

PDC Energy, Inc.
Fourth Quarter 2018 Groundwater Monitoring Summary

January 14, 2019

Former Swanson 34-20 Tank Battery
SWSE Section 20 T6N R66W
Spill Point ID # 436120
Remediation # 11750

This groundwater monitoring summary has been prepared by Tasman Geosciences, Inc. for the former Swanson 34-20 tank battery. On December 17, 2018, groundwater monitoring was conducted at all five monitoring well locations (BH01 – BH05). Five groundwater samples were submitted to Summit Scientific Laboratory for analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX) by USEPA Method 8260B.

Fourth quarter 2018 analytical results indicate that BTEX concentrations are below applicable COGCC Table 910-1 groundwater standards in all monitoring well locations

Monitored natural attenuation (MNA) was selected as the remediation strategy for this site during the third quarter 2018 and will remain the selected remediation strategy for the first quarter 2019.

First quarter 2019 groundwater sampling will be conducted during March 2019. Per the Condition of Approval (COA) issued by the COGCC on November 5, 2018, the well completion logs are included as Attachment A. Analytical results are summarized in Table 1 and the laboratory report is included as Attachment B. Sample locations and corresponding analytical results are illustrated on Figure 1. Groundwater elevation data is summarized on Figure 2.



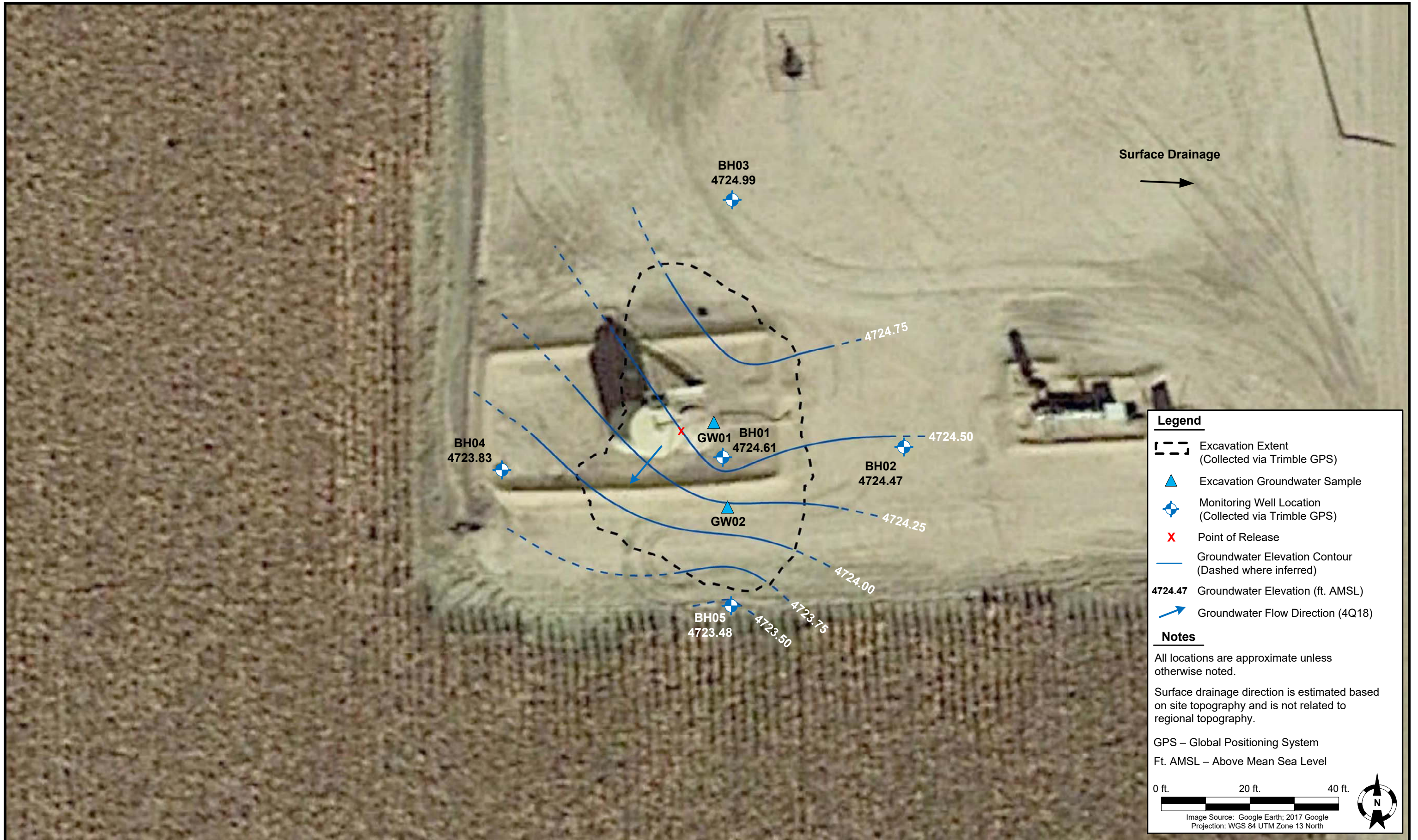


TABLE 1
FORMER SWANSON 34-20 TANK BATTERY
