FORM 27 Rev 5/22

State of Colorado
Oil and Gas Conservation Commission

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Report taken by:

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: taspillremediationcontractor@pdce.com

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

PROJECT, PURPOSE & SITE INFORMATION

PROJECT INFORMATION

Remediation Project #: 24688 Initial Form 27 Document #: 403142094

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.
- [ ] Other:

SITE INFORMATION

No Multiple Facilities

Facility Type: LOCATION Facility ID: 471652 API #: County Name: WELD
Facility Name: Totems 44-24 Latitude: 40.029632 Longitude: -104.948911
** correct Lat/Long if needed: Latitude: 40.029616 Longitude: -104.949061
QtrQtr: SWSE Sec: 24 Twp: 1N Range: 68W Meridian: 6 Sensitive Area? Yes

SITE CONDITIONS

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

Nearest Well: Domestic - 899' NE; Surface Water: Bull Canal - 71' NNW; Occupied Building: 525' ENE; FWS Wetlands: 71' NNW Riverine (R4SBCx).

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
No	GROUNDWATER	Refer to Table 5 & Figure 2	Confirmation Groundwater Sampling
Yes	SOILS	Refer to Tables 1-4 & 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 October 21, 2022, field screening and confirmation soil sampling was conducted in accordance with the COGCC Rule 911 during the decommissioning and closure of the Totems 44-24 tank battery (Figure 1). Based on analytical results, it was determined that a historic release was discovered adjacent to and beneath the former partially buried produced water vessel (PWV). Additionally, during the abandonment of the separator (SEP), based on analytical results, it was determined that a historic release was discovered adjacent to and beneath the former separator. Following the discovery of the releases, mitigation activities were initiated and to date, approximately 3,530 cubic yards of impacted material was removed at the PWV excavation, and approximately 9 cubic yards of impacted material was removed at the SEP excavation. All material removed was transported to the Front Range Landfill in Erie, CO for disposal under PDC waste manifests. During excavation activities, groundwater was encountered in the PWV excavation at approximately 14.5 feet bgs. Groundwater vacuum recovery was conducted concurrent with excavation activities. A total of 20 BBLs of groundwater were removed from the location and transported to the NGL C3 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):

Between October 24 & 26, 2022, four soil samples (PWV01-W, PWV01-B, SS01 & SS02) were collected from impacted source material adjacent to the PWV between depths of approximately 9 feet & 11 feet bgs & were for laboratory analysis analysis of the full COGCC Table 915-1 analyte suite. Laboratory analytical results indicated COCs for the historic release adjacent to the PWV include BTEX, 1,2,4-TMB, 1,3,5-TMB, naphthalene, TPH (C6-C36), fluorene, 1-M, 2-M, arsenic, cadmium, & lead. Between October 24 & December 2, 2022, seventy three soil samples (SS03-SS53, SS57-SS60, SS62-SS64, & SS66-SS80) were collected from the sidewalls & base of the PWV final excavation extent between depths of approximately 5 feet & 14.5 feet bgs. All soil samples were submitted for analysis of the above listed COC's. Additionally, soil samples SS54, SS55, SS61, & SS65 were collected from the final excavation extent at a depth of approximately 2.5 feet bgs & submitted for laboratory analysis of pH, EC, SAR & boron.

Proposed Groundwater Sampling

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

On October 31, 2022, groundwater was encountered at approximately 14.5 feet bgs in the excavation. Consequently, one groundwater sample (GW01) was collected from the excavation and submitted for laboratory analysis of BTEX, naphthalene, 1,2,4-TMB, and 1,3,5-TMB. Analytical results indicated that all analyzed constituents were below the applicable COGCC Table 915-1 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):

On October 24, 2022, two soil samples (SEP01-DL-S & SEP01-DL-B) were collected from impacted source material adjacent to the SEP between depths of approximately 5 feet and 10.5 feet bgs (Figure 1). The samples were submitted for laboratory analysis analysis of the full COGCC Table 915-1 analyte suite. Laboratory analytical results indicated COCs for the historic release adjacent to the SEP include BTEX, 1,2,4-TMB, 1,3,5-TMB, naphthalene, TPH (C6-C36), 1-M, 2-M, cadmium, lead, and nickel. Due to landowner constraints source mass removal was suspended at the SEP excavation. Supplemental source mass removal activities will be conducted to remove remaining hydrocarbon impacted material via mechanical excavation pending landowner approval.

SITE INVESTIGATION REPORT

SAMPLE SUMMARY

Soil

Number of soil samples collected: 85

Number of soil samples exceeeding 915-1: 16

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

Approximate areal extent (square feet): 6621

NA / ND

-- Highest concentration of TPH (mg/kg): 880

-- Highest concentration of SAR: 25.2

BTEX > 915-1: Yes

Vertical Extent > 915-1 (in feet): 15

Groundwater

Number of groundwater samples collected: 1

Was extent of groundwater contaminated delineated? No

Depth to groundwater (below ground surface, in feet): 14

Number of groundwater monitoring wells installed:

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):

ND Highest concentration of Xylene (µg/l):

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?

