FORM 27 Rev 5/22

State of Colorado
Oil and Gas Conservation Commission

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Receive Date:
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: 1099 18TH STREET SUITE 1500
City: DENVER State: CO Zip: 80202
Contact Person: Karen Olson Email: taspillremediationcontractor@pdce.com

Phone Numbers
Phone: (303) 860-5800
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PROJECT, PURPOSE & SITE INFORMATION

PROJECT INFORMATION

Remediation Project #: 19948 Initial Form 27 Document #: 402780624

PURPOSE INFORMATION

- [ ] Rule 913.c.(1): Pit or Cuttings Trench closure.
- [ ] 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: 472145 API #: County Name: WELD
Facility Name: Miller G J 33-24 Latitude: 40.468635 Longitude: -104.606764
** correct Lat/Long if needed: Latitude: 40.468646 Longitude: -104.606843
QtrQtr: NWSE Sec: 24 Twp: 6N Range: 65W Meridian: 6 Sensitive Area? Yes

SITE CONDITIONS

General soil type - USCS Classifications SM
Most Sensitive Adjacent Land Use Agriculture
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: Irrigation - 612 feet NW, Surface Water: Tributary off JB Cooke Reservoir - 171 feet SE, Occupied Buildings: 547 feet N, Livestock: 1,200 feet SE, FWS Wetlands: Riverine (R5UBH), Tributary off JB Cooke Reservoir - 171 feet SE, HPH: Aquatic Native Species Conservation Water - 454 feet SE

Conflict possible as dump line crosses / runs under riverine habitat between separator and tank battery

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
Yes	GROUNDWATER	Refer to Table 6 & Figure 3	Confirmation Groundwater Sampling
Yes	SOILS	Refer to Tables 1-5 & Figures 1-3	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 11, 2022, historic hydrocarbon impacts were discovered outside of the containment berm during reclamation activities at the Miller GJ 33-24 Tank Battery and a historic release was reported. Following the discovery, excavation activities were initiated, and to date, approximately 11,190 cubic yards (CY) of impacted material were removed and transported to the North Weld Waste Management Facility for disposal under PDC manifests. During excavation activities, groundwater was encountered at approximately 10 feet below ground surface (bgs). Groundwater vacuum recovery was conducted concurrent with excavation activities and approximately 14,500 barrels (bbls) of groundwater were removed from the excavation and transported to NGL C4 and NGL C10 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 January 12 and March 3, 2022, three soil samples (SS01, SS02, & SS87) were collected from the source area at approximately 3 feet, 10 feet, and 11 feet bgs, respectively, and submitted for laboratory analysis of the full COGCC Table 915-1 analyte suite. Preliminary analytical results indicate that the COCs include BTEX, 1,2,4-TMB, 1,3,5-TMB, naphthalene, TPH (C6-C36), chrysene, fluorene, 1-methylnaphtalene (M), and 2-M. Between January 17 and March 21, 2022, one hundred twenty-four (124) soil samples (SS03-SS76, SS78-SS86, SS88-SS113, SS115-SS120, SS122-SS130) were collected from the sidewalls and base of the excavation at depths ranging from 6 to 13.5 feet bgs and were submitted for laboratory analysis of the above referenced COCs.

Proposed Groundwater Sampling

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

On January 17, 2022, one groundwater sample (GW01) was collected from the tank battery excavation and was 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 exceedance of the COGCC Table 915-1 standards in sample GW01.

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):

Between January 28, and March 15, 2022, five (5) composite overburden samples (OB01-OB05) were collected from overburden material stockpiles and submitted for laboratory analysis of BTEX, naphthalene, 1,2,4-TMB, 1,3,5-TMB, TPH (C6-C36), pH, EC, SAR, and boron. Composite overburden samples OB03-OB05 were submitted for additional analysis of the Table 915-1 PAHs. Analytical results indicated that organic compound concentrations were below applicable COGCC Table 915-1 regulatory standards; however, pH was observed in exceedance of the applicable regulatory standard in four composite overburden samples (OB01-OB04) and SAR was observed in exceedance of applicable regulatory standard in two samples (OB04 & OB05). Stockpiled overburden material from OB01-OB03 was returned to the excavation as backfill material. Stockpiled overburden material from OB04 & OB05 were removed and transported to the North Weld Waste Management Facility for disposal under PDC waste manifests.