GROUNDWATER ANALYTICAL RESULTS SUMMARY TABLE

Sample ID	Date Sampled	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	Depth to Water ⁽²⁾ (feet)	Groundwater Elevation (ft AMSL)
COGCC Table 910-1 Groundwater Standard (µg/L)⁽¹⁾		5	560	700	1,400		
GW01	8/17/2018	13	<1.0	<1.0	<2.0	~ 8.0	NM
GW02	8/22/2018	72	<1.0	25	490	~ 8.0	NM
BH01	9/28/2018	3.8	<1.0	16	67	4.97	4726.39
BH01	12/17/2018	<1.0	<1.0	<1.0	<2.0	6.75	4724.61
BH02	9/28/2018	<1.0	<1.0	<1.0	<2.0	4.48	4726.24
BH02	12/17/2018	<1.0	<1.0	<1.0	<2.0	6.25	4724.47
BH03	9/28/2018	<1.0	<1.0	<1.0	<2.0	4.90	4726.88
BH03	12/17/2018	<1.0	<1.0	<1.0	<2.0	6.79	4724.99
BH04	9/28/2018	<1.0	<1.0	<1.0	<2.0	5.84	4725.62
BH04	12/17/2018	<1.0	<1.0	<1.0	<2.0	7.63	4723.83
BH05	9/28/2018	<1.0	<1.0	<1.0	<2.0	5.67	4725.18
BH05	12/17/2018	<1.0	<1.0	<1.0	<2.0	7.37	4723.48

Notes:

- Groundwater standards referenced from 2 CCR 404-1, Table 910-1, effective May 1, 2018.
- Depth to water measurements were collected from top of casing and adjusted using survey data to reflect depth of water from ground surface.

COGCC = Colorado Oil and Gas Conservation Commission

µg/L = Micrograms per liter

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

ft AMSL = Feet Above Mean Sea Level

NM = Not Measured

BOLD = Analytical result is in exceedance of COGCC groundwater standards.

ATTACHMENT A



6899 Pecos Street, Unit C
Denver, Colorado 80221

CLIENT: PDC Energy Inc.

LOGGED BY: Tyler Blessing

PROJECT MANAGER: Brock Nelson

DRILLING CONTRACTOR: Tasman Geosciences, Inc.

