

March 23, 2016

Mr. Randall Ferguson  
EHS Senior Compliance Specialist  
PDC Energy, Inc.  
1775 Sherman Street, Suite 3000  
Denver, CO 80203

Re: **Produced Water Vessel Closure Report**  
**Miening 2 Tank Battery**  
**Facility ID: 322979**  
**NWNE S30 T4N R66W**  
**Blanket Remediation #: 9440**

Dear Mr. Ferguson,

On behalf of PDC Energy, Inc. (PDC), Tasman Geosciences, Inc. (Tasman) has prepared this Produced Water Vessel Closure Report (Report) to document environmental sampling activities performed at the above-referenced site. This Report is being submitted under the Form 27 Management Plan for Closure of Produced Water Vessels, which has been assigned Blanket Remediation #9440 by the Colorado Oil and Gas Conservation Commission (COGCC).

A summary of excavation and environmental sampling activities is provided below.

### **Site Assessment Activities**

On March 10, 2016, confirmation sampling activities were completed following the removal of the partially buried produced water vessel. Soil encountered in the excavation area was field screened for volatile organic compound (VOC) concentrations using a photoionization detector (PID). One soil sample (SS01) was collected below the former vessel location at approximately 4 feet below ground surface (bgs). The sample was submitted to Summit Scientific Laboratories in Golden, Colorado for analysis of benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene, and total petroleum hydrocarbons (TPH) - gasoline range organics (GRO) by Environmental Protection Agency (EPA) Method 8260B, TPH - diesel range organics (DRO) by EPA Method 8015, pH, and electrical conductivity (EC).

Analytical results indicated organic compound concentrations and physical parameters in soil sample SS01 were in compliance with COGCC Table 910-1 soil standards.

The excavation extent and soil sample location are illustrated on Figure 1. Soil analytical data is summarized in Table 1 and the laboratory analytical report is provided in Attachment A.

### **Conclusions**

Based on the soil analytical data described herein, petroleum hydrocarbon impacts were not encountered during the removal of the produced water vessel. Consequently, no further site investigation is recommended at this time. The facility was decommissioned following site assessment activities.

Please contact me at (720) 409-8791 if you have any questions regarding this report.