Between October 24, and November 21, 2022, fourteen background soil samples (BKG01-BKG03) were collected between 2.5 feet and 14.5 feet bgs. All soil samples were submitted for analysis of Table 915-1 metals. Additionally, background soil samples collected from soil borings BKG01 & BKG02 were submitted for analysis of pH, electrical conductivity (EC), and sodium adsorption ratio (SAR). Analytical results indicated that arsenic, barium, cadmium, lead, selenium, pH, EC, and SAR were in exceedance of the applicable regulatory standards in native soil adjacent to the tank battery. Based on these results the selenium exceedances observed in soil samples SEP01-DL-S, PWV01-W, & SS02 are within 1.25x the background concentrations and indicative of native soil conditions, as referenced in footnote 11 of the Table 915-1. Additionally, the pH, EC, & SAR exceedances observed in soil samples SS54, SS55, SS61, and SS65 are indicative of native soil conditions.

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

Volume of solid waste (cubic yards): 3539

Volume of liquid waste (barrels): 20

[X] Is further site investigation required?

Ten (10) groundwater monitoring wells will be installed to confirm the absence of dissolved-phase hydrocarbon impacts within and surrounding the former northern, eastern, and southern sidewalls of the PWV excavation extent. Volatile organic compound (VOC) concentrations using a photoionization detector (PID) and lithologic descriptions 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 the COGCC approved COCs. Soil samples will be collected from monitoring wells as needed to complete the vertical and horizontal delineation of Table 915-1 metal exceedances described below.

Pending the completion of supplemental source mass removal activities of the SEP-DL historic release, additional groundwater monitoring wells will be installed to the west of the former PWV excavation extent in order to confirm the absence of dissolved phase hydrocarbon impacts. Proposed monitoring well locations are illustrated on Figure 3.

Groundwater monitoring well installation and confirmation soil sampling will be conducted following landowner approval.

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 October 21 and December 2, 2022, approximately 3,539 cubic yards of impacted material were excavated below and adjacent to the former PWV and SEP were transported to the Front Range Landfill for disposal under PDC waste manifests. Groundwater vacuum recovery was conducted concurrent with excavation activities. A total of 20 BBLs of groundwater were removed from the location and transported to the NGL C3 facility for disposal under PDC waste manifests.

Any hydrocarbon impacted material generated in supplemental source mass removal activities in the vicinity of the SEP will be transported off-site to a licensed disposal facility in accordance with Rules 905 and 906.

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 soil and groundwater analytical results for the PWV excavation, and following the supplemental source mass removal activities in the vicinity of the SEP-DL. The remaining hydrocarbon impacts identified beneath the former SEP-DL will be removed via mechanic excavation pending landowner approval.

During supplemental source mass removal activities at the SEP release, confirmation soil samples will be collected from sidewalls and base of the final excavation extent and submitted for laboratory analysis of the COGCC approved COCs. Supplemental source mass removal activities and final analytical results will be summarized in a forthcoming Supplemental Form 27 within 90 days of completing the proposed scope of work.

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 ten proposed monitoring wells until closure criteria are met. Groundwater samples will be submitted for laboratory analysis of BTEX, naphthalene, 1,2,4-TMB, and 1,3,5 -TMB by EPA Method 8260B, as well as total dissolved solids (TDS), chlorides, and sulfates in accordance with Table 915-1.

REMEDIATION PROGRESS UPDATE

PERIODIC REPORTING

Approved Reporting Schedule:

[X] Quarterly [ ] Semi-Annually [ ] Annually [ ] Other Confirmation Sample Summary, Analyte Reduction, Supp. Site Investigation, & Source Mass Removal

[ ] **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: [ ] Groundwater Monitoring [ ] Land Treatment Progress Report [ ] O&M Report

[X] Other Confirmation Sample Summary, Analyte Reduction, Supp. Site Investigation, & Source Mass Removal

Adequacy of Operator's General Liability Insurance and Financial Assurance

Describe the adequacy of the Operator's general liability insurance and Financial Assurance to fully address the anticipated costs of Remediation, including the estimated remaining cost for this project (below).
If this information has been provided on a Form 27 within the last 12 months, provide the Document Number of that form.

Operator does not have site-specific financial assurance for this project; however, Operator has inactive well, blanket, and surface bonding including Surety IDs 106077122, 106473808, and 106473820, as well as commercial general liability and/or umbrella/excess insurance meeting the requirements of Rule 705.b. Operator does not anticipate making an insurance claim for this project.

- Monitoring wells will be installed, and groundwater will be monitored.
- PWV Release: Investigation and delineation has been completed in soil.
- SEP Release: Source mass removal and confirmation sampling will be conducted to confirm the absence of hydrocarbon impacts in soil adjacent to the SEP release.
- Facility and infrastructure were decommissioned and the location will be reclaimed in accordance with the COGCC 1000 Series.

Costs included herein are estimates only and may change over time based on numerous factors. Accordingly, Operator makes no guarantees as to the accuracy of such cost estimates, thus providing an estimate for the next year below.