DRILLING EQUIPMENT: Direct Push

DRILL BIT SIZE (INCHES): 2.375"

DATE STARTED - COMPLETED: 9/26/2018

TOTAL WELL DEPTH (FT. BGS): 14

DEPTH TO WATER (FT. BGS): 6

Swanson 34-20

BORING / WELL ID: BH01

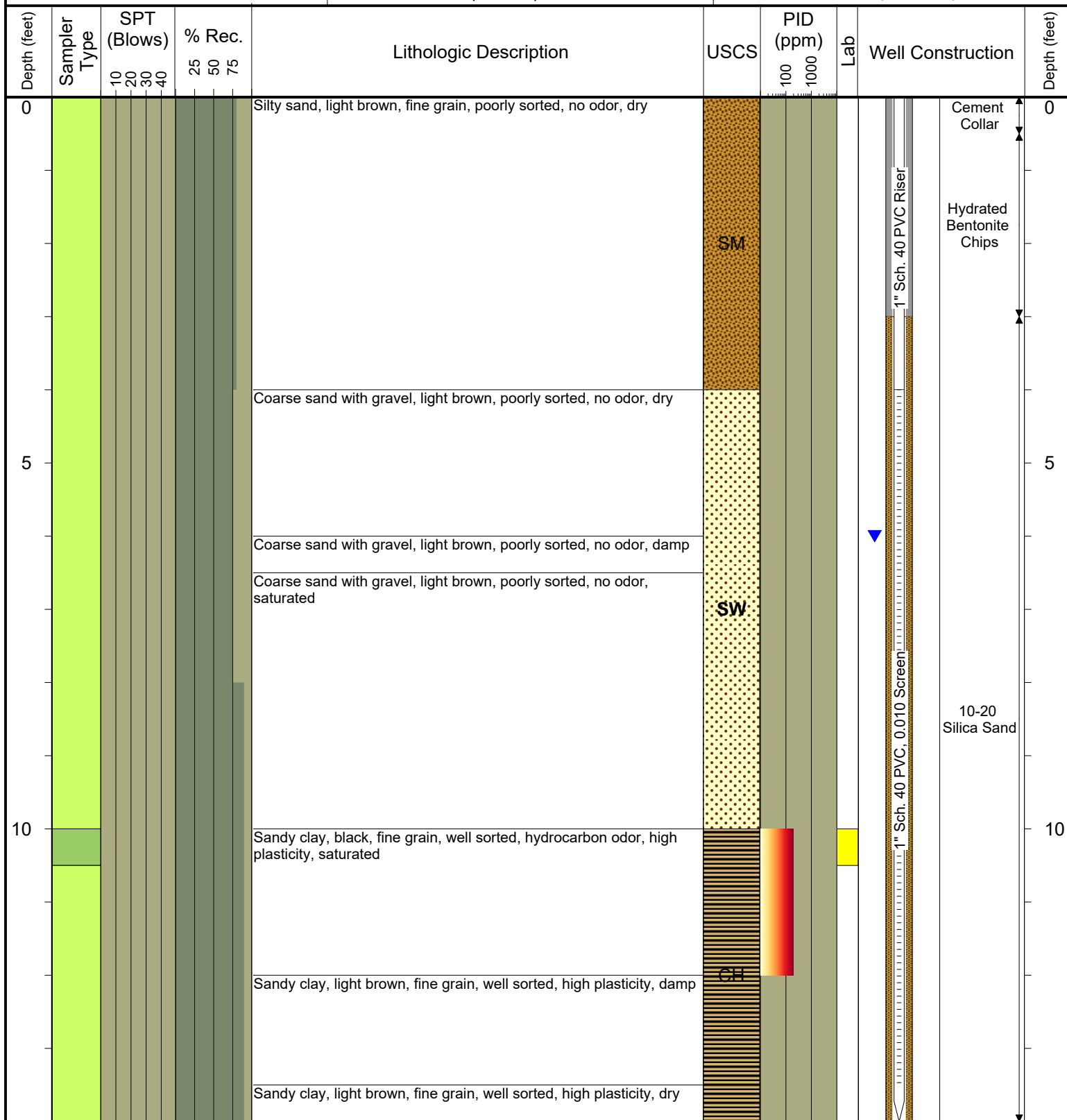
LOCATION: Greeley, CO

NORTHING (CO STATE PLANE): 4479713

EASTING (CO STATE PLANE): 516993.2

CASING ELEVATION (FT. AMSL): 4732.44

GROUND ELEVATION (FT. AMSL): 4731.36



Drilling / Sample Method:

