Rule Engineering, LLC
Solutions to Regulations for Industry

October 30, 2013

Mr. Charlie Jensen
Encana Oil & Gas (USA) Inc.
143 Diamond Ave
Parachute, CO 81635

Re: West Divide Creek October 2013 Seep Status – Remediation #1815

Dear Mr. Jensen:

Rule Engineering (Rule) prepared this report to present the results of the quarterly monitoring and modification sampling associated with the West Divide Creek Seep for Encana Oil and Gas (USA) Inc. The COGCC approved modification to the remediation system and sampling plan and recommendations for the gas seep associated with Colorado Oil and Gas Conservation Commission (COGCC) Remediation #1815 pursuant to the Schwartz 2-15B well Order No. 1V-276. Figure 1 provides a map of monitoring stations and remediation system locations for this site.

October 2013 Quarterly Monitoring

Groundwater

On October 17, 2013 Rule sampled 7 groundwater monitoring wells (MW-2, 4, 8, 12, 17, 20, 22) as part of the quarterly monitoring program. Prior to sample collection, static water levels were measured at the wells to within 0.01 feet (ft) from the top of the north side of the PVC casing using an electronic water level meter. Prior to collection of the groundwater sample, each well was purged of three casing volumes of water using disposable bailers. Field parameters were obtained during sample collection which included pH, temperature, specific conductance, dissolved oxygen, and oxygen reduction potential (ORP) with an YSI® water quality meter. Groundwater field measurement results are provided in Table 1.

All groundwater samples were immediately placed on ice after sample collection and shipped under Chain-of-Custody procedures to Environmental Science Corporation (ESC) for laboratory analysis. Samples were received in good condition within appropriate temperatures by ESC. Quarterly samples were analyzed for benzene, toluene, ethylbenzene, xylene (BTEX) and methane, method-RSK175.

A summary of the groundwater analytical results is presented in Tables 2 and 3.

Remediation System

On December 20, 2012 the air sparge system was shut down to evaluate source area concentrations and remediation through natural attenuation.

Results

Site Hydrology

During the October 2013 monitoring period, groundwater elevation varied from 5965 feet above mean seal level (AMSL) at MW-12 to 5946 feet at MW-20. Figure 2 illustrates the potentiometric surface for the site during this quarter. An average groundwater gradient was

determined to be 0.025 with a groundwater flow to the northeast/north consistent with the drainage system of West Divide Creek within the seep area.

October 2013 Analytical Results

Groundwater analytical results indicate that monitoring stations MW-2, MW-4 and MW-17 had dissolved benzene concentrations of 0.027 mg/L, 0.031 mg/L and 0.015 mg/L, respectively. Dissolved toluene and ethylbenzene concentrations were below detection levels in all wells. Results indicate monitoring stations MW-2 and MW-4 had dissolved xylene concentrations of 0.0035 mg/L and 0.0040 mg/L, respectively. Figure 3 illustrates dissolved BTEX and dissolved methane results for the October 2013.

Figure 4 illustrates the dissolved benzene impacts greater than 0.005 mg/L. Dissolved benzene concentrations above Table 910-1 allowable limits were detected in wells MW-2, MW-4, and MW-17.

The highest concentrations of dissolved methane were observed in MW-4 (3.8 mg/L), MW-2 (3.4 mg/L), and MW-17 (1.5 mg/L). Analytical results indicate methane was below 1.0 mg/L in all other sampled monitoring wells during the October 2013.

Below is a summary of monitoring stations that are in the current sampling plan that had been impacted by the seep:

- MW-2: Dissolved benzene concentrations remain above the groundwater standard (Figure 5). MW-2 is upgradient of the treatment area, but dissolved benzene concentrations have declined over time. The concentration during the October sampling event was 0.027 mg/L which is consistent with previous data.

- MW-4: Dissolved benzene concentrations remain above the groundwater standard (Figure 6). MW-4 is upgradient of the treatment area, but dissolved benzene concentrations have declined over time. The concentration during the October sampling event was 0.031 mg/L which is consistent with previous data.

- MW-8: Dissolved benzene concentrations declined to non-detect levels before the system was installed (Figure 7) and have remained below the groundwater standard since July 2005.

- MW-12: Dissolved benzene concentrations declined dramatically before the system was installed in 2005 (Figure 8) and have remained below the groundwater standard since March 2007. MW-12 is upgradient of the treatment area.

- MW-17: Dissolved benzene concentrations declined before the system start up and continue to decline (Figure 9). The concentration during the October sampling event was 0.015 mg/L which is consistent with previous data.

A summary of the historical BTEX and methane concentrations is provided in the electronic attachment (Appendix B).

Divide Creek Remediation Analysis
As described in previous West Divide Creek Seep Status Reports, the overall decline in dissolved benzene concentrations are attributed to a reduction in the mass flux of hydrocarbons from the seep. The natural processes of dilution, degradation, dispersion, and volatilization under the current site conditions provide remediation through natural attenuation (RNA), resulting in the observed decline in concentrations. Based on the extensive monitoring conducted to date, the groundwater plume is stable and/or diminishing, and demonstrates no potential for migration towards downgradient groundwater receptors (ie. water wells), without immediate detection within the existing monitoring well network.

We suggest continuing the current remediation plan through RNA. We would also suggest abandoning all monitoring wells, system wells, and system equipment that are not part of the current sampling plan.

Rule Engineering appreciates the opportunity to provide services to Encana. If you have any questions please contact me at 970-244-8500.