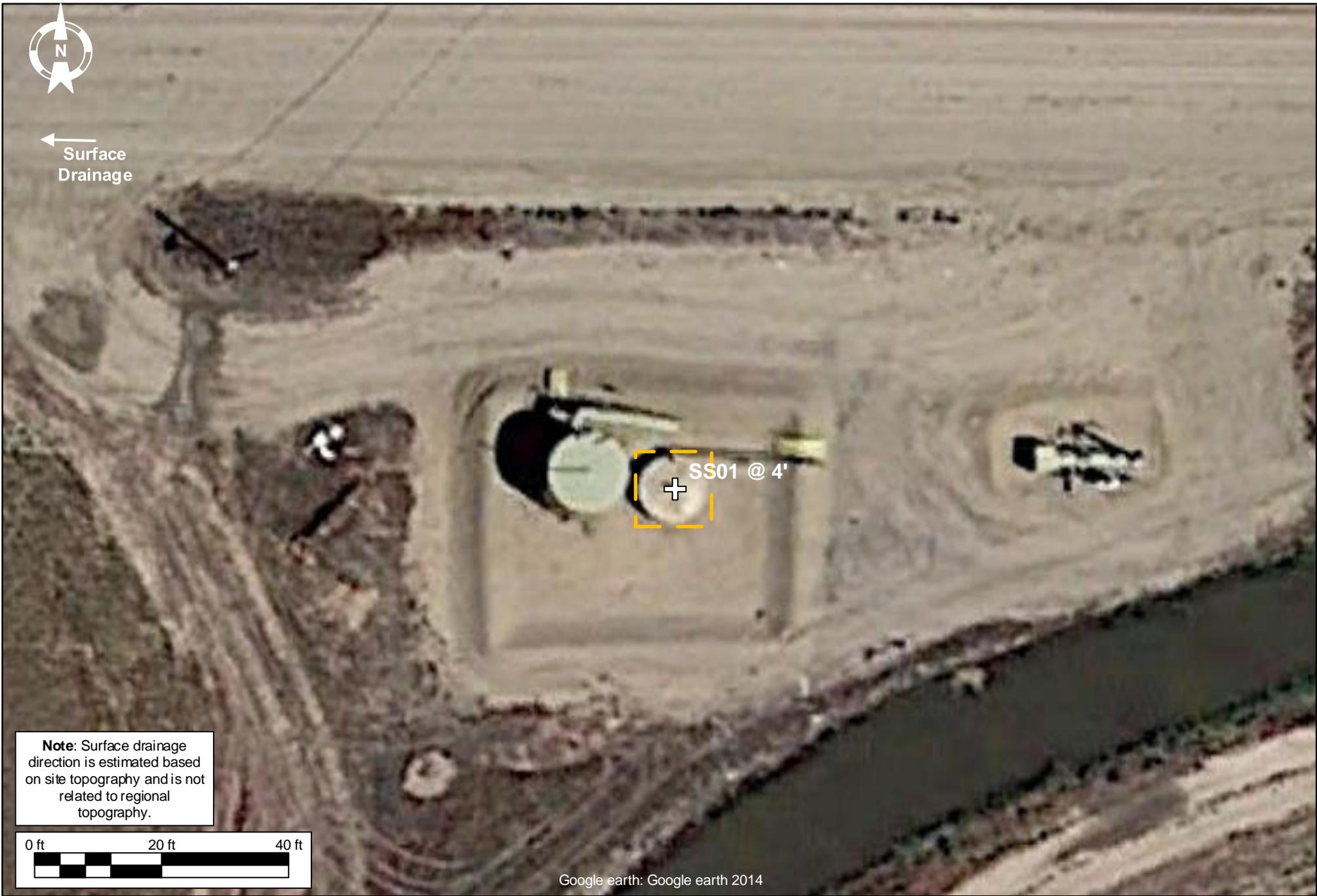
Sincerely,

A handwritten signature in blue ink that reads "Christine Wasko".

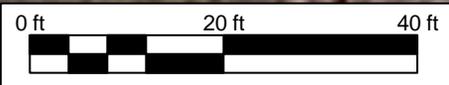
Christine Wasko  
Project Manager  
Tasman Geosciences, Inc.

**Enclosures:**

Figure 1 – Soil Sample Location Map  
Table 1 – Soil Analytical Results Summary Table  
Attachment A – Laboratory Analytical Report



**Note:** Surface drainage direction is estimated based on site topography and is not related to regional topography.



Google earth: Google earth 2014

DRAWN BY:	EMB
DATE:	3/22/2016

**Facility Diagram**  
 PDC Energy – DJ Basin  
 Miening 2 Tank Battery  
 NWNE S30 T4N R66W  
 Weld County, CO



**TASMAN** 6899 Pecos St., Unit C  
 GEOSCIENCES Denver, CO 80221

**LEGEND**

-  Excavation Extent
-  Soil Sample Location

All locations are approximate unless otherwise noted

**FIGURE 1**  
**SOIL SAMPLE LOCATION MAP**

**TABLE 1**  
**MIENING 2 TANK BATTERY**  
**SOIL ANALYTICAL RESULTS SUMMARY TABLE**

Sample ID	Date Sampled	Depth (feet bgs)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	Naphthalene (mg/kg)	TPH <sup>(2)</sup> (mg/kg)	pH (units)	EC (mmhos/cm)
<b>COGCC standards for soil (mg/kg) <sup>(1)</sup></b>			<b>0.17</b>	<b>85</b>	<b>100</b>	<b>175</b>	<b>23</b>	<b>500</b>	<b>6-9</b>	<b>&lt;4</b>
SS01 @ 4'	3/10/2016	4	<0.0020	<0.0050	<0.0050	<0.010	<0.010	<50	8.08	0.230

**Notes:**

- Standards for soil are taken from 2 CCR 404-1, Table 910-1, effective January 30, 2015.
- TPH - Total volatile and extractable petroleum hydrocarbons. Value calculated by adding GRO and DRO concentrations.

