 915-1. In addition, site-specific inorganic parameters, including total dissolved solids (TDS), chlorides, and sulfates, will be evaluated at the source, up-and down-gradient monitoring wells during the fourth quarter 2021. Contingent on analytical results, inorganic parameter analysis will be discontinued after one sampling event. Quarterly groundwater monitoring will continue until closure criteria is achieved.

REMEDIATION PROGRESS UPDATE

PERIODIC REPORTING

Approved Reporting Schedule:

[X] Quarterly [ ] Semi-Annually [ ] Annually [ ] Other

[ ] **Request Alternative Reporting Schedule:**

[ ] Semi-Annually [ ] Annually [ ] Other

Rule 913.e:
After initial approval of a Form 27, the Operator will provide quarterly update reports in a Supplemental Form 27 to document progress of site investigation and remediation, unless an alternative reporting schedule has been requested by the Operator and approved by the Director. The Director may request a more frequent reporting schedule based on site-specific conditions.

Report Type: [X] 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 706

E&P waste (solid) description Hydrocarbon impacted soils

COGCC Disposal Facility ID #, if applicable:

Non-COGCC Disposal Facility: North Weld Waste Management

Volume of E&P Waste (liquid) in barrels 0

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

If YES:

[ ] Compliant with Rule 913.h.(1).

[ ] Compliant with Rule 913.h.(2).

[ ] Compliant with Rule 913.h.(3).

Do all soils meet Table 915-1 standards?

Does the previous reply indicate consideration of background concentrations?

Does Groundwater meet Table 915-1 standards?

Is additional groundwater monitoring to be conducted?

Operator shall comply with the COGCC 1000-Series Reclamation Requirements for all impacted and disturbed areas.

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 tank battery decommissioning activities, the location was backfilled, compacted, and re-contoured to match pre-existing conditions. The location will be reclaimed in accordance with the COGCC 1000 series.

Is the described reclamation complete? Yes

Does the reclamation described herein constitute interim or final reclamation of the Oil and Gas Location?

[X] Interim [ ] Final

Did the Surface Owner provide the seed mix?

If YES, does the seed mix comply with local soil conservation district recommendations?

Did the local soil conservation district provide the seed mix?

SITE RECLAMATION DATES

Proposed date of commencement of Reclamation.

Proposed date of completion of Reclamation.

IMPLEMENTATION SCHEDULE

Per Rule 913.d.(2): Any change from the approved implementation schedule will be requested at least 14 days in advance, and the Operator may not make the change without the Director's approval.

PRIOR DATES

Date of Surface Owner notification/consultation, if required. 11/10/2020

Actual Spill or Release date, or date of discovery.

SITE INVESTIGATION DATES

Date of Initial Actions described in Site Investigation Plan (start date). 03/01/2021

Proposed site investigation commencement. 03/31/2021

Proposed completion of site investigation.

REMEDIAL ACTION DATES

Proposed start date of Remediation. 03/31/2021

Proposed date of completion of Remediation.

Per Rule 913.d.(2): Any change from the approved implementation schedule will be requested at least 14 days in advance, and the Operator may not make the change without the Director's approval.

[ ] Change from approved implementation schedule per Rule 913.d.(2).

Basis for change in implementation schedule:

OPERATOR COMMENT

This Supplemental Form 27 was submitted to summarize quarterly groundwater monitoring activities and analytical results collected during the third quarter 2021 at the former Anderson 12-13 tank battery location.

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 Program Manager

Submit Date:`

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:

Date:

Remediation Project Number: 17005

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
402834750	MONITORING REPORT

Total Attach: 1 Files

General Comments

User Group	Comment	Comment Date
		Stamp Upon Approval

Total: 0 comment(s)