

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 INFORMATION

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

PROJECT, PURPOSE & SITE INFORMATION

PROJECT INFORMATION

Remediation Project #: 16917 Initial Form 27 Document #: 402607738

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.
- 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: Wellhead Closure and Flowline Removal

SITE INFORMATION

No Multiple Facilities

Facility Type: WELL	Facility ID: _____	API #: 123-20261	County Name: WELD
Facility Name: KRISTIN 1	Latitude: 40.302610	Longitude: -104.831500	
** correct Lat/Long if needed: Latitude: _____		Longitude: _____	
QtrQtr: NENE	Sec: 24	Twp: 4N	Range: 67W 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? Yes

**Other Potential Receptors within 1/4 mile**

Surface Water: South Platte River - 1144 feet SE, FWS Wetlands: Forested/Shrub Riparian - 482 feet E, HP Habitat: Location falls within the following HPHs - Mule Deer Sever Winter Range, Mule Deer Migration Corridor, Bald Eagle Active Nest Site (1/4 mile buffer) / Aquatic Native Species Conservation - 760 feet SE

# 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 checked="" type="checkbox"/> Oil            | <input type="checkbox"/> Tank Bottoms                |  |
| <input checked="" 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	SOILS	Refer to Tables 1-6 and Figures 1-4	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 May 7 and 12, 2021, field screening and confirmation soil sampling was conducted in accordance with the COGCC Rule 911 during the decommissioning and closure of the Kristin 1 Wellhead (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 excavation at approximately 3.5 feet below ground surface (bgs). Approximately 44 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

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

On May 12, 2021, one soil sample (WH01) was collected from the source area at approximately 3 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, TPH (C6-C36), anthracene, chrysene, fluoranthene, fluorene, and pyrene. Between May 12 and 17, 11 soil samples (WH01, SS01 – SS09, and SS11) were collected from the sidewalls and base of the excavation at depths ranging from 3 feet to 5.5 feet bgs and were submitted for laboratory analysis of the above referenced organic COCs. The final excavation extent and sample locations are illustrated on Figure 3. Initial 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 May 12, 2021, one groundwater sample (GW01) was collected from the excavation prior to 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 exceedance of the applicable COGCC Table 915-1 groundwater standards. The groundwater sample location is illustrated on Figure 3 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 May 7, 2021, soil encountered adjacent to and surrounding the wellhead and below the flowline riser was visually inspected and field screened for volatile organic compound (VOC) concentrations using a photoionization detector (PID). In addition, a field screening samples was collected, and inspection conducted below the separator end of the flowline. Per the approved proposed soil sampling plan, two soil samples (FLR01 and WH01) were collected at approximately 2.5 feet and 3 feet below ground surface (bgs) from undisturbed areas most likely to be impacted by oil and gas operations located adjacent to and below production infrastructure. Due to the discovery of the historic release, the samples collected on May 7, 2021, were not submitted for laboratory analysis. GPS coordinates and field screened VOC concentrations are summarized in Table 6. Sample locations at the wellhead and along the flowline are illustrated on Figures 1 and 2.

# SITE INVESTIGATION REPORT

## SAMPLE SUMMARY

### Soil

Number of soil samples collected 11

Number of soil samples exceeding 915-1 2

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

Approximate areal extent (square feet) 575

### NA / ND

-- Highest concentration of TPH (mg/kg) 7

-- Highest concentration of SAR 4.66

BTEX > 915-1 Yes

Vertical Extent > 915-1 (in feet) 5

### Groundwater

Number of groundwater samples collected 1

Was extent of groundwater contaminated delineated? No

Depth to groundwater (below ground surface, in feet) 3'

Number of groundwater monitoring wells installed 0

Number of groundwater samples exceeding 915-1 1

-- Highest concentration of Benzene (µg/l) 280

-- Highest concentration of Toluene (µg/l) 83

-- Highest concentration of Ethylbenzene (µg/l) 110

-- Highest concentration of Xylene (µg/l) 1900

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?