Solid Stem Auger

Hollow Stem Auger

Push Probe

Push Probe Macro Liner

Laboratory Sample Types:

Geotechnical Lab

Analytical Chemistry Lab

Geotechnical & Analytical Chemistry Lab



DEPTH TO WATER (FT. BGS): 5

GROUND ELEVATION (FT. AMSL): 4731.78

Drilling / Sample Method:

Solid Stem Auger	Push Probe	Geotechnical Lab	Geotechnical & Analytical Chemistry Lab
 Hollow Stem Auger	 Push Probe Macro Liner	 Analytical Chemistry Lab	

ATTACHMENT B

Summit Scientific

4653 Table Mountain Drive, Golden, Colorado 80403

303.277.9310

December 26, 2018

Mark Longhurst

PDC Energy

1775 Sherman St. STE. 3000

Denver, CO 80203

RE: Swanson 34-20

Enclosed are the results of analyses for samples received by Summit Scientific on 12/17/18 18:40. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'P. Shrewsbury', with a stylized, cursive script.

Paul Shrewsbury

President



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

Project: Swanson 34-20

Project Number: [none]

Project Manager: Mark Longhurst

Reported:

12/26/18 08:19

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BH01	1812210-01	Water	12/17/18 10:42	12/17/18 18:40
BH02	1812210-02	Water	12/17/18 10:35	12/17/18 18:40
BH03	1812210-03	Water	12/17/18 10:25	12/17/18 18:40
BH04	1812210-04	Water	12/17/18 10:24	12/17/18 18:40
BH05	1812210-05	Water	12/17/18 10:33	12/17/18 18:40

Summit Scientific

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Summit Scientific

1812210

741 Corporate Circle Suite I ♦ Golden, Colorado 80401
303-277-9310 ♦ 303-374-5933 Fax

Page 1 of 1

Client: PDC / Tasman Geosciences
Address: 6899 Pecos St, Unit C
City/State/Zip: Denver, CO 80221
Phone: 303-487-1228 Fax:
Sampler Name: Alison Dahl, Brian Gabel

Project Manager: Mark Longhurst
E-Mail: mark.longhurst@pdce.com
Project Name: Swanson 34-20
Project Number: N/A

Sample Description	Date Sampled	Time Sampled	Number of Containers	Preservative				Matrix				Analyze For:								Special Instructions	
				HCl	HNO ₃	None	Other (Specify)	Groundwater	Soil	Air - Canister Serial #	Other (Specify)	BTEX - 8260									
BH01	12/17/2018	1042	3	X				X					X								
BH02	1	1035	1	1				1					1								
BH03	1	1025	1	1				1					1								
BH04	1	1024	1	1				1					1								
BH05	1	1033	1	1				1					1								
<div style="display: flex; justify-content: space-between;"> <div> <p>Relinquished by: <u>Alison Dahl</u></p> <p>Relinquished by: <u>Tasman Drop Box</u></p> <p>Relinquished by:</p> </div> <div> <p>Date/Time: <u>12/17/2018 1345</u></p> <p>Date/Time: <u>12-17-18 1840</u></p> <p>Date/Time:</p> </div> <div> <p>Received by: <u>Tasman Drop Box</u></p> <p>Received by: <u>[Signature]</u></p> <p>Received in Lab by:</p> </div> <div> <p>Date/Time: <u>12/17/2018 1345</u></p> <p>Date/Time: <u>12-17-18 1840</u></p> <p>Date/Time:</p> </div> <div> <p>Turn Around Time (Check)</p> <p>Same Day <input type="checkbox"/> 72 Hours <input type="checkbox"/></p> <p>24 Hours <input type="checkbox"/> Standard <input checked="" type="checkbox"/></p> <p>48 Hours <input type="checkbox"/></p> <p>Sample Integrity:</p> <p>Temperature Upon Receipt: <u>5.1</u></p> <p>Intact: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p> </div> <div> <p>Notes:</p> </div> </div>																					