SITE INVESTIGATION REPORT

SAMPLE SUMMARY

Soil

Number of soil samples collected: 138
Number of soil samples exceeeding 915-1: 19
Was the areal and vertical extent of soil contamination delineated? No
Approximate areal extent (square feet): 31043

NA / ND

-- Highest concentration of TPH (mg/kg): 27100
-- Highest concentration of SAR: 3.7
BTEX > 915-1: Yes
Vertical Extent > 915-1 (in feet): 13

Groundwater

Number of groundwater samples collected: 1
Was extent of groundwater contaminated delineated? No
Depth to groundwater (below ground surface, in feet): 10
Number of groundwater monitoring wells installed: 0
Number of groundwater samples exceeding 915-1: 1

-- Highest concentration of Benzene (µg/l): 110
-- Highest concentration of Toluene (µg/l): 1700
-- Highest concentration of Ethylbenzene (µg/l): 490
-- Highest concentration of Xylene (µg/l): 8400
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 January 26, 2022, six background soil samples (BKG01 & BKG02) were collected at approximately 6 feet, 11 feet, and 13.5 feet bgs, from each location, from native material topographically up-gradient of the tank battery and submitted for laboratory analysis of Table 915-1 metals. Analytical results indicated that arsenic, barium, cadmium, and selenium were in exceedance of the applicable regulatory standard in native material.

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

Volume of solid waste (cubic yards): 11190
Volume of liquid waste (barrels): 14500

[X] Is further site investigation required?

On November 28, 2022, eight soil borings (BKG03–BKG10) were advanced to a depth of approximately 13.5 feet bgs to assess soil suitability constituents in native soil on site. Forty background soil samples were collected at depths ranging from 2.5 feet to 13.5 feet bgs and were submitted to for laboratory analysis of pH, EC, SAR, and boron.

Background soil analytical results indicated that EC and SAR were in exceedance of the applicable regulatory standards in background soil borings BKG04–BKG07 and BKG09. Additionally, pH and boron were in compliance with the applicable regulatory standards in all background soil boring locations.

Between November 30, and December 2, 2022, 20 monitoring wells (BH01 – BH20) [Figure 3] were installed to delineate dissolved-phase hydrocarbon impacts within and adjacent to the former excavation extent. Due to land-access negotiations, three of the proposed monitoring wells were unable to be installed. Lithologic descriptions and VOC concentrations measured using a photoionization detector (PID) were recorded for each monitoring well. Due to elevated PID readings recorded during installation activities, samples were collected from monitoring wells BH02, BH05, BH10, BH11, BH14, BH17, and BH18 from the intervals exhibiting the highest VOC concentrations as well as, from the terminus of each soil boring. Fourteen soil samples were submitted to Summit for laboratory analysis of BTEX, naphthalene, 1,2,4-TMB, 1,3,5-TMB, TPH(C6-C36), chrysene, fluorene, 1-M, and 2-M.

Soil analytical results indicated that organic compound concentrations were in exceedance of the applicable COGCC Table 915-1 regulatory standards in monitoring wells BH10, BH11, BH14, and BH18.

Per the Condition of Approval (COA) issued in the approved Supplemental Form 27 (Document No. 403311258) further site investigation activities are required to delineate the pH exceedance recorded in soil sample SS77. The proposed soil boring locations are illustrated on Figure 4.

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 11 and March 21, 2022, approximately 11,190 cubic yards of impacted material were removed and transported to the North Weld Waste Management Facility in Ault, Colorado for disposal under PDC waste manifests.

Groundwater vacuum recovery activities were conducted concurrent with excavation activities. Approximately 14,500 barrels of groundwater were recovered and transported to the NGL C4 and NGL C10 facilities 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.

Hydrocarbon impacted soil was vertically and horizontally defined with exception of the remaining hydrocarbon impacts located below Weld County Road 49 east of the former excavation. Due to underground infrastructure and the ROW, excavation activities could not continue below County Road 49.

Per the approved Supplemental Form 27 (Document No. 403030913), on December 1, 2022, one soil boring (SB01) was advanced near soil sample SS87 to further define potential remaining impacts along the former excavation extent. Two samples were collected from soil boring SB01 at 14 feet and 15 feet bgs and were submitted for laboratory analysis of BTEX, naphthalene, 1,2,4-TMB, 1,3,5-TMB, TPH(C6-C36), chrysene, fluorene, 1-M, and 2-M. Soil analytical results indicated that organic compound concentrations were in exceedance of the applicable COGCC Table 915-1 regulatory standards in soil sample SB01 @ 14'. Organic compound concentrations were in compliance with the applicable regulatory standards in soil sample SB01 @ 15'.

Based on the data received, monitored natural attenuation (MNA) will be the selected remediation strategy for the remaining soil impacts located below County Road 49.

Additionally, on December 2, 2022, two soil borings (SB02 and SB03) [Figure 2] were advanced at the significant bends of the dump line to complete decommissioning and soil sampling activities from January 2022. Two soil samples were collected from the borings and submitted for laboratory analysis of BTEX, naphthalene, 1,2,4-TMB, 1,3,5-TMB, and TPH(C6-C36). Soil analytical results indicated that organic compound concentrations were in compliance with the applicable COGCC Table 915-1 regulatory standards in both soil boring locations.

