



**PDC Energy, Inc.**  
**First Quarter 2023 Groundwater Monitoring Summary**

February 15, 2023

Former Von Feldt 13-12 Wellhead  
SWSW Section 12 T6N R65W  
Remediation # 19634

This groundwater monitoring summary has been prepared by Tasman, Inc. for the former Von Feldt 13-12 Wellhead.

### **Site History and Background**

On September 2, 2021, a historic hydrocarbon release was discovered at the former wellhead during wellhead decommissioning activities. Following the discovery, mitigation activities were initiated and approximately 8 cubic yards of impacted material were removed from the former excavation. During excavation activities, groundwater was encountered within the excavation at approximately 6 feet below ground surface (bgs). On January 21, 2022, five monitoring wells (BH01 – BH05) were installed to confirm the absence of dissolved-phase hydrocarbon impacts within and adjacent to the former excavation extent. Per the approved Supplemental Form 27 (Document No. 403210939), benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene, 1,2,4-trimethylbenzene (TMB), and 1,3,5-TMB were removed from the quarterly sampling and analysis plan following the fourth quarter 2022.

### **Groundwater Monitoring Activities**

On January 9, 2023, groundwater monitoring was conducted at all five monitoring wells (BH01 – BH05). Five (5) groundwater samples were submitted to Summit Scientific Laboratories for analysis of chloride and sulfate anions by EPA Method 300.0 and total dissolved solids (TDS) by Method SM 2540C.

First quarter 2023 analytical results indicated that inorganic parameters were in compliance with the applicable COGCC Table 915-1 regulatory standards or within 1.25x the background concentrations of the up- and cross-gradient monitoring wells (BH02 and BH04) in all monitoring well locations.

In addition, sulfate and chloride anion concentration trends were examined over time and compared to historic background data and groundwater flow direction. Based on the results, historic anion concentrations in all monitoring wells were below the 125% threshold of the historic maximum background concentration recorded during the third quarter of 2022. Furthermore, a correlation could not be made between groundwater elevation and inorganic concentrations and the inorganic concentrations were highly variable over time. The graphs illustrating the data are included as Attachment A. Sample locations and corresponding analytical results are illustrated on Figure 1. Groundwater

elevation data is illustrated on Figure 2. Groundwater analytical results are summarized in Table 1. The laboratory analytical report is included as Attachment B.

### **Current Remediation Activities and Path Forward**

Monitored natural attenuation (MNA) was selected as the remediation strategy for this site during the first quarter 2022 and will remain the selected remediation strategy through the second quarter 2023.

Second quarter 2023 groundwater sampling will be conducted in April 2023.

BH02		
Compound (mg/L)	10/13/2022	1/9/2023
Chloride	208	288
Sulfate	1,880	3,450
TDS	3,070	5,020
Depth to Water (ft. bgs)	5.54	9.18

BH05		
Compound (mg/L)	10/13/2022	1/9/2023
Chloride	309	284
Sulfate	2,410	2,430
TDS	2,890	4,520
Depth to Water (ft. bgs)	5.63	9.36

BH03		
Compound (mg/L)	10/13/2022	1/9/2023
Chloride	173	338
Sulfate	1,180	3,630
TDS	2,780	5,080
Depth to Water (ft. bgs)	5.64	9.40

BH01		
Compound (mg/L)	10/13/2022	1/9/2023
Chloride	189	282
Sulfate	1,570	2,890
TDS	2,550	4,430
Depth to Water (ft. bgs)	5.66	9.33

BH04		
Compound (mg/L)	10/13/2022	1/9/2023
Chloride	128	223
Sulfate	374	2,890
TDS	3,110	4,010
Depth to Water (ft. bgs)	5.50	9.22

Legend

- Underground Flowline Location (Collected via Trimble GPS)
- Excavation Extent (Collected via Trimble GPS)
- Groundwater Sample Location
- Monitoring Well Location (Collected via Trimble GPS)
- Groundwater Flow Direction (1Q23)

Notes

All locations are approximate unless otherwise noted.

mg/L – Milligrams per liter

TDS – Total Dissolved Solids

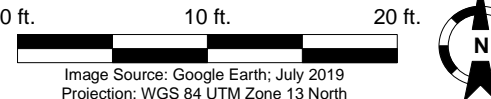
ft. bgs – Feet below ground surface

GPS – Global Positioning System


Black bold text denotes an exceedance of COGCC regulatory standards, but within 1.25x background concentration