Sample Receipt Checklist

S2 Work Order 1812210

Client: POC/Tasman Client Project ID: Swanson 34-20

Shipped Via: H.D./P.U./FedEx/UPS/USPS/Other P.U. Airbill #: _____

Matrix (check all that apply): Air Soil/Solid / Water Other: _____
(Describe)

Temp (°C)	5.1
-----------	-----

Thermometer ID: 61857155-K

	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature at 4°C +/- 2°C ⁽¹⁾ ? NOTE: If samples are delivered the same day of sampling, this requirement is met provided that there is evidence that cooling has begun.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Were all samples received intact ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was adequate sample volume provided ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
If custody seals are present, are they intact ⁽¹⁾ ?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Are samples with holding times due within 48 hours sample due within 48 hours present?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Is a chain-of-custody (COC) form present and filled out completely ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is the COC properly relinquished by the client w/ date and time recorded ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
For volatiles in water – is there headspace present? If yes, contact client and note in narrative.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Are samples preserved that require preservation (excluding cooling) ⁽¹⁾ ? Note the type of preservative in the Comments column – HCl, H2SO4, NaOH, HNO3, ect	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	HCl
If samples are acid preserved for metals, is the pH ≤ 2 ⁽¹⁾ ? 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):

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

Custodian Printed Name or Initials

Signature of Custodian

Date/Time

12.17.18 1845



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

Project: Swanson 34-20

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
12/26/18 08:19

BH01
1812210-01 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **12/17/18 10:42**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Benzene	ND	1.0		ug/l	1	1812242	12/18/18	12/19/18	EPA 8260B	
Toluene	ND	1.0		"	"	"	"	"	"	
Ethylbenzene	ND	1.0		"	"	"	"	"	"	
Xylenes (total)	ND	2.0		"	"	"	"	"	"	

Date Sampled: **12/17/18 10:42**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Surrogate: 1,2-Dichloroethane-d4		110 %		23-173		"	"	"	"	
Surrogate: Toluene-d8		95.7 %		20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		94.3 %		21-167		"	"	"	"	

Summit Scientific

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

Project: Swanson 34-20

Project Number: [none]

Project Manager: Mark Longhurst

Reported:
12/26/18 08:19

BH02
1812210-02 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **12/17/18 10:35**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Benzene	ND	1.0	ug/l	1	1812242	12/18/18	12/19/18	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **12/17/18 10:35**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Surrogate: 1,2-Dichloroethane-d4		119 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		100 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		88.6 %	21-167		"	"	"	"	

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1775 Sherman St. STE. 3000
Denver CO, 80203

Project: Swanson 34-20

Project Number: [none]

Project Manager: Mark Longhurst

Reported:
12/26/18 08:19

BH03
1812210-03 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **12/17/18 10:25**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Benzene	ND	1.0	ug/l	1	1812242	12/18/18	12/19/18	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **12/17/18 10:25**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Surrogate: 1,2-Dichloroethane-d4		115 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		98.5 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		98.6 %	21-167		"	"	"	"	

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

Project: Swanson 34-20

Project Number: [none]

Project Manager: Mark Longhurst

Reported:
12/26/18 08:19

BH04
1812210-04 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **12/17/18 10:24**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Benzene	ND	1.0	ug/l	1	1812242	12/18/18	12/19/18	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **12/17/18 10:24**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Surrogate: 1,2-Dichloroethane-d4		108 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		98.9 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		77.6 %	21-167		"	"	"	"	

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

Project: Swanson 34-20

Project Number: [none]