Sincerely,
Rule Engineering, LLC

Shad Johnson
Scientist/Project Manager

cc: Alex Fischer-COGCC
Brett Middleton-Encana
Russ Knight-Rule
Pepi Langegger

Tables

Table 1. 4/16/13 - 10/17/13 Groundwater Field Parameters

Monitoring Station	Date	DTW (ft)	Temp (°C)	SPC (mS/cm)	DO (mg/L)	TDS (mg/L)	SAL (ppt)	pH	ORP (mV)	Water Quality Observations
MW-2	4/16/2013	4.71	8.50	0.82	2.95	533.00	0.40	7.37	-60.20	Light brown in color, no sheen, no effervescence, mild sulfur odor, mildly visually turbid
MW-4	4/16/2013	7.26	8.50	0.77	2.99	500.50	0.38	7.50	-78.20	Light brown in color, large particles present, minor effervescence, no sheen, no odor, highly visually turbid
MW-8	4/16/2013	8.87	8.20	0.92	2.53	591.50	0.45	7.39	-56.00	Light gray in color, no effervescence, no sheen, no odor, mild visually turbid
MW-12	4/16/2013	-0.10	5.80	0.82	5.14	533.00	0.40	7.24	-81.80	Light gray in color, no effervescence, no sheen, no odor, mild visually turbid
MW-17	4/16/2013	6.39	7.70	1.12	2.48	728.00	0.56	7.49	-61.40	Light brown in color, no sheen, no effervescence, no odor, mildly visually turbid
MW-20	4/16/2013	9.13	7.00	0.76	5.90	507.00	0.38	7.39	4.30	Light gray in color, no effervescence, no sheen, no odor, mild visually turbid
MW-22	4/16/2013	10.66	7.50	0.85	4.50	552.50	0.42	7.42	-22.40	Light brown in color, no sheen, no effervescence, no odor, mildly visually turbid
MW-2	7/30/2013	5.23	13.10	0.92	2.35	NR	NR	8.21	-28.70	Light brown in color, no sheen, no effervescence, mild sulfur odor, mildly visually turbid
MW-4	7/30/2013	6.83	13.00	0.95	2.61	NR	NR	8.71	-70.30	Light brown in color, large particles present, minor effervescence, no sheen, no odor, highly visually turbid
MW-8	7/30/2013	9.93	13.70	1.33	3.05	NR	NR	8.17	-63.20	Light gray in color, no effervescence, no sheen, no odor, mild visually turbid
MW-12	7/30/2013	2.78	13.70	0.97	3.11	NR	NR	7.99	-62.10	Light gray in color, no effervescence, no sheen, no odor, mild visually turbid
MW-17	7/30/2013	7.69	13.00	1.27	2.41	NR	NR	8.41	-162.70	Light brown in color, no sheen, no effervescence, no odor, mildly visually turbid
MW-20	7/30/2013	10.38	13.30	1.23	3.88	NR	NR	8.21	-17.90	Light gray in color, no effervescence, no sheen, no odor, mild visually turbid
MW-22	7/30/2013	12.15	13.60	0.91	4.89	NR	NR	8.07	-25.60	Light brown in color, no sheen, no effervescence, no odor, mildly visually turbid
MW-2	10/17/2013	5.12	13.20	0.891	1.05	578.50	0.44	7.65	-97.40	Light brown in color, no sheen, no effervescence, mild sulfur odor, mildly visually turbid
MW-4	10/17/2013	7.50	15.80	0.818	1.02	533.00	0.40	8.07	-90.40	Light brown in color, large particles present, minor effervescence, no sheen, mild odor, highly visually turbid
MW-8	10/17/2013	9.75	11.70	1.025	1.81	669.50	0.51	7.61	-88.40	Light gray/brown in color, no effervescence, no sheen, no odor, mild visually turbid
MW-12	10/17/2013	7.80	9.90	1.026	0.80	669.50	0.51	7.34	-96.70	Light gray/brown in color, no effervescence, no sheen, no odor, mild visually turbid
MW-17	10/17/2013	7.80	11.50	1.115	1.95	728.00	0.66	7.81	-55.50	Light gray in color, no effervescence, no sheen, slight odor, mild visually turbid
MW-20	10/17/2013	10.14	10.80	0.81	7.01	526.50	0.40	7.55	-47.70	Light gray in color, no effervescence, no sheen, no odor, mild visually turbid
MW-22	10/17/2013	11.89	9.90	0.829	4.10	539.50	0.41	7.54	-74.70	Light brown in color, no sheen, no effervescence, no odor, mildly visually turbid

Notes: NR= Not recorded

Table 2. 4/16/13 - 10/17/13 West Divide Creek BTEX Groundwater Concentrations

Monitoring Station	Sample ID	Lab ID	Sample Date	Benzene (mg/L)				Toluene (mg/L)				Ethylbenzene (mg/L)				Total Xylenes (mg/L)			
				RDL	MDL	Value	Qual	RDL	MDL	Value	Qual	RDL	MDL	Value	Qual	RDL	MDL	Value	Qual
MW-2	MW-2-041613	L630994-01	4/16/2013	0.001	0.00033	0.018		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	0.0032	
MW-4	MW-4-041613	L630994-02	4/16/2013	0.001	0.00033	0.042		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	0.005	
MW-8	MW-8-041613	L630994-03	4/16/2013	0.001	0.00033	ND		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	ND	
MW-12	MW-12-041613	L630994-04	4/16/2013	0.001	0.00033	ND		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	ND	
MW-17	MW-17-041613	L630994-05	4/16/2013	0.001	0.00033	0.0035		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	ND	
MW-20	MW-20-041613	L630994-06	4/16/2013	0.001	0.00033	ND		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	ND	
MW-22	MW-22-041613	L630994-07	4/16/2013	0.001	0.00033	ND		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	ND	
MW-2	MW-2-073013	L649377-01	7/30/2013	0.001	0.00033	0.018		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	ND	
MW-4	MW-4-073013	L649377-02	7/30/2013	0.001	0.00033	0.011		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	ND	
MW-8	MW-8-073013	L649377-03	7/30/2013	0.001	0.00033	ND		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	ND	
MW-12	MW-12-073013	L649377-04	7/30/2013	0.001	0.00033	ND		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	ND	
MW-17	MW-17-073013	L649377-05	7/30/2013	0.001	0.00033	0.013		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	ND	
MW-20	MW-20-073013	L649377-06	7/30/2013	0.001	0.00033	ND		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	ND	
MW-22	MW-22-073013	L649377-07	7/30/2013	0.001	0.00033	ND		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	ND	
MW-2	MW-2-101713	L664031-01	10/17/2013	0.001	0.00033	0.027		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	0.0035	
MW-4	MW-4-101713	L664031-02	10/17/2013	0.001	0.00033	0.031		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	0.004	
MW-8	MW-8-101713	L664031-03	10/17/2013	0.001	0.00033	ND		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	ND	
MW-12	MW-12-101713	L664031-04	10/17/2013	0.001	0.00033	ND		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	ND	
MW-17	MW-17-101713	L664031-05	10/17/2013	0.001	0.00033	0.015		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	ND	
MW-20	MW-20-101713	L664031-06	10/17/2013	0.001	0.00033	ND		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	ND	
MW-22	MW-22-101713	L664031-07	10/17/2013	0.001	0.00033	ND		0.005	0.00078	ND		0.001	0.00038	ND		0.003	0.0011	ND	

Value exceeds Table 910-1

Table 3. 4/16/13 - 10/17/13 Methane Groundwater Concentrations.