Red text denotes an exceedance of COGCC regulatory standards

COGCC – Colorado Oil and Gas Conservation Commission



DATE:	February 15, 2023
DESIGNED BY:	C. Hamlin
DRAWN BY:	S. Anderson



**TASMAN**  
Tasman, Inc.  
6855 W. 119<sup>th</sup> Ave.  
Broomfield, CO 80020

**PDC Energy, Inc. – DJ Basin**  
**Former Von Feldt 13-12 Wellhead**  
SWSW, Section 12, Township 6 North, Range 65 West  
Weld County, Colorado

**GROUNDWATER**  
**ANALYTICAL RESULTS**  
**MAP**  
**(INORGANIC PARAMETERS)**

**FIGURE**  
**1**





**TABLE 1**  
**FORMER VON FELDT 13-12 WELLHEAD**  
**GROUNDWATER ANALYTICAL RESULTS SUMMARY TABLE**  
**INORGANIC PARAMETERS**

Sample ID	Date Sampled	TDS (unit)	Chloride Ion (mg/L)	Sulfate Ion (mg/L)	Depth to Water <sup>(2)</sup> (ft.)	Groundwater Elevation (ft. AMSL)
<b>COGCC Table 915-1 Groundwater Standard (mg/L) <sup>(1)</sup></b>		<b>&lt;1.25 x BCKG</b>	<b>250 or &lt;1.25 x BCKG</b>	<b>250 or &lt;1.25 x BCKG</b>	-	-
BH01	1/28/2022	3,410	173	<b>1,750</b>	9.77	4708.82
BH01	4/8/2022	Not Sampled - Dry			DRY	DRY
BH01	7/5/2022	1,740	176	<b>1,080</b>	3.04	4715.72
BH01	10/13/2022	2,550	189	<b>1,570</b>	5.66	4713.10
BH01	1/9/2023	4,430	<b>282</b>	<b>2,890</b>	9.33	4709.43
BH02	1/28/2022	4,530	244	<b>2,300</b>	9.51	4708.70
BH02	4/8/2022	Not Sampled - Insufficient Water Column			10.26	4707.95
BH02	7/5/2022	4,160	<b>277</b>	<b>3,730</b>	2.93	4715.70
BH02	10/13/2022	3,070	208	1,880	5.54	4713.09
BH02	1/9/2023	5,020	288	3,450	9.18	4709.45
BH03	1/28/2022	3,740	188	1,830	9.69	4708.87
BH03	4/8/2022	3,660	266	3,060	NA	NA
BH03	7/5/2022	3,160	215	2,850	3.03	4715.77
BH03	10/13/2022	2,780	173	1,180	5.64	4713.16
BH03	1/9/2023	5,080	<b>338</b>	<b>3,630</b>	9.40	4709.40
BH04	1/28/2022	3,030	113	1,450	9.56	4708.79
BH04	4/8/2022	2,960	155	<b>2,450</b>	10.52	4707.83
BH04	7/5/2022	4,480	368	4,070	2.90	4715.73
BH04	10/13/2022	3,110	128	374	5.50	4713.13
BH04	1/9/2023	4,010	223	2,890	9.22	4709.41
BH05	1/28/2022	2,910	126	<b>1,280</b>	9.74	4708.70
BH05	4/8/2022	Not Sampled - Insufficient Water Column			10.53	4707.91
BH05	7/5/2022	3,320	<b>264</b>	<b>3,010</b>	3.04	4715.62
BH05	10/13/2022	2,890	<b>309</b>	<b>2,410</b>	5.63	4713.03
BH05	1/9/2023	4,520	<b>284</b>	<b>2,430</b>	9.36	4709.30

**TABLE 1**  
**FORMER VON FELDT 13-12 WELLHEAD**  
**GROUNDWATER ANALYTICAL RESULTS SUMMARY TABLE**  
**INORGANIC PARAMETERS**

Sample ID	Date Sampled	TDS (unit)	Chloride Ion (mg/L)	Sulfate Ion (mg/L)	Depth to Water <sup>(2)</sup> (ft.)	Groundwater Elevation (ft. AMSL)
COGCC Table 915-1 Groundwater Standard (mg/L) <sup>(1)</sup>		<1.25 x BCKG	250 or <1.25 x BCKG	250 or <1.25 x BCKG	-	-

**Notes:**

1. Groundwater standards referenced from 2 CCR 404-1, Table 915-1, January 15, 2021.

2. Depth to water measurements were measured from ground surface for excavation samples. Monitoring well measurements were collected from top of casing and adjusted using survey data to reflect depth of water from ground surface.