Were background samples collected as part of this site investigation?

On May 7, 2021, one background soil sample (BKG01) was collected at approximately 2.5 feet bgs from native material topographically up-gradient of the wellhead and submitted for analysis of COGCC Table 915-1 metals and pH. These laboratory results are pending.

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

Volume of solid waste (cubic yards) 44

Volume of liquid waste (barrels) 290

Is further site investigation required?

Five (5) 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, 1,2,4-TMB, 1,3,5-TMB, TPH (C6-C36), anthracene, chrysene, fluoranthene, fluorene, and pyrene. Proposed monitoring well 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 May 12 and 17, 2021, approximately 44 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.

Per the Condition of Approval (COA) issued by the COGCC, confirmation soil samples were collected from the native material adjacent to and below the former excavation to confirm the absence of hydrocarbon impacts. In addition, one sample was collected from the source borehole BH05, adjacent to the cut and capped well casing. The samples were submitted for laboratory analysis benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene, 1, 2, 4-trimethylbenzene (TMB), 1, 3, 5-TMB, total petroleum hydrocarbons (TPH) [C6-C36], pH, electrical conductivity (EC), sodium adsorption ratio (SAR), boron, anthracene, chrysene, fluorene, fluoranthene, pyrene, arsenic, and selenium. Soil analytical results collected during the drilling investigation indicated that organic compound concentrations were in compliance with the applicable COGCC Table 915-1 Protection of Groundwater SSLs. Arsenic and selenium concentrations were above the applicable regulatory standards in all five samples collected. Following receipt of the remaining background soil analytical results, a path forward will be determined for this location.

In addition, two field screening samples (FL01-02 and FL01-03) were collected between the capped ends along the flowline at approximately 3 feet bgs. Based on the locates present during the investigation, no significant direction changes were observed along the length of the flowline. The sample locations are illustrated on Figure 1 and GPS coordinates and field screened VOC concentrations are summarized in Table 1. The flowline investigation field notes are attached for reference.

Based on the groundwater analytical results collected during the third quarter 2021, monitored natural attenuation (MNA) will be the selected remediation strategy for fourth quarter 2021.

### Soil Remediation Summary

<input type="checkbox"/> In Situ	<input checked="" type="checkbox"/> Ex Situ
_____ Bioremediation ( or enhanced bioremediation )	Yes _____ Excavate and offsite disposal
_____ Chemical oxidation	_____ If Yes: Estimated Volume (Cubic Yards) _____ 44
_____ Air sparge / Soil vapor extraction	_____ Name of Licensed Disposal Facility or COGCC Facility ID # _____
_____ Natural Attenuation	_____ Excavate and onsite remediation
_____ Other _____	_____ 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 five 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, were evaluated at the source, up-gradient, and down-gradient monitoring wells during the third quarter 2021. Analytical results indicated that inorganic parameters are within 1.25x of the background sample collected from the up-gradient monitoring well BH04.



# 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 wellhead and flowline abandonment 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?

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. 12/30/2021

Actual Spill or Release date, or date of discovery. 05/13/2021

### SITE INVESTIGATION DATES

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

Proposed site investigation commencement. 05/07/2021

Proposed completion of site investigation. \_\_\_\_\_

### REMEDIAL ACTION DATES

Proposed start date of Remediation. 05/12/2021

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 Kristin 1 location. Based on the results of the inorganic parameters collected during the third quarter 2021 groundwater monitoring event, PDC is requesting that analysis of TDS, and chloride and sulfate anions are removed from the quarterly sampling plan.

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: 16917 \_\_\_\_\_

**COA Type****Description**

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**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**

402811384	MONITORING REPORT
402811386	SOIL SAMPLE LOCATION MAP
402811388	PHOTO DOCUMENTATION
402811401	OTHER

Total Attach: 4 Files

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

		Stamp Upon Approval
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Total: 0 comment(s)