Monitoring Station	Sample ID	Lab ID	Sample Date	Methane (mg/L)			
				RDL	MDL	Value	Qual
MW-2	MW-2-041613	L630994-01	4/16/2013	0.05	0.01	2.6	
MW-4	MW-4-041613	L630994-02	4/16/2013	0.05	0.01	2.8	
MW-8	MW-8-041613	L630994-03	4/16/2013	0.01	0.0021	0.055	
MW-12	MW-12-041613	L630994-04	4/16/2013	0.01	0.0021	<0.010	
MW-17	MW-17-041613	L630994-05	4/16/2013	0.01	0.0021	0.42	
MW-20	MW-20-041613	L630994-06	4/16/2013	0.01	0.0021	<0.010	
MW-22	MW-22-041613	L630994-07	4/16/2013	0.01	0.0021	<0.010	
MW-2	MW-2-073013	L649377-01	7/30/2013	0.05	0.01	1.6	
MW-4	MW-4-073013	L649377-02	7/30/2013	0.05	0.01	1.3	
MW-8	MW-8-073013	L649377-03	7/30/2013	0.01	0.0021	0.051	
MW-12	MW-12-073013	L649377-04	7/30/2013	0.01	0.0021	0.66	
MW-17	MW-17-073013	L649377-05	7/30/2013	0.01	0.0021	1.9	
MW-20	MW-20-073013	L649377-06	7/30/2013	0.01	0.0021	<0.010	
MW-22	MW-22-073013	L649377-07	7/30/2013	0.01	0.0021	<0.010	
MW-2	MW-2-101713	L664031-01	10/17/2013	0.05	0.01	3.4	
MW-4	MW-4-101713	L664031-02	10/17/2013	0.05	0.01	3.8	
MW-8	MW-8-101713	L664031-03	10/17/2013	0.01	0.0021	0.083	
MW-12	MW-12-101713	L664031-04	10/17/2013	0.01	0.0021	0.068	
MW-17	MW-17-101713	L664031-05	10/17/2013	0.01	0.0021	1.5	
MW-20	MW-20-101713	L664031-06	10/17/2013	0.01	0.0021	0.016	
MW-22	MW-22-101713	L664031-07	10/17/2013	0.01	0.0021	<0.010	

Note: No Methane Standard for Groundwater in COGCC Table 910-1

Figures

Section Line

Northwest 1/4 Corner
Section 12
(1987 Brass Cap)

North 1/4 Corner
Section 12
(1987 Brass Cap)

MW 27

Site Boundary

Langegger
NE 1/4 NW 1/4

Eich 1

Bracken & Eicher
NW 1/4 NW 1/4

West Divide Creek

MW 23

Gate

Thompson

MW 24

1/16 Section Line

MW 21

MW 20

NW 1/4

DCS 8

1/16 Section Line

MW 18

DCS 7

MW 22

DCS 6

MW 26

MW 8

Langegger
SW 1/4 NW 1/4

MW 17

AS-13 AS-14 AS-15 AS-10 AS-7 AS-8 AS-9 AS-11 AS-2 AS-1 AS-3 AS-18 AS-4 AS-5

MW 7

Pond

MW 16

MW 1

DCS 5

MW 6

MW 2

MW 15

Section Line

Gate

Langegger
SE 1/4 NW 1/4

DCS 4

DCS 1

MW 4

AS-19

1/16 Section Line

DCS 2

DCS 3

Multa-Trina Ditch

MW 12

MW 9

MW 14

Marshland

MW 11

MW 19

MW 25

MW 13

Site Boundary

West 1/4 Corner
Section 12
(Rebar)

1/4 Section Line

Sec. 12

Legend

- Site Boundary
- Road
- Drainage
- Fence
- Old Fence
- Property Line
- Trail
- Air Sparge
- Divide Creek Sample Location
- Monitoring Well Location
- Abandoned or Plugged Monitoring Well Location
- Nested Air Sparge Well Location
- Piezometer Location
- Section Corners

N

0 100 200 400 600 Feet

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Site Location Map

DATE: 10/29/2013 | JG | File:\\EnCana\Figures\West Divide Creek\3Q2013\131017 Site Location Map.pdf | Figure: 1

Section Line

Northwest 1/4 Corner
Section 12
(1987 Brass Cap)

North 1/4 Corner
Section 12
(1987 Brass Cap)

Site Boundary

Eicher

Thompson

Langegger
NE 1/4 NW 1/4

Langegger
SW 1/4 NW 1/4

Langegger
SE 1/4 NW 1/4

NW 1/4 NW 1/4

NW 1/4

1/16 Section Line

1/16 Section Line

1/16 Section Line

Section Line

Gate

Pond

West Divide Creek

Multa-Trina Ditch

Marshland

MW 27 NM
MW 24 NM
MW 21 NM
MW 20 5946.06
MW 22 5947.61
MW 18 5951.04
MW 8 5952.85
MW 17 5953.40
MW 7 5955.13
MW 16 5956.38
MW 1 5955.57
MW 6 5955.45
MW 2 5957.58
MW 15 NM
MW 4 5955.90*
MW 12 5964.99
MW 9 5960.90
MW 14 NM
MW 19 NM
MW 11 NM
MW 25 NM
MW 13 NM
MW 23 NM
MW 26 NM
Eich 1 NM
DCS 1 NM
DCS 2 NM
DCS 3 NM
DCS 4 NM
DCS 5 NM
DCS 6 NM
DCS 7 NM
DCS 8 NM
PZ1 NM
PZ2 NM
PZ3 NM
PZ4 NM
PZ5 NM
PZ6 NM
PZ7 NM
PZ8 NM

5948.00
5950.00
5952.00
5954.00
5956.00
5958.00
5960.00
5962.00
5964.00

AS-1 AS-2 AS-3 AS-4 AS-5 AS-7 AS-8 AS-9 AS-10 AS-11 AS-13 AS-14 AS-15 AS-18 AS-19

Site Boundary

West 1/4 Corner
Section 12
(Rebar)

1/4 Section Line

Sec. 12

Legend

- Site Boundary
- Road
- Drainage
- Fence
- Old Fence
- Property Line
- Trail
- Air_Sparge_unconverted
- Divide Creek Sample Location
- Monitoring Well Location
- Abandoned or Plugged Monitoring Well Location
- Nested Air Sparge Well Location
- Piezometer Location
- Section Corners

Groundwater Legend

- 5940.00 = Groundwater Elevation Contour (Feet)
- 5940.17 = Groundwater Elevation (Feet)
- NM = Not Measured
- * = Data not used in contouring
- = Flow Vector

N

0 100 200 400 600 Feet

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Groundwater Elevation Map
October 2013

DATE: 10/29/2013 | JG | File:\\EnCana\Figures\West Divide Creek\3Q2013\131017 GW Elevation October.pdf | Figure: 2

Section Line

Northwest 1/4 Corner
Section 12
(1987 Brass Cap)

North 1/4 Corner
Section 12
(1987 Brass Cap)