TDS = Total dissolved solids

COGCC = Colorado Oil and Gas Conservation Commission

BCKG = Background

mg/L = Milligrams per liter

ft. = Feet

AMSL = Above Mean Sea Level

(<) = Analytical result is less than the indicated laboratory reporting limit.

  = Historic up- / cross-gradient monitoring well location used for background concentration.

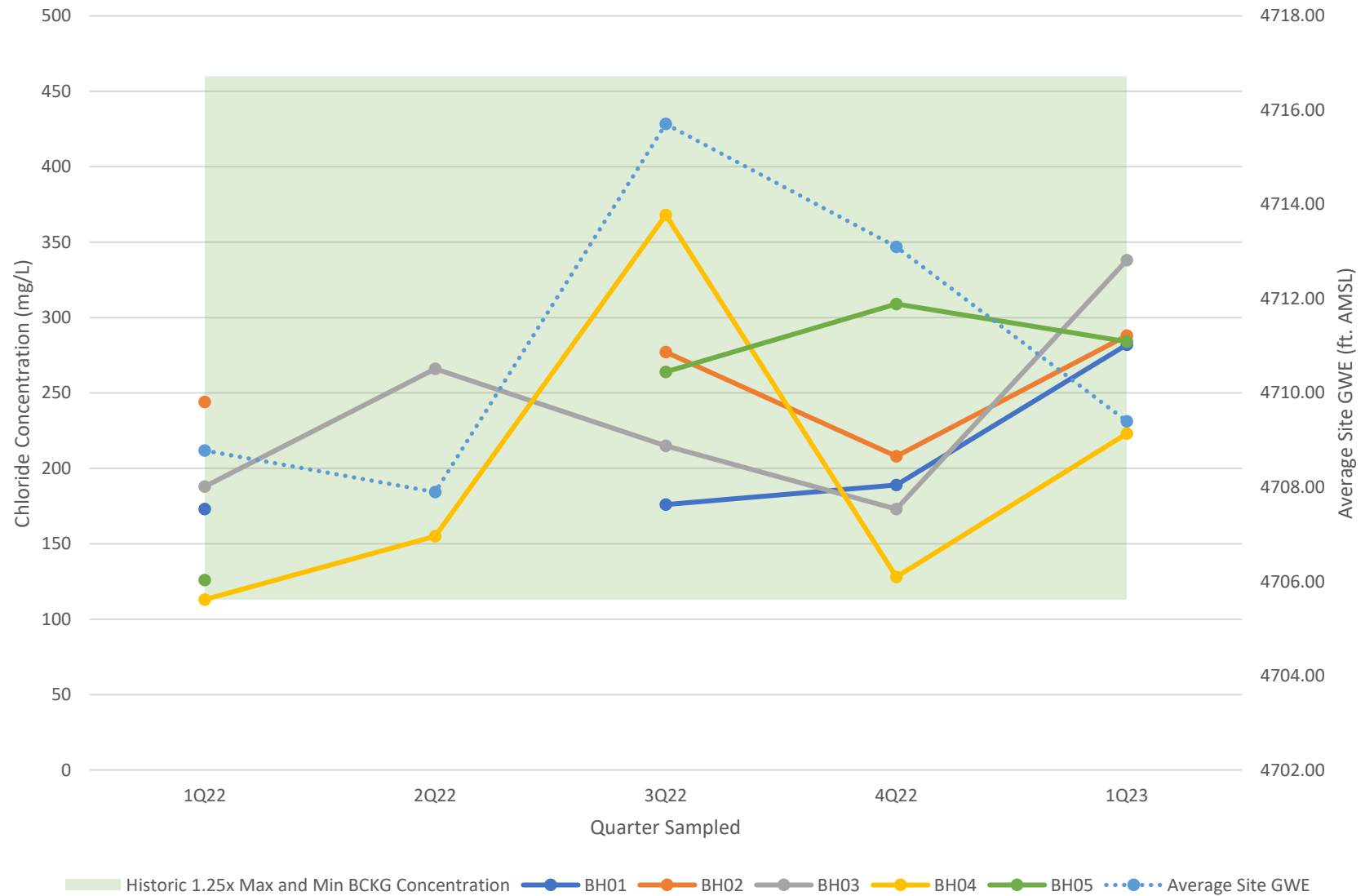
  = Up- / cross-gradient well location used for background concentration.