Operator anticipates the remaining cost for this project to be: $ 75000

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 3539

E&P waste (solid) description Hydrocarbon impacted soils

COGCC Disposal Facility ID #, if applicable:

Non-COGCC Disposal Facility: Front Range Landfill

Volume of E&P Waste (liquid) in barrels 20

E&P waste (liquid) description Hydrocarbon impacted groundewater

COGCC Disposal Facility ID #, if applicable:

Non-COGCC Disposal Facility: NGL C3

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 and source mass removal activities, the location will be backfilled, compacted, and re-contoured to match preexisting 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?

☒ 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. 10/21/2022

Proposed date of completion of Reclamation. 01/31/2028

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. 06/29/2022

Actual Spill or Release date, or date of discovery. 10/25/2022

SITE INVESTIGATION DATES

Date of Initial Actions described in Site Investigation Plan (start date). 09/09/2022

Proposed site investigation commencement. 04/01/2023

Proposed completion of site investigation. 06/30/2023

REMEDIAL ACTION DATES

Proposed start date of Remediation. 10/25/2022

Proposed date of completion of Remediation. 01/31/2028

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:

The implementation schedule has been changed as result of decommissioning activities, discovery of historic releases, necessity of additional site investigation activities, and necessity to address remaining petroleum hydrocarbon impacts.

OPERATOR COMMENT

Based on analytical results for the waste characterization sample SS01 collected from the wellhead source area, PDC is requesting that the COCs for both of the historic releases discovered at the Totem 44-24 Tank Battery be reduced to the following: BTEX, 1,2,4-TMB, 1,3,5-TMB, naphthalene, TPH (C6-C36), fluorene, 1-M, 2-M, arsenic, cadmium, & lead.

Analytical results indicated that arsenic, cadmium, & lead were in exceedance of the applicable COGCC Table 915-1 standards or 1.25x the average background concentration in a number of soil samples collected from the final excavation extent. A statistical analysis of the Table 915-1 metals data for the excavation & background soil samples was conducted. This analysis indicated that Table 915-1 metals were highly variable. A correlation between soil sample metal concentrations & depth, across both datasets, is increased variability. The distinguishing factor between the excavation extent dataset & background dataset is the number of soil samples collected. Seventy-three (73) soil samples were utilized in the final excavation extent soil sample dataset & fourteen (14) soils samples were utilized in the background soil sample dataset. The following observations were made for each metal constituent-of-concern.

Arsenic:
- The soil samples collected from the final excavation extent exhibited variable concentrations ranging between 0.703 mg/kg & 44.8 mg/kg with a mean concentration of 6.58 mg/kg
- The background soil sample dataset is variable, ranging between 0.821 mg/kg & 269 mg/kg with a mean concentration of 22.4 mg/kg.
- 71 of the 73 excavation extent samples fall below 1.25x the average background arsenic concentration.
- The two remaining soil sample concentrations above 1.25x the average background arsenic concentration are below the highest concentration observed in native material.

Cadmium:
- The soil samples collected from the final excavation extent exhibited variable concentrations ranging between non-detect & 0.717 mg/kg with a mean concentration of 0.221 mg/kg
- The background soil sample dataset is variable, ranging between non-detect & 0.683 mg/kg with a mean concentration of 0.266 mg/kg.
- 70 of the 73 excavation extent samples fall below 1.25x the average background arsenic concentration.
- The three remaining soil sample concentration above 1.25x the average background cadmium concentration are below or within 1.25x the highest observed cadmium concentration in native material.

Lead:
- The soil samples collected from the final excavation extent exhibited variable concentrations ranging between 6.30 mg/kg & 17.3 mg/kg with a mean concentration of 11.03 mg/kg
- The background soil sample dataset is variable, ranging between 6.35 mg/kg & 16.6 mg/kg with a mean concentration of 11.54 mg/kg.
- 64 of the 73 excavation extent samples fall below 1.25x the average background arsenic concentration.
- The nine remaining soil sample concentrations above 1.25x the average background arsenic concentration are below or within 1.25x the highest observed lead concentration in native material.

Following statistical analysis, PDC concluded the range and mean of arsenic, cadmium, & lead concentrations were found to be very similar in both native material & confirmation soil samples. Based on this evaluation and the similarities across the spectrum of native material and confirmation sample Table 915-1 metal analytical results, PDC utilized the highest background value observed for arsenic, cadmium, & lead was applied when evaluating the soil samples collected from the final excavation extent. Consequently, all final excavation extent soil sample metal concentrations are indicative of native soil conditions. The graphical representation of this statistical analysis is provided as attachment C.

Following landowner approval & the approval of this form, PDC will install and conduct quarterly groundwater monitoring at the ten proposed monitoring wells.

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: taspillremediationcontractor@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: 24688

COA Type	Description
0 COA	

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
403313009	ANALYTICAL RESULTS
403313029	SOIL SAMPLE LOCATION MAP
403313111	PHOTO DOCUMENTATION
403314028	OTHER

Total Attach: 4 Files

General Comments

User Group	Comment	Comment Date
		Stamp Upon Approval

Total: 0 comment(s)