Site Boundary

Eicher

Langegger
NE 1/4 NW 1/4

NW 1/4 NW 1/4

Gate

Thompson

1/16 Section Line

NW 1/4

Langegger
SW 1/4 NW 1/4

Pond

Marshland

Multa-Trina Ditch

West Divide Creek

Langegger
SE 1/4 NW 1/4

Section Line

1/16 Section Line

Site Boundary

West 1/4 Corner
Section 12
(Rebar)

1/4 Section Line

Sec. 12

MW 27 NS
Eich 1 W NS
MW 23 NS
MW 24 NS
MW 21 NS
MW 20
MW 22
DCS 8 NS
MW 18 NS
DCS 7 NS
DCS 6 NS
MW 26 NS
MW 8
MW 17
MW 7 NS
MW 16 NS
MW 1 NS
MW 6 NS
DCS 5 NS
MW 15 NS
MW 2
DCS 1 NS
DCS 4 NS
MW 4
AS-19
DCS 2 NS
DCS 3 NS
MW 12
MW 9 NS
MW 14 NS
MW 11 NS
MW 19 NS
MW 25 NS
MW 13 NS
AS-1 AS-2 AS-3 AS-4 AS-5 AS-7 AS-8 AS-9 AS-10 AS-11 AS-13 AS-14 AS-15 AS-18

	Value
B	<0.0010
T	<0.0050
E	<0.0010
X	<0.0030
M	<0.010

	Value
B	<0.0010
T	<0.0050
E	<0.0010
X	<0.0030
M	0.016

	Value
B	<0.0010
T	<0.0050
E	<0.0010
X	<0.0030
M	0.083

	Value
B	**0.015**
T	<0.0050
E	<0.0010
X	<0.0030
M	1.5

	Value
B	<0.0010
T	<0.0050
E	<0.0010
X	<0.0030
M	0.068

	Value
B	**0.027**
T	<0.0050
E	<0.0010
X	0.0035
M	3.4

	Value
B	**0.031**
T	<0.0050
E	<0.0010
X	0.004
M	3.8

Legend

- Site Boundary
- Road
- Drainage
- Fence
- Old Fence
- Property Line
- Trail
- Air Sparge
- Divide Creek Sample Location
- Monitoring Well Location
- Abandoned or Plugged Monitoring Well Location
- Nested Air Sparge Well Location
- Piezometer Location
- Section Corners

Chemical Data
B = Benzene (mg/L)
T = Toluene (mg/L)
E = Ethylbenzene (mg/L)
X = Xylenes (mg/L)
M = Total Methane (mg/L)
NS = Not Sampled
NA = Not Analyzed

N

0 100 200 400 600 Feet

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Groundwater Analytical Results
October 2013

DATE: 10/29/2013 | JG | File:\\EnCana\Figures\West Divide Creek\3Q2013\131017 GW Analytical Results October.pdf | Figure: 3

Section Line

Northwest 1/4 Corner
Section 12
(1987 Brass Cap)

North 1/4 Corner
Section 12
(1987 Brass Cap)

MW 27
NS

Eicher

Site Boundary

Langegger
NE 1/4 NW 1/4

Eich 1
W
NS

NW 1/4 NW 1/4

West Divide Creek

MW 23
NS

Gate

Thompson

MW 24
NS

1/16 Section Line

MW 21
NS

MW 20
<0.0010

NW 1/4

DCS 8
NS

1/16 Section Line

MW 18
NS

DCS 7
NS

MW 22
<0.0010

DCS 6
NS

MW 26
NS

MW 8
<0.0010

Langegger
SW 1/4 NW 1/4

MW 17
0.015

AS-13 AS-14 AS-15 AS-7 AS-8 AS-9 AS-10 AS-11 AS-2 AS-1 AS-3 AS-4 AS-5 AS-18 AS-19

MW 7
NS

Pond

MW 16
NS

MW 1
NS

MW 6
NS

DCS 5
NS

MW 15
NS

Langegger
SE 1/4 NW 1/4

Gate

MW 2
0.027

0.005 0.01

DCS 1
NS

DCS 4
NS

MW 4
0.031

Section Line

1/16 Section Line

DCS 2
NS

DCS 3
NS

Multa-Trina Ditch

MW 12
<0.0010

MW 9
NS

MW 14
NS

Marshland

MW 11
NS

MW 19
NS

MW 25
NS

MW 13
NS

Site Boundary

West 1/4 Corner
Section 12
(Rebar)

1/4 Section Line

Sec. 12

Legend

- Site Boundary
- Road
- Drainage
- Fence
- Old Fence
- Property Line
- Trail
- Air Sparge
- Divide Creek Sample Location
- Monitoring Well Location
- Abandoned or Plugged Monitoring Well Location
- Nested Air Sparge Well Location
- Piezometer Location
- Section Corners

Chemical Data

- 0.005 = Benzene Concentration Contour (mg/L)
- 0.045 = Benzene Concentration (mg/L)
- NS = Not Sampled

N

0 100 200 400 600 Feet

Rule Engineering, LLC
Solutions to Regulations for Industry

encana natural gas

**Dissolved Benzene Concentrations
October 2013**

DATE: 10/17/2012 | JG | File:\\EnCana\Figures\West Divide Creek\3Q2013\131017 Dissolved Benzene October.pdf | Figure: 4