**BOLD** = Analytical result is in exceedance of applicable standard but within 1.25x background concentration.

**BOLD** = Analytical result is in exceedance of applicable standard and above 1.25x background concentration.

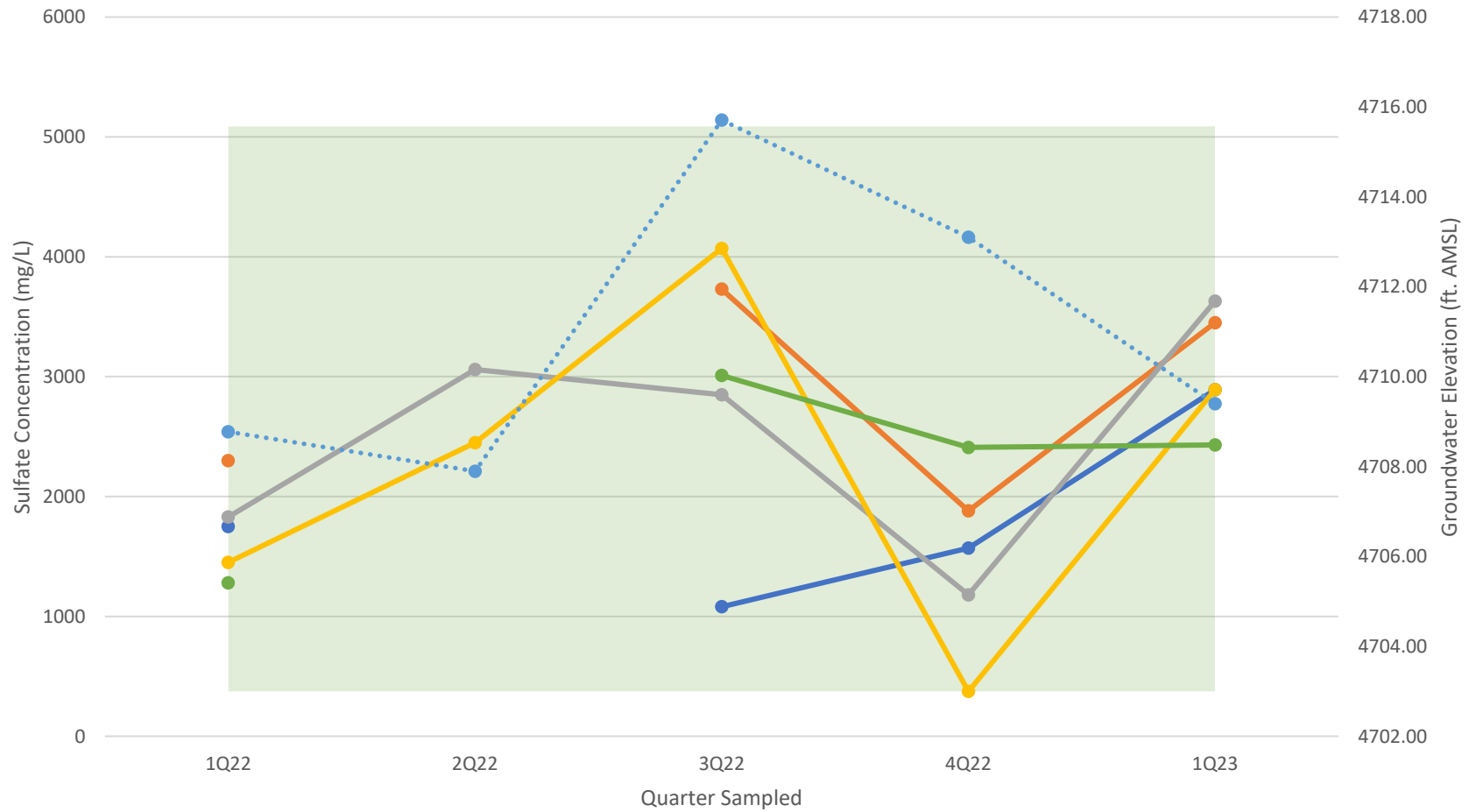
## Attachment A

# Former Von Feldt 13-12 Wellhead Chloride Concentration vs Historic Background





# Former Von Feldt 13-12 Wellhead Sulfate Concentration vs Historic Background



Historic 1.25x Max and Min BCKG Concentration BH01 BH02 BH03 BH04 BH05 Average Site GWE

## Attachment B

# Summit Scientific

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4653 Table Mountain Drive, Golden, Colorado 80403

303.277.9310

January 16, 2023

Mark Longhurst

PDC Energy

1775 Sherman St. STE. 3000

Denver, CO 80203

RE: Von Feldt 13-12 Wellhead

Work Order #2301144

Enclosed are the results of analyses for samples received by Summit Scientific on 01/09/23 18:24. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read "Scott Sheely", is displayed within a light gray rectangular box.