COGCC = Colorado Oil and Gas Conservation Commission

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

GRO = Total volatile petroleum hydrocarbons - gasoline range organics

DRO = Total extractable petroleum hydrocarbons - diesel range organics

mg/kg = Milligrams per kilogram

bgs = Below ground surface

EC = Electrical conductivity

mmhos/cm = millimhos per centimeter

**BOLD** = Analytical result is in exceedance of COGCC soil standards.

**ATTACHMENT A**

# Summit Scientific

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741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

March 15, 2016

Mark Longhurst  
Tasman Geosciences  
6899 Pecos Street  
Denver, CO 80221  
RE: Miening #2

Enclosed are the results of analyses for samples received by Summit Scientific on 03/10/16 14:55. 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', written in a cursive style.

Paul Shrewsbury  
President



Tasman Geosciences  
6899 Pecos Street  
Denver CO, 80221

Project: Miening #2

Project Number: [none]  
Project Manager: Mark Longhurst

Reported:  
03/15/16 12:02

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SS01@4'	1603085-01	Soil	03/10/16 12:50	03/10/16 14:55

Summit Scientific  
S<sub>2</sub>

1603085

741 Corporate Circle, Suite J • Golden, Colorado 80401  
303-277-9310 • 303-374-5933

Client: PDC/Tasman Project Manager: Mark Longhurst Page 1 of 1  
Address: \_\_\_\_\_ E-Mail: \_\_\_\_\_  
City/State/Zip: \_\_\_\_\_  
Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ Project Name: Miening #2  
Sampler Name: Eric Sigel Project Number: \_\_\_\_\_

ID	Sample Description	Date Sampled	Time Sampled	# of containers	Preservative				Matrix			Analysis Requested					Special Instructions	
					HCl	HNO <sub>3</sub>	None	Other (Specify)	Ground/water	Soil	Air-Canister #	Other (Specify)	8015 DCL	4260 GBBW	PH	EC		SAR (Hold)
1	SS01@4'	3/10/16	12:50	1			X			X			X	X	X	X		Hold SAR
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Relinquished by: <u>E-A Sigel</u> Date/Time: <u>3/10/16 14:55</u>	Received by: <u>AS</u> Date/Time: <u>3-10-16 14:55</u>	Turn Around Time (Check)	Notes:
Relinquished by: <u>AS</u> Date/Time: <u>3-10-16 15:30</u>	Received by: _____ Date/Time: _____	Same Day _____ 72 hours _____	Hold SAR pending results
Relinquished by: _____ Date/Time: _____	Received by: _____ Date/Time: _____	24 hours _____ Standard <u>X</u>	
		48 hours _____	
		Sample Integrity:	
		Temperature Upon Receipt: <u>6.7</u>	
		Intact: <u>Yes</u> No	

www.s2scientific.com

Summit Scientific

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Tasman Geosciences  
6899 Pecos Street  
Denver CO, 80221

Project: Miening #2

Project Number: [none]  
Project Manager: Mark Longhurst

Reported:  
03/15/16 12:02

**SS01@4'**  
**1603085-01 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **03/10/16 12:50**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1603122	03/11/16	03/12/16	8015M	

Date Sampled: **03/10/16 12:50**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		114 %	30-150		"	"	"	"	

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: **03/10/16 12:50**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Naphthalene	ND	0.010	mg/kg	1	1603121	03/11/16	03/12/16	EPA 8260B	
Benzene	ND	0.0020	"	"	"	"	"	"	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.010	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: **03/10/16 12:50**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		94.3 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		95.0 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		97.3 %	21-167		"	"	"	"	