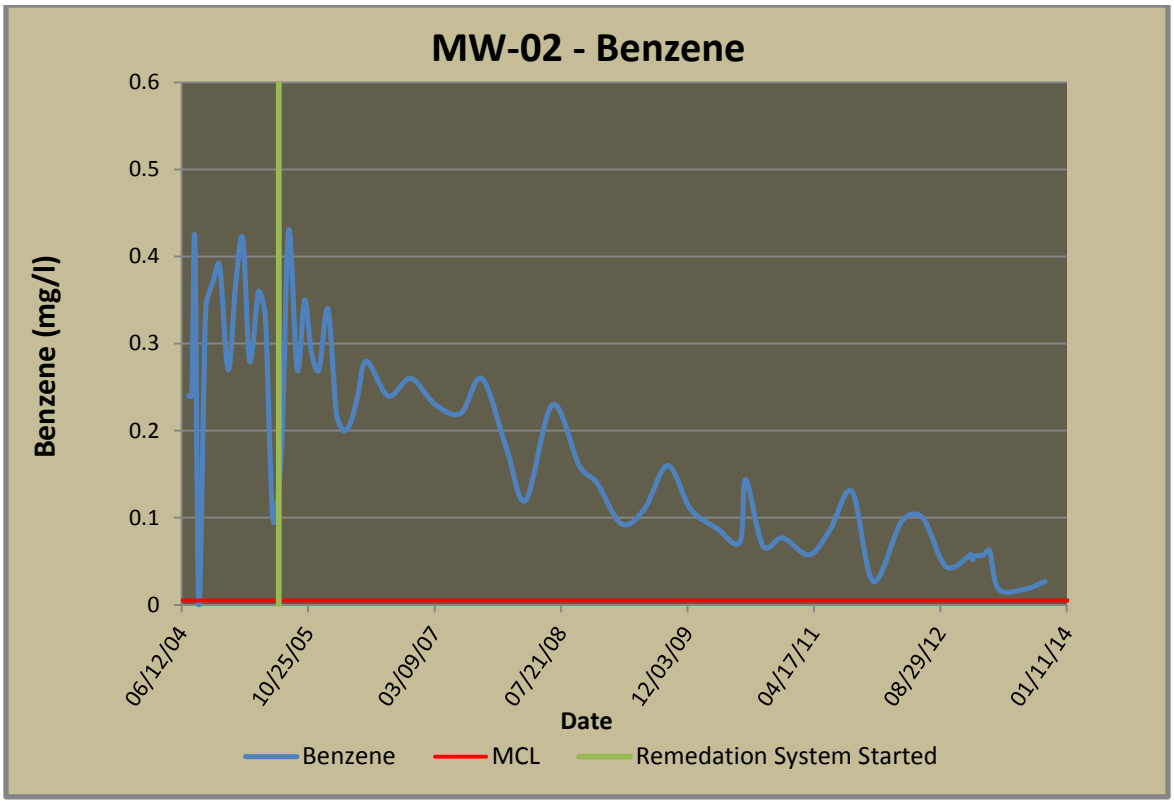

Figure 5 (MW-02 Historical Benzene Concentrations)

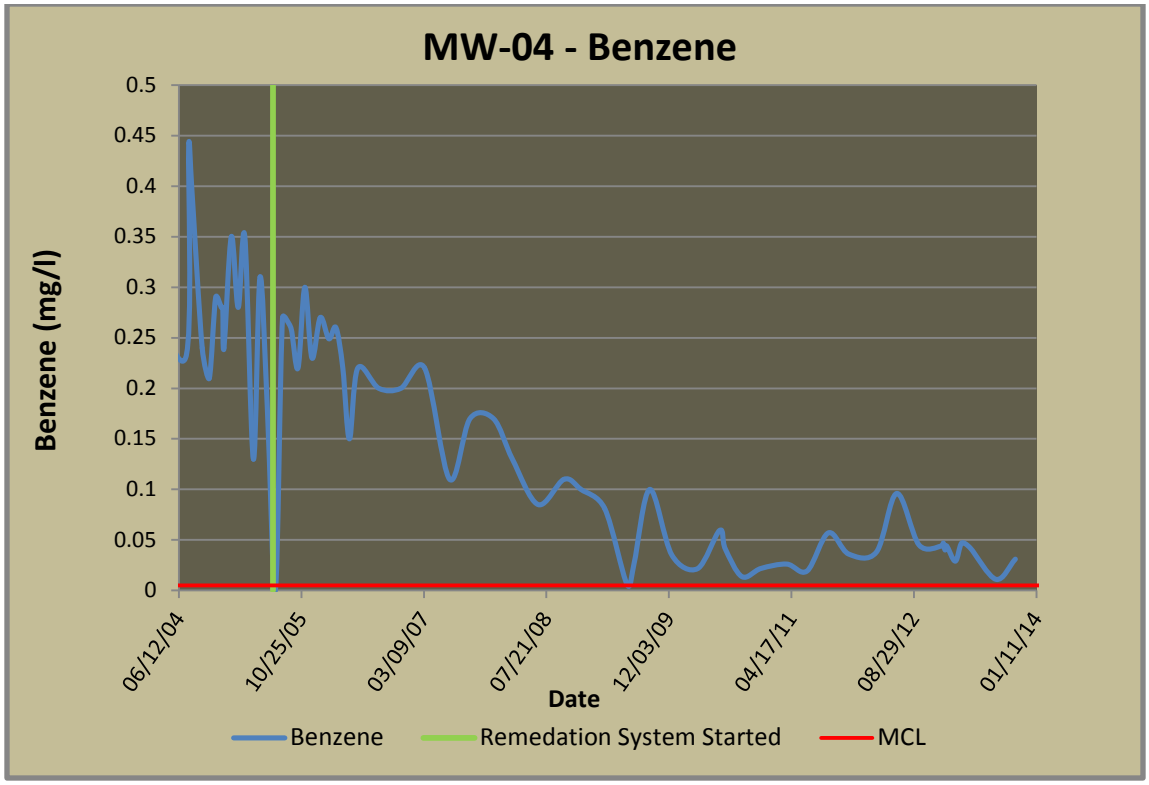

Figure 6 (MW-04 Historical Benzene Concentrations)

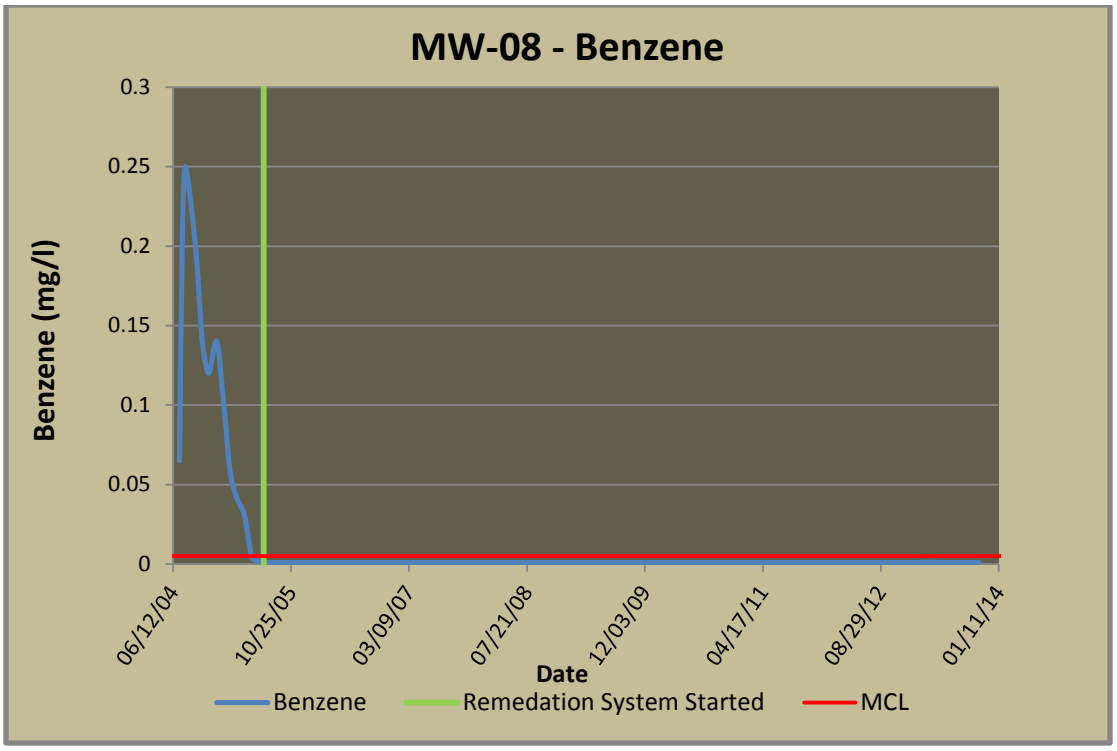

Figure 7 (MW-08 Historical Benzene Concentrations)