Scott Sheely For Paul Shrewsbury  
President



PDC Energy  
1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: Von Feldt 13-12 Wellhead

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
01/16/23 11:16

### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BH01	2301144-01	Water	01/09/23 13:06	01/09/23 18:24
BH02	2301144-02	Water	01/09/23 12:40	01/09/23 18:24
BH03	2301144-03	Water	01/09/23 12:48	01/09/23 18:24
BH04	2301144-04	Water	01/09/23 12:07	01/09/23 18:24
BH05	2301144-05	Water	01/09/23 12:57	01/09/23 18:24

Summit Scientific

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230144

Page of /

Project Number: NA

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S<sub>2</sub>

## Sample Receipt Checklist

S2 Work Order# 2301144Client: ADC/tasman Client Project ID: Von feblt 13-12 wellheadShipped Via: H.D./P.U./FedEx/UPS/USPS/Other ☐ Airbill #:                     

<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	-------------------------------------	--------------------------	--------------------------	--------------------------

Matrix (Check all that apply) Air ☐ Soil/Solid ☐ Water ☒ Other ☐Temp (°C) 6.2 Thermometer # 1

	Yes	No	N/A	Comments (if any)
If samples require cooling, is the temperature < 6°C? <sup>(1)</sup> <b>NOTE:</b> If samples are delivered the same day of sampling, this requirement is met if there is evidence that cooling has begun.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<u>on ICE</u>
If custody seals are present, are they intact? <sup>(1)</sup>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are samples due within 48 hours present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Are water samples with short hold times present? Note the short hold analysis in the comments column - pH, Nitrate/Nitrite, Ferrous Iron (Fe <sup>2+</sup> ), Hexavalent Chromium (Cr <sup>6+</sup> , Cr VI), COD/BOD, Total Coliform, E. Coli, Total Residual Chlorine (TRC), Dissolved Oxygen	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Is a chain-of-custody (COC) form present and filled out Completely? <sup>(1)</sup>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is the COC properly relinquished by the client w/ date and time recorded? <sup>(1)</sup>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Were all samples received intact? <sup>(1)</sup>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was adequate sample volume provided? <sup>(1)</sup>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Does the COC agree with the number and type of sample bottles received? <sup>(1)</sup>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Do the sample IDs on the bottle labels match the COC? <sup>(1)</sup>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
For volatiles in water – is there headspace present? <b>If yes, contact client and note in narrative.</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Are samples preserved that require preservation <b>(excluding cooling)</b> ? <sup>(1)</sup> Note the type of preservative in the comments column – HCl, H <sub>2</sub> SO <sub>4</sub> , NaOH, HNO <sub>3</sub> , etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
If samples are acid preserved for metals, is the pH ≤ 2? <sup>(1)</sup> Record the pH in Comments.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
If dissolved metals are requested, were samples field filtered?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

Additional Comments (if any):

<sup>(1)</sup> If NO, then contact the client before proceeding with analysis and note in case narrative.

Custodian Printed Name

Date/Time

1-9-23 1824



PDC Energy  
1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: Von Feldt 13-12 Wellhead  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
01/16/23 11:16

**BH01**  
**2301144-01 (Water)**

**Summit Scientific**

**Anions by EPA Method 300.0**

Date Sampled: **01/09/23 13:06**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Chloride	<b>282</b>	12.0	mg/L	200	BGA0317	01/13/23	01/13/23	EPA 300.0	
Sulfate	<b>2890</b>	60.0	"	"	"	"	"	"	

**Total Dissolved Solids by SM2540C**

Date Sampled: **01/09/23 13:06**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Total Dissolved Solids	<b>4430</b>	10.0	mg/L	1	BGA0191	01/10/23	01/10/23	SM2540C	

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1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: Von Feldt 13-12 Wellhead  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
01/16/23 11:16

**BH02**  
**2301144-02 (Water)**

**Summit Scientific**

**Anions by EPA Method 300.0**

Date Sampled: **01/09/23 12:40**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Chloride	<b>288</b>	12.0		mg/L	200	BGA0317	01/13/23	01/13/23	EPA 300.0	
Sulfate	<b>3450</b>	60.0		"	"	"	"	"	"	