Project Manager: Mark Longhurst

Reported:
12/26/18 08:19

BH05
1812210-05 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **12/17/18 10:33**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Benzene	ND	1.0	ug/l	1	1812242	12/18/18	12/19/18	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **12/17/18 10:33**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Surrogate: 1,2-Dichloroethane-d4		113 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		96.2 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		89.8 %	21-167		"	"	"	"	

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

Project: Swanson 34-20

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
12/26/18 08:19

Volatile Organic Compounds by EPA Method 8260B - Quality Control

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

Batch 1812242 - EPA 5030 Water MS

Blank (1812242-BLK1)

Prepared: 12/18/18 Analyzed: 12/19/18

Benzene	ND	1.0	ug/l							
Toluene	ND	1.0	"							
Ethylbenzene	ND	1.0	"							
Xylenes (total)	ND	2.0	"							
Surrogate: 1,2-Dichloroethane-d4	14.5		"	13.2		110	23-173			
Surrogate: Toluene-d8	13.3		"	13.3		99.9	20-170			
Surrogate: 4-Bromofluorobenzene	12.5		"	13.3		93.9	21-167			

LCS (1812242-BS1)

Prepared: 12/18/18 Analyzed: 12/19/18

Benzene	36.8	1.0	ug/l	33.3		111	70-130			
Toluene	33.8	1.0	"	33.3		101	70-130			
Ethylbenzene	39.3	1.0	"	33.3		118	70-130			
m,p-Xylene	75.0	2.0	"	66.7		113	70-130			
o-Xylene	38.3	1.0	"	33.3		115	70-130			
Surrogate: 1,2-Dichloroethane-d4	13.9		"	13.2		105	23-173			
Surrogate: Toluene-d8	12.4		"	13.3		92.9	20-170			
Surrogate: 4-Bromofluorobenzene	12.7		"	13.3		95.2	21-167			

Matrix Spike (1812242-MS1)

Source: 1812220-02

Prepared: 12/18/18 Analyzed: 12/19/18

Benzene	35.6	1.0	ug/l	33.3	1.44	102	70-130			
Toluene	35.3	1.0	"	33.3	3.11	96.5	70-130			
Ethylbenzene	38.6	1.0	"	33.3	ND	116	70-130			
m,p-Xylene	74.0	2.0	"	66.7	2.34	108	70-130			
o-Xylene	37.2	1.0	"	33.3	ND	112	70-130			
Surrogate: 1,2-Dichloroethane-d4	14.2		"	13.2		108	23-173			
Surrogate: Toluene-d8	13.3		"	13.3		99.5	20-170			
Surrogate: 4-Bromofluorobenzene	12.4		"	13.3		93.4	21-167			

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

Project: Swanson 34-20

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
12/26/18 08:19

Volatile Organic Compounds by EPA Method 8260B - Quality Control
Summit Scientific

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

Batch 1812242 - EPA 5030 Water MS

Matrix Spike Dup (1812242-MSD1)	Source: 1812220-02			Prepared: 12/18/18 Analyzed: 12/19/18						
Benzene	37.5	1.0	ug/l	33.3	1.44	108	70-130	5.15	30	
Toluene	37.1	1.0	"	33.3	3.11	102	70-130	5.11	30	
Ethylbenzene	39.9	1.0	"	33.3	ND	120	70-130	3.23	30	
m,p-Xylene	75.4	2.0	"	66.7	2.34	110	70-130	1.75	30	
o-Xylene	39.2	1.0	"	33.3	ND	118	70-130	5.36	30	
Surrogate: 1,2-Dichloroethane-d4	14.8		"	13.2		112	23-173			
Surrogate: Toluene-d8	13.1		"	13.3		98.2	20-170			
Surrogate: 4-Bromofluorobenzene	12.8		"	13.3		95.6	21-167			

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

Project: Swanson 34-20

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
12/26/18 08:19

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