**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **03/10/16 12:50**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	<b>0.230</b>	0.0100	mmhos/cm	1	1603131	03/14/16	03/14/16	SM 2510B	

Summit Scientific

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Tasman Geosciences  
 6899 Pecos Street  
 Denver CO, 80221

Project: Miening #2

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 03/15/16 12:02

**SS01@4'**  
**1603085-01 (Soil)**

**Summit Scientific**

**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: **03/10/16 12:50**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
<b>pH</b>	<b>8.08</b>	0.100	pH Units	1	1603130	03/14/16	03/14/16	EPA 9045	

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Denver CO, 80221

Project: Miening #2

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
03/15/16 12:02

**Extractable Petroleum Hydrocarbons by 8015 - Quality Control**  
**Summit Scientific**

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

**Batch 1603122 - EPA 3550A**

**Blank (1603122-BLK1)**

Prepared & Analyzed: 03/11/16

C10-C28 (DRO)	ND	50	mg/kg								
<i>Surrogate: o-Terphenyl</i>	13.7		"	12.5		110	30-150				

**LCS (1603122-BS1)**

Prepared & Analyzed: 03/11/16

C10-C28 (DRO)	450	50	mg/kg	499		90.2	73-134				
<i>Surrogate: o-Terphenyl</i>	14.5		"	12.5		116	30-150				

**Matrix Spike (1603122-MS1)**

Source: 1603084-01

Prepared & Analyzed: 03/11/16

C10-C28 (DRO)	976	50	mg/kg	477	692	59.5	50-148				
<i>Surrogate: o-Terphenyl</i>	14.6		"	12.0		123	30-150				

**Matrix Spike Dup (1603122-MSD1)**

Source: 1603084-01

Prepared & Analyzed: 03/11/16

C10-C28 (DRO)	1130	50	mg/kg	493	692	88.8	50-148	14.6	13		QM-07
<i>Surrogate: o-Terphenyl</i>	15.3		"	12.4		124	30-150				

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6899 Pecos Street  
Denver CO, 80221

Project: Miening #2

Project Number: [none]  
Project Manager: Mark Longhurst

Reported:  
03/15/16 12:02

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

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

**Batch 1603121 - EPA 5030 Soil MS**

**Blank (1603121-BLK1)**

Prepared & Analyzed: 03/11/16

Naphthalene	ND	0.010	mg/kg							
Benzene	ND	0.0020	"							
Toluene	ND	0.0050	"							
Ethylbenzene	ND	0.0050	"							
Xylenes (total)	ND	0.010	"							
Gasoline Range Hydrocarbons	ND	0.50	"							
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0383</i>		<i>"</i>	<i>0.0396</i>		<i>96.7</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0389</i>		<i>"</i>	<i>0.0400</i>		<i>97.4</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0399</i>		<i>"</i>	<i>0.0400</i>		<i>99.7</i>	<i>21-167</i>			

**LCS (1603121-BS1)**

Prepared & Analyzed: 03/11/16

Naphthalene	ND	0.010	mg/kg				66-138			
Benzene	0.0973	0.0020	"	0.100		97.3	58-130			
Toluene	0.108	0.0050	"	0.100		108	61-134			
Ethylbenzene	0.121	0.0050	"	0.0992		121	74-139			
m,p-Xylene	0.225	0.010	"	0.200		113	73-137			
o-Xylene	0.111	0.0050	"	0.0984		113	73-141			
Xylenes (total)	0.336	0.010	"				0-200			
Gasoline Range Hydrocarbons	2.99	0.50	"				30-150			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0369</i>		<i>"</i>	<i>0.0396</i>		<i>93.2</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0390</i>		<i>"</i>	<i>0.0400</i>		<i>97.5</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0399</i>		<i>"</i>	<i>0.0400</i>		<i>99.7</i>	<i>21-167</i>			