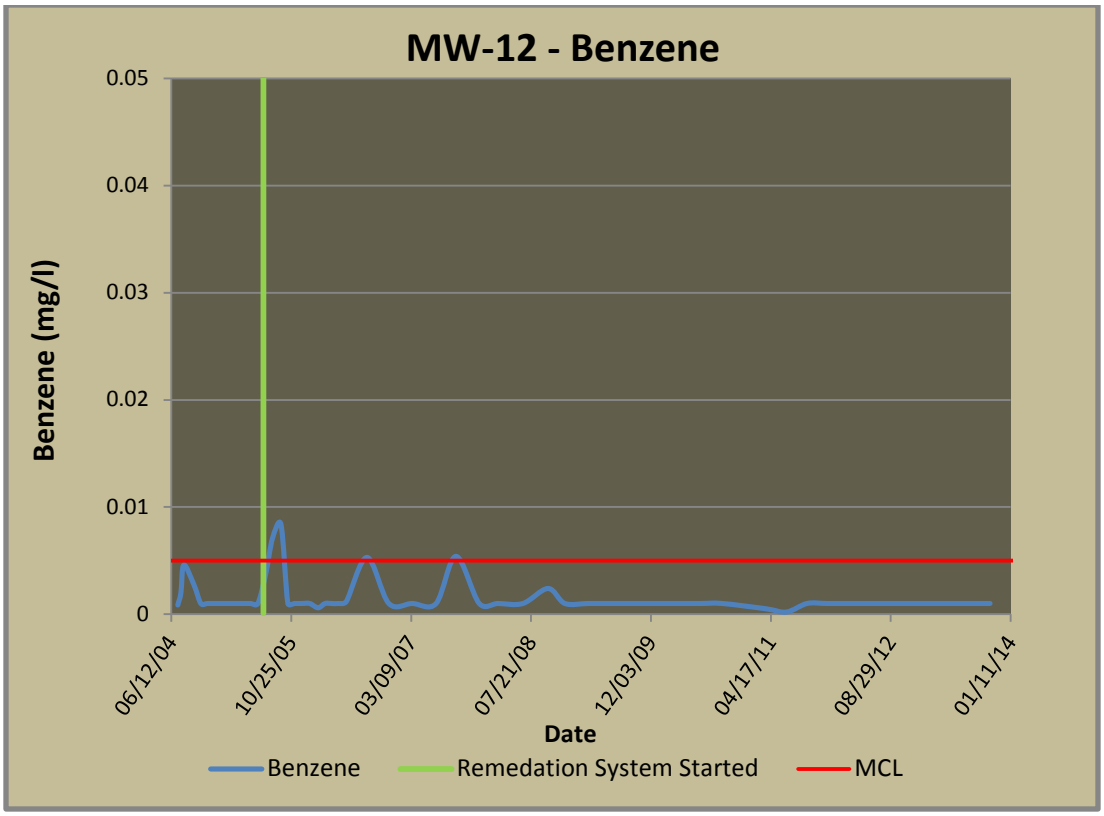

Figure 8 (MW-12 Historical Benzene Concentrations)

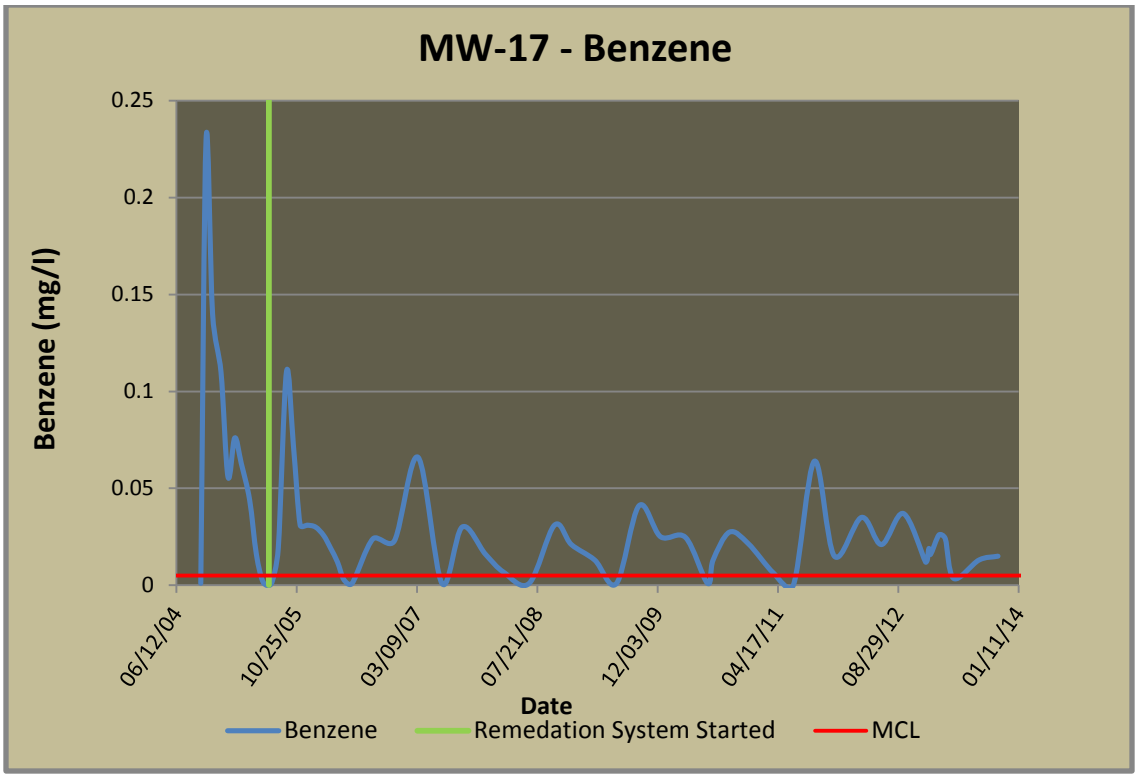

Figure 9 (MW-17 Historical Benzene Concentrations)

Appendix A

12065 Lebanon Rd.
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(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Chris Hines
EnCana Oil & Gas - Parachute, CO
143 Diamond Avenue
Parachute, CO 81635

Report Summary

Friday October 25, 2013

Report Number: L664031
Samples Received: 10/18/13
Client Project: WDC-01E

Description: West Divide Creek-Quarterly

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By: Alan Harvill

T. Alan Harvill , ESC Representative

Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - 01157CA, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704/BIO041, ND - R-140. NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 460132, WV - 233, AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032011-1, TX - T104704245-11-3, OK - 9915, PA - 68-02979, IA Lab #364

Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.
Note: The use of the preparatory EPA Method 3511 is not approved or endorsed by the CA ELAP.

Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

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REPORT OF ANALYSIS

Chris Hines
EnCana Oil & Gas - Parachute, CO
143 Diamond Avenue
Parachute, CO 81635

October 25, 2013

ESC Sample # : L664031-01

Site ID : WDC

Project # : WDC-01E

Date Received : October 18, 2013
Description : West Divide Creek-Quarterly

Sample ID : MW-2-101713

Collected By : Shad Johnson
Collection Date : 10/17/13 10:15

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Methane	3.4	0.10	mg/l	RSK175	10/24/13	10
Benzene	0.027	0.0010	mg/l	8260B	10/24/13	1
Toluene	BDL	0.0050	mg/l	8260B	10/24/13	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	10/24/13	1
Total Xylenes	0.0035	0.0030	mg/l	8260B	10/24/13	1
Surrogate Recovery						
Toluene-d8	97.3		% Rec.	8260B	10/24/13	1
Dibromofluoromethane	103.		% Rec.	8260B	10/24/13	1
a,a,a-Trifluorotoluene	100.		% Rec.	8260B	10/24/13	1
4-Bromofluorobenzene	90.1		% Rec.	8260B	10/24/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

.
Reported: 10/25/13 16:09 Printed: 10/25/13 17:13

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REPORT OF ANALYSIS

Chris Hines
EnCana Oil & Gas - Parachute, CO
143 Diamond Avenue
Parachute, CO 81635

October 25, 2013

ESC Sample # : L664031-02

Site ID : WDC

Project # : WDC-01E

Date Received : October 18, 2013
Description : West Divide Creek-Quarterly

Sample ID : MW-4-101713

Collected By : Shad Johnson
Collection Date : 10/17/13 10:45

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Methane	3.8	0.10	mg/l	RSK175	10/24/13	10
Benzene	0.031	0.0010	mg/l	8260B	10/24/13	1
Toluene	BDL	0.0050	mg/l	8260B	10/24/13	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	10/24/13	1
Total Xylenes	0.0040	0.0030	mg/l	8260B	10/24/13	1
Surrogate Recovery						
Toluene-d8	95.2		% Rec.	8260B	10/24/13	1
Dibromofluoromethane	107.		% Rec.	8260B	10/24/13	1
a,a,a-Trifluorotoluene	97.3		% Rec.	8260B	10/24/13	1
4-Bromofluorobenzene	91.4		% Rec.	8260B	10/24/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
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.
Reported: 10/25/13 16:09 Printed: 10/25/13 17:13

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REPORT OF ANALYSIS

Chris Hines
EnCana Oil & Gas - Parachute, CO
143 Diamond Avenue
Parachute, CO 81635

October 25, 2013

ESC Sample # : L664031-03

Date Received : October 18, 2013
Description : West Divide Creek-Quarterly

Site ID : WDC

Sample ID : MW-8-101713

Project # : WDC-01E

Collected By : Shad Johnson
Collection Date : 10/17/13 11:15

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Methane	0.083	0.010	mg/l	RSK175	10/23/13	1
Benzene	BDL	0.0010	mg/l	8260B	10/24/13	1
Toluene	BDL	0.0050	mg/l	8260B	10/24/13	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	10/24/13	1
Total Xylenes	BDL	0.0030	mg/l	8260B	10/24/13	1
Surrogate Recovery						
Toluene-d8	102.		% Rec.	8260B	10/24/13	1
Dibromofluoromethane	113.		% Rec.	8260B	10/24/13	1
a,a,a-Trifluorotoluene	105.		% Rec.	8260B	10/24/13	1
4-Bromofluorobenzene	88.4		% Rec.	8260B	10/24/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

.
Reported: 10/25/13 16:09 Printed: 10/25/13 17:13

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REPORT OF ANALYSIS

Chris Hines
EnCana Oil & Gas - Parachute, CO
143 Diamond Avenue
Parachute, CO 81635

October 25, 2013

ESC Sample # : L664031-04

Site ID : WDC

Project # : WDC-01E

Date Received : October 18, 2013
Description : West Divide Creek-Quarterly

Sample ID : MW-12-101713

Collected By : Shad Johnson
Collection Date : 10/17/13 11:30

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Methane	0.068	0.010	mg/l	RSK175	10/24/13	1
Benzene	BDL	0.0010	mg/l	8260B	10/24/13	1
Toluene	BDL	0.0050	mg/l	8260B	10/24/13	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	10/24/13	1
Total Xylenes	BDL	0.0030	mg/l	8260B	10/24/13	1
Surrogate Recovery						
Toluene-d8	101.		% Rec.	8260B	10/24/13	1
Dibromofluoromethane	111.		% Rec.	8260B	10/24/13	1
a,a,a-Trifluorotoluene	106.		% Rec.	8260B	10/24/13	1
4-Bromofluorobenzene	87.4		% Rec.	8260B	10/24/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

.
Reported: 10/25/13 16:09 Printed: 10/25/13 17:13

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REPORT OF ANALYSIS

Chris Hines
EnCana Oil & Gas - Parachute, CO
143 Diamond Avenue
Parachute, CO 81635

October 25, 2013

ESC Sample # : L664031-05

Site ID : WDC

Project # : WDC-01E

Date Received : October 18, 2013
Description : West Divide Creek-Quarterly

Sample ID : MW-17-101713

Collected By : Shad Johnson
Collection Date : 10/17/13 12:15

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Methane	1.5	0.050	mg/l	RSK175	10/25/13	5
Benzene	0.015	0.0010	mg/l	8260B	10/24/13	1
Toluene	BDL	0.0050	mg/l	8260B	10/24/13	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	10/24/13	1
Total Xylenes	BDL	0.0030	mg/l	8260B	10/24/13	1
Surrogate Recovery						
Toluene-d8	101.		% Rec.	8260B	10/24/13	1
Dibromofluoromethane	108.		% Rec.	8260B	10/24/13	1
a,a,a-Trifluorotoluene	104.		% Rec.	8260B	10/24/13	1
4-Bromofluorobenzene	88.9		% Rec.	8260B	10/24/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