Based on the analytical results received from the initial groundwater monitoring assessment, MNA was selected as the remediation strategy for this location during the fourth quarter 2022 and will remain the selected remediation strategy through the second quarter 2023.

Soil Remediation Summary

[X] In Situ

- [ ] Bioremediation (or enhanced bioremediation)
- [ ] Chemical oxidation
- [ ] Air sparge / Soil vapor extraction
- [Yes] Natural Attenuation
- [ ] Other

[X] Ex Situ

- [Yes] Excavate and offsite disposal
  - If Yes: Estimated Volume (Cubic Yards) 11190
  - 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.

During the first quarter 2023, PDC conducted quarterly groundwater monitoring at the 20 site monitoring wells (BH01 - BH20). Groundwater samples were submitted for laboratory analysis of benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene, 1,2,4-trimethylbenzene (TMB), 1,3,5-TMB, by EPA Method 8260B, 1-methylnaphthalene (M) by EPA Method 8270D SIM, chloride and sulfate anions by EPA Method 300.0 and total dissolved solids (TDS) by Method SM 2540C in accordance with Table 915-1.

First quarter 2023 groundwater analytical results indicated organic compound concentrations were in compliance with the applicable regulatory standards in all 20 monitoring well locations. TDS and sulfate anion concentrations were in exceedance with the applicable COGCC Table 915-1 regulatory standards and greater than 1.25x the background concentrations in monitoring BH09. Chloride anion concentrations were in compliance with the applicable regulatory standard in all monitoring well locations.

Per the Condition of Approval (COA) issued in the approved Supplemental Form 27 (Document No. 403311258), 2-M will be added to the quarterly sampling and analysis plan beginning in the second quarter 2023.

REMEDIATION PROGRESS UPDATE

PERIODIC REPORTING

Approved Reporting Schedule:

[X] Quarterly [ ] Semi-Annually [ ] Annually [X] Other Supplemental Site Investigation Proposal

[ ] **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

[X] Other Supplemental Site Investigation Proposal

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.

Financial assurance information was included on the June 2022 Supplemental Form 27 (Document No. 403030913). This section and estimate will be updated on an annual basis until closure criteria are achieved.

Operator anticipates the remaining cost for this project to be: $ 45000

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 11190

E&P waste (solid) description Hydrocarbon impacted soil

COGCC Disposal Facility ID #, if applicable:

Non-COGCC Disposal Facility: North Weld Waste Management

Volume of E&P Waste (liquid) in barrels 14500

E&P waste (liquid) description Hydrocarbon impacted groundwater

COGCC Disposal Facility ID #, if applicable:

Non-COGCC Disposal Facility: NGL C4 & NGL C10

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. 01/12/2022

Proposed date of completion of Reclamation. 06/23/2027

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. 02/24/2021

Actual Spill or Release date, or date of discovery. 01/11/2022

SITE INVESTIGATION DATES

Date of Initial Actions described in Site Investigation Plan (start date). 09/16/2021

Proposed site investigation commencement. 09/30/2023

Proposed completion of site investigation. 09/30/2023

REMEDIAL ACTION DATES

Proposed start date of Remediation. 01/12/2022

Proposed date of completion of Remediation. 06/23/2027

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.

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

Basis for change in implementation schedule:

Per the Condition of Approval (COA) issued in the approved Supplemental Form 27 (Document No. 403311258) further site investigation activities are required to delineate the pH exceedance recorded in soil sample SS77. The proposed soil boring locations are illustrated on Figure 4.

OPERATOR COMMENT

This Supplemental Form 27 was submitted to summarize quarterly groundwater monitoring activities and analytical results collected during the first quarter 2023 at the former Miller GJ 33-24 tank battery location.

Per the Condition of Approval (COA) issued in the approved Supplemental Form 27 (Document No. 403311258), 2-methylnaphthalene will be added to the quarterly sampling and analysis plan beginning in the second quarter 2023.

First quarter 2023 groundwater analytical results indicated that organic compound concentrations and chloride anion concentrations were in compliance with the applicable regulatory standards in all 20 monitoring well locations for the second consecutive quarter. Additionally, 1-methylnaphthalene concentrations were in compliance with the USEPA Regional Screening Levels for tap water in all 20 monitoring well locations. TDS and sulfate anion concentrations were in exceedance of the applicable regulatory standards and greater than 1.25x the background concentrations in monitoring well BH09.

Per the Condition of Approval (COA) issued in the approved Supplemental Form 27 (Document No. 403311258) further site investigation activities are required to delineate the pH exceedance recorded in soil sample SS77. The proposed soil boring locations are illustrated on Figure 4.

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: 19948

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
403406774	MONITORING REPORT

Total Attach: 1 Files

General Comments

User Group	Comment	Comment Date
		Stamp Upon Approval

Total: 0 comment(s)