**Matrix Spike (1603121-MS1)**

Source: 1603084-01

Prepared & Analyzed: 03/11/16

Naphthalene	0.00427	0.010	mg/kg		0.00610		10-158			
Benzene	0.0863	0.0020	"	0.0949	ND	91.0	30-131			
Toluene	0.103	0.0050	"	0.0949	ND	108	30-134			
Ethylbenzene	0.118	0.0050	"	0.0941	ND	125	22-153			
m,p-Xylene	0.220	0.010	"	0.189	ND	116	10-159			
o-Xylene	0.109	0.0050	"	0.0934	ND	117	31-151			
Xylenes (total)	0.329	0.010	"		ND		30-160			
Gasoline Range Hydrocarbons	3.51	0.50	"		0.863		30-160			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0374</i>		<i>"</i>	<i>0.0376</i>		<i>99.5</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0366</i>		<i>"</i>	<i>0.0380</i>		<i>96.4</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0376</i>		<i>"</i>	<i>0.0380</i>		<i>99.0</i>	<i>21-167</i>			

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Tasman Geosciences  
6899 Pecos Street  
Denver CO, 80221

Project: Miening #2

Project Number: [none]  
Project Manager: Mark Longhurst

Reported:  
03/15/16 12:02

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

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

**Batch 1603121 - EPA 5030 Soil MS**

<b>Matrix Spike Dup (1603121-MSD1)</b>	<b>Source: 1603084-01</b>			<b>Prepared &amp; Analyzed: 03/11/16</b>						
Naphthalene	0.00507	0.010	mg/kg		0.00610		10-158	17.1	42	
Benzene	0.0967	0.0020	"	0.0977	ND	99.1	30-131	11.4	34	
Toluene	0.110	0.0050	"	0.0977	ND	113	30-134	6.94	30	
Ethylbenzene	0.124	0.0050	"	0.0969	ND	128	22-153	4.75	24	
m,p-Xylene	0.231	0.010	"	0.195	ND	118	10-159	5.04	68	
o-Xylene	0.113	0.0050	"	0.0961	ND	118	31-151	3.56	38	
Xylenes (total)	0.344	0.010	"		ND		30-160	4.55	30	
Gasoline Range Hydrocarbons	3.92	0.50	"		0.863		30-160	10.9	30	
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0376</i>		<i>"</i>	<i>0.0387</i>		<i>97.3</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0378</i>		<i>"</i>	<i>0.0391</i>		<i>96.7</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0385</i>		<i>"</i>	<i>0.0391</i>		<i>98.6</i>	<i>21-167</i>			

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Tasman Geosciences  
6899 Pecos Street  
Denver CO, 80221

Project: Miening #2

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
03/15/16 12:02

**Physical Parameters by APHA/ASTM/EPA Methods - Quality Control**  
**Summit Scientific**

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

**Batch 1603130 - General Preparation**

<b>LCS (1603130-BS1)</b>					Prepared & Analyzed: 03/14/16					
pH	7.97	0.100	pH Units	8.00	99.6	95-105				
<b>Duplicate (1603130-DUP1)</b>					Source: 1603077-01 Prepared & Analyzed: 03/14/16					
pH	7.64	0.100	pH Units	7.58	0.788	20				

**Batch 1603131 - General Preparation**

<b>Blank (1603131-BLK1)</b>					Prepared & Analyzed: 03/14/16					
Specific Conductance (EC)	ND	0.0100	mmhos/cm							
<b>LCS (1603131-BS1)</b>					Prepared & Analyzed: 03/14/16					
Specific Conductance (EC)	0.506	0.0100	mmhos/cm	0.500	101	90-110				
<b>Duplicate (1603131-DUP1)</b>					Source: 1603077-01 Prepared & Analyzed: 03/14/16					
Specific Conductance (EC)	0.339	0.0100	mmhos/cm	0.334	1.32	20				

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Tasman Geosciences  
6899 Pecos Street  
Denver CO, 80221

Project: Miening #2

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
03/15/16 12:02

### Notes and Definitions

- QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS/LCSD recovery.
- 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

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