.
Reported: 10/25/13 16:09 Printed: 10/25/13 17:13

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REPORT OF ANALYSIS

Chris Hines
EnCana Oil & Gas - Parachute, CO
143 Diamond Avenue
Parachute, CO 81635

October 25, 2013

ESC Sample # : L664031-06

Site ID : WDC

Project # : WDC-01E

Date Received : October 18, 2013
Description : West Divide Creek-Quarterly

Sample ID : MW-20-101713

Collected By : Shad Johnson
Collection Date : 10/17/13 11:45

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Methane	0.016	0.010	mg/l	RSK175	10/24/13	1
Benzene	BDL	0.0010	mg/l	8260B	10/24/13	1
Toluene	BDL	0.0050	mg/l	8260B	10/24/13	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	10/24/13	1
Total Xylenes	BDL	0.0030	mg/l	8260B	10/24/13	1
Surrogate Recovery						
Toluene-d8	99.6		% Rec.	8260B	10/24/13	1
Dibromofluoromethane	108.		% Rec.	8260B	10/24/13	1
a,a,a-Trifluorotoluene	103.		% Rec.	8260B	10/24/13	1
4-Bromofluorobenzene	93.6		% Rec.	8260B	10/24/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

.
Reported: 10/25/13 16:09 Printed: 10/25/13 17:13

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REPORT OF ANALYSIS

Chris Hines
EnCana Oil & Gas - Parachute, CO
143 Diamond Avenue
Parachute, CO 81635

October 25, 2013

ESC Sample # : L664031-07

Site ID : WDC

Project # : WDC-01E

Date Received : October 18, 2013
Description : West Divide Creek-Quarterly

Sample ID : MW-22-101713

Collected By : Shad Johnson
Collection Date : 10/17/13 12:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Methane	BDL	0.010	mg/l	RSK175	10/24/13	1
Benzene	BDL	0.0010	mg/l	8260B	10/24/13	1
Toluene	BDL	0.0050	mg/l	8260B	10/24/13	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	10/24/13	1
Total Xylenes	BDL	0.0030	mg/l	8260B	10/24/13	1
Surrogate Recovery						
Toluene-d8	100.		% Rec.	8260B	10/24/13	1
Dibromofluoromethane	112.		% Rec.	8260B	10/24/13	1
a,a,a-Trifluorotoluene	106.		% Rec.	8260B	10/24/13	1
4-Bromofluorobenzene	89.9		% Rec.	8260B	10/24/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

.
Reported: 10/25/13 16:09 Printed: 10/25/13 17:13

Summary of Remarks For Samples Printed
10/25/13 at 17:13:17

TSR Signing Reports: 358
R5 - Desired TAT

Log ALL samples for EDD (COGCC EDD). Log all PAHs as PAHSIM. DRO and DRO-SGT needed if TPH is listed twice on COC, one being TPH-GEL EXTRACT.

Sample: L664031-01 Account: ENCANACO Received: 10/18/13 09:30 Due Date: 10/25/13 00:00 RPT Date: 10/25/13 16:09

Sample: L664031-02 Account: ENCANACO Received: 10/18/13 09:30 Due Date: 10/25/13 00:00 RPT Date: 10/25/13 16:09

Sample: L664031-03 Account: ENCANACO Received: 10/18/13 09:30 Due Date: 10/25/13 00:00 RPT Date: 10/25/13 16:09

Sample: L664031-04 Account: ENCANACO Received: 10/18/13 09:30 Due Date: 10/25/13 00:00 RPT Date: 10/25/13 16:09

Sample: L664031-05 Account: ENCANACO Received: 10/18/13 09:30 Due Date: 10/25/13 00:00 RPT Date: 10/25/13 16:09

Sample: L664031-06 Account: ENCANACO Received: 10/18/13 09:30 Due Date: 10/25/13 00:00 RPT Date: 10/25/13 16:09

Sample: L664031-07 Account: ENCANACO Received: 10/18/13 09:30 Due Date: 10/25/13 00:00 RPT Date: 10/25/13 16:09

Company Name/Address:
Encana
143 Diamond Ave
Parachute, CO 81635
***ENCRCO* - ENCRCO-RULEENG**

Billing Information:
Charles Jensen
143 Diamond Ave
Parachute, CO 81635
970-285-2735

Report to: **Charles Jensen**

Email To: **charles.jensen@encana.com**

Project Description: **West Divide Creek-Quarterly**

City/State Collected: **CO**

Phone:
Fax: **970-285-2735**

Client Project # **WDC-O1E**

Lab Project # **ENCRCO-RULEENG**

Collected by (print): **Shad Johnson**

Site/Facility ID # **WDC**

P.O. #

Collected by (signature):

Immediately Packed on Ice N ___ Y X

Rush? (Lab MUST Be Notified)
___ Same Day 200%
___ Next Day 100%
___ Two Day 50%
___ Three Day 25%

Date Results Needed

Email? ___No ✓Yes
FAX? ✓No ___Yes

Analysis / Container / Preservative

Chain of Custody Page ___ of ___

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12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

L# L664631

E085

Acctnum:
Template:
Prelogin:
TSR:
Cooler:
Shipped Via:

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	BTEX (8260)	CH4	Rem./Contaminant	Sample # (lab only)
MW-2-101713	Grab	GW	NA	10/17/13	1015	6	X	X		01
MW-4-101713	Grab	GW	NA	10/17/13	1045	6	X	X		02
MW-8-101713	Grab	GW	NA	10/17/13	1115	6	X	X		03
MW-12-101713	Grab	GW	NA	10/17/13	1130	6	X	X		04
MW-17-101713	Grab	GW	NA	10/17/13	1215	6	X	X		05
MW-20-101713	Grab	GW	NA	10/17/13	1145	6	X	X		06
MW-22-101713	Grab	GW	NA	10/17/13	1200	6	X	X		07

* Matrix: **SS** - Soil **GW** - Groundwater **WW** - WasteWater **DW** - Drinking Water **OT** - Other_____

pH _____ Temp _____

Flow _____ Other _____

5622397 90965

Remarks:

Hold #

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Samples returned via: ☐ UPS ☑ FedEx ☐ Courier ☐ ____	Condition: 5 (lab use only)
	10-17-13	1600			
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: 3.4 °C Bottles Received: 42	COC Seal Intact: ✓Y ___N ___NA
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 10/18/13 Time: 0930	pH Checked: NCF:

Appendix B

(Electronic Attachment)