**Total Dissolved Solids by SM2540C**

Date Sampled: **01/09/23 12:40**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Total Dissolved Solids	<b>5020</b>	10.0		mg/L	1	BGA0191	01/10/23	01/10/23	SM2540C	

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Project Manager: Mark Longhurst

**Reported:**  
01/16/23 11:16

**BH03**  
**2301144-03 (Water)**

**Summit Scientific**

**Anions by EPA Method 300.0**

Date Sampled: **01/09/23 12:48**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Chloride	<b>338</b>	12.0		mg/L	200	BGA0317	01/13/23	01/13/23	EPA 300.0	
Sulfate	<b>3630</b>	60.0		"	"	"	"	"	"	

**Total Dissolved Solids by SM2540C**

Date Sampled: **01/09/23 12:48**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Total Dissolved Solids	<b>5080</b>	10.0		mg/L	1	BGA0191	01/10/23	01/10/23	SM2540C	

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Project: Von Feldt 13-12 Wellhead  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
01/16/23 11:16

**BH04**  
**2301144-04 (Water)**

**Summit Scientific**

**Anions by EPA Method 300.0**

Date Sampled: **01/09/23 12:07**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Chloride	<b>223</b>	12.0		mg/L	200	BGA0317	01/13/23	01/13/23	EPA 300.0	
Sulfate	<b>2890</b>	60.0		"	"	"	"	"	"	

**Total Dissolved Solids by SM2540C**

Date Sampled: **01/09/23 12:07**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Total Dissolved Solids	<b>4010</b>	10.0		mg/L	1	BGA0191	01/10/23	01/10/23	SM2540C	

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Project Manager: Mark Longhurst

**Reported:**  
01/16/23 11:16

**BH05**  
**2301144-05 (Water)**

**Summit Scientific**

**Anions by EPA Method 300.0**

Date Sampled: **01/09/23 12:57**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Chloride	<b>284</b>	12.0		mg/L	200	BGA0317	01/13/23	01/13/23	EPA 300.0	
Sulfate	<b>2430</b>	60.0		"	"	"	"	"	"	

**Total Dissolved Solids by SM2540C**

Date Sampled: **01/09/23 12:57**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Total Dissolved Solids	<b>4520</b>	10.0		mg/L	1	BGA0191	01/10/23	01/10/23	SM2540C	

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Project: Von Feldt 13-12 Wellhead  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
01/16/23 11:16

### Anions by EPA Method 300.0 - Quality Control

#### Summit Scientific

Analyte	Reporting			Spike	Source		%REC		RPD	
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

#### Batch BGA0317 - General Preparation

##### Blank (BGA0317-BLK1)

Prepared & Analyzed: 01/13/23

Chloride	ND	0.0600	mg/L
Sulfate	ND	0.300	"

##### LCS (BGA0317-BS1)

Prepared & Analyzed: 01/13/23

Chloride	2.86	0.0600	mg/L	3.00	95.4	90-110
Sulfate	14.6	0.300	"	15.0	97.3	90-110

##### Duplicate (BGA0317-DUP1)

Source: 2301144-01

Prepared & Analyzed: 01/13/23

Chloride	298	12.0	mg/L	282	5.38	20
Sulfate	2980	60.0	"	2890	3.09	20

##### Matrix Spike (BGA0317-MS1)

Source: 2301144-01

Prepared & Analyzed: 01/13/23

Chloride	866	12.0	mg/L	600	282	97.2	80-120
Sulfate	6140	60.0	"	3000	2890	108	80-120

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1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: Von Feldt 13-12 Wellhead

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
01/16/23 11:16

**Total Dissolved Solids by SM2540C - Quality Control**  
**Summit Scientific**

Analyte	Reporting			Spike	Source	%REC		RPD		
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

**Batch BGA0191 - General Preparation**

**Blank (BGA0191-BLK1)**

Prepared & Analyzed: 01/10/23

Total Dissolved Solids ND 10.0 mg/L

**Duplicate (BGA0191-DUP1)**

**Source: 2301138-01**

Prepared & Analyzed: 01/10/23

Total Dissolved Solids 1630 10.0 mg/L 1620 0.492 20

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PDC Energy  
1775 Sherman St. STE. 3000  
Denver CO, 80203

Project: Von Feldt 13-12 Wellhead

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
01/16/23 11:16

### Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference