



enhance



**ENHANCE ENERGY CLIVE MMV PLAN
APPENDICES O:**

Baseline Water Test Reports

July, 2019

Baseline Water Well Test Report [Export to Excel](#)

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Baseline Water Well Testing Report		
Test ID	Date Of Test	Resource Development Company
2002341	June 5, 2017	Ember Resources Inc.

Background Information				Contact Information		
Purpose of Well Test	Is the resource well completed above or below the Base of Groundwater Protection?	Is this a Pre-or-Post-drill Test?	Did the Landowner refuse testing?	APEGA overseer company name	Yield test company name	Water sampler company name
CBM Development	Above	Pre-Test	NO	0910780 BC Ltd	Jag and Sons Consulting Ltd.	Jag and Sons Consulting Ltd.

Water Well Information								
GIC Well ID	Legal Land Location	GPS Coordinates	Elevation * amsl(m)	Description of water well location	Current well use	Year Drilled	Well Depth	Is the well in a pit?
	NE-27-39-24-4	52.388884N, -113.364864W	858.00 metres	10 meters northwest of house		0	24.38 metres	NO
*amsl = above mean sea level								
Landowner Comments								

Water Quality			
Lab Name	Lab Location	Lab Sample Number	Date received by lab
ALS Environmental	Calgary	L1936810-1	June 5, 2017
Description of sampling location		Comments on sample collection	
hose bibb on west side of house			
Parameter Name	Result	GCDWQ Criteria	Type of objective: MAC or Aesthetic
Bicarbonate	420 mg/L		
Calcium	82.3 mg/L		
Carbonate	< 5.0 mg/L		
Chloride	5.06 mg/L	250 mg/L	Aesthetic
Electrical Conductivity	727 µS/cm		
Escherichia coli	< 1 mpn/100mL	0 mpn/100mL	MAC
Fluoride	0.118 mg/L	1.5 mg/L	MAC
Hydroxide	< 5.0 mg/L		
Ionic Balance	102 %		
Iron	< 0.030 mg/L	0.3 mg/L	Aesthetic
Iron (Total)	< 0.030 mg/L	0.3 mg/L	Aesthetic
Iron Related Bacteria	35000 cfu/mL		
Magnesium	35 mg/L		
Manganese	< 0.0050 mg/L	0.05 mg/L	Aesthetic
Manganese (total)	< 0.0050 mg/L	0.05 mg/L	Aesthetic
Nitrate as Nitrogen	4.55 mg/L	10 mg/L	MAC
Nitrite + Nitrate as Nitrogen	4.55 mg/L	10 mg/L	MAC
Nitrite as Nitrogen	< 0.010 mg/L	1 mg/L	MAC
pH	7.86	6.5 - 8.5	Aesthetic
Potassium	2.69 mg/L		
Sodium	31.4 mg/L	200 mg/L	Aesthetic
Sulphate	44.6 mg/L	500 mg/L	Aesthetic
Sulphate Reducing Bacteria	< 1.0 cfu/mL		
Temperature of sample upon receipt by lab	6 °C	4 °C	CBM Standard
Total alkalinity	344 mg/L		
Total Coliforms	< 1 mpn/100mL	0 mpn/100mL	MAC
Total dissolved solids	428 mg/L	500 mg/L	Aesthetic
Total hardness	350 mg/L		
Water Analysis Comments			
Bacterial Analysis Comments			

Gas Composition		
Lab Name	Lab Location	Lab Sample Number
Compound	Concentration (ppm)	Detection Limit (ppm)

Iso Analysis *		
Lab Name	Lab Location	Lab Sample Number
Compound	Stable carbon isotope ratio (delta-13C per mil PDB)	
Gas Analysis Comments		

Field Measurements and Observations	
Electrical Conductivity	610.00 µS/cm
Dissolved Oxygen	
pH	8.00 pH Units
Temperature	7.30 °C
Colour	None
Odour	None
Sediment	Small amount of black sediment
Turbidity	None
Debris	None

Exceedances	
Was there an exceedance of the GCDWQ criteria?	NO
If yes, when was the Landowner notified?	

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Yield Test						
Distance from ground to top of casing	Location from which water level measurements taken	Non-pumping water level	Is the well flowing?	Was the pressure system disconnected?	If not, explain	Constant pumping rate
1.00 metres	Top of Casing	11.270 metres	No	No	Not practical	18.18 L/min

Was a yield test performed?	If no, explain	If a spring, what is the flow rate
Yes		

Was free gas observed in FTC?	Flow rate of water through FTC	Total volume of water passed through FTC	Total volume of gas collected in FTC	Location of sample in water distribution system	Sample collected after pressure tank?
No	6.82 L/min	818.28 Litres	0.000 Litres	hose bibb on west side of house	Yes

FTC = Flow Through Cell

Drawdown			Recovery	
Time of Measurement (min)	Water Level (m)	Discharge Rate (L/min)	Time of Measurement (min)	Water Level (m)
0.00	11.270		0.00	11.910
1.00	11.760		1.00	11.290
2.00	11.290			
3.00	11.420			
4.00	11.800			
5.00	11.380			
6.00	11.290			
7.00	11.800			
8.00	11.290			
9.00	11.780			
10.00	11.910			
15.00	11.900			
20.00	11.860			
25.00	11.290			
30.00	11.810			
40.00	11.760			
50.00	11.860			
60.00	11.300			
70.00	11.830			
80.00	11.290			
90.00	11.900			
100.00	11.760			
120.00	11.910			

Yield Test Comments

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Baseline Water Well Testing Report		
Test ID	Date Of Test	Resource Development Company
1208075	February 4, 2009	Fairborne Energy

Background Information				Contact Information		
Purpose of Well Test	Is the resource well completed above or below the Base of Groundwater Protection?	Is this a Pre-or-Post-drill Test?	Did the Landowner refuse testing?	APEGA overseer company name	Yield test company name	Water sampler company name
CBM Development	Below	Pre-Test	YES	Nor-Alta Environmental Services Ltd.	Unknown	Water Testing Samples Ltd.

Water Well Information								
GIC Well ID	Legal Land Location	GPS Coordinates	Elevation * amsl(m)	Description of water well location	Current well use	Year Drilled	Well Depth	Is the well in a pit?
	NE-27-039-24-W4	52.386833N, -113.369450W		unknown	Domestic and Agricultural (stock, irrigation)	0	24.24 metres	NO

*amsl = above mean sea level

Landowner Comments

Water Quality			
Lab Name	Lab Location	Lab Sample Number	Date received by lab
Norwest Labs	Edmonton	A046632-2	February 5, 2009
Description of sampling location		Comments on sample collection	
Hose attached to hydrant			
Parameter Name	Result	GCDWQ Criteria	Type of objective: MAC or Aesthetic
Bicarbonate	436 mg/L		
Calcium	75.2 mg/L		
Carbonate	< 6 mg/L		
Chloride	1.8 mg/L	250 mg/L	Aesthetic
Electrical Conductivity	678 µS/cm		
Escherichia coli	< 1 cfu/100mL	0 cfu/100mL	MAC
Hydroxide	< 5 mg/L		
Ionic Balance	93 %		
Iron	< 0.01 mg/L	0.3 mg/L	Aesthetic
Iron Related Bacteria	9000 cfu/mL		
Magnesium	29.5 mg/L		
Manganese	< 0.005 mg/L	0.05 mg/L	Aesthetic
Methane (Dissolved)	< 0.003 mg/L		
Nitrate as Nitrogen	1.98 mg/L	10 mg/L	MAC
Nitrite + Nitrate as Nitrogen	1.98 mg/L	10 mg/L	MAC
Nitrite as Nitrogen	< 0.005 mg/L	1 mg/L	MAC
pH	7.95	6.5 - 8.5	Aesthetic
Potassium	2.7 mg/L		
Sodium	32.4 mg/L	200 mg/L	Aesthetic
Sulphate	32.1 mg/L	500 mg/L	Aesthetic
Temperature of sample upon receipt by lab	21.2 °C	4 °C	CBM Standard
Total alkalinity	358 mg/L		
Total Coliforms	< 1 cfu/100mL	0 cfu/100mL	MAC
Total dissolved solids	398 mg/L	500 mg/L	Aesthetic
Total hardness	309 mg/L		
Water Analysis Comments			
No comments			
Bacterial Analysis Comments			

Gas Composition		
Lab Name	Lab Location	Lab Sample Number
Compound	Concentration (ppm)	Detection Limit (ppm)

Iso Analysis *		
Lab Name	Lab Location	Lab Sample Number
Compound	Stable carbon isotope ratio (delta-13C per mil PDB)	
Gas Analysis Comments		

Field Measurements and Observations	
Electrical Conductivity	680.00 µS/cm
Dissolved Oxygen	
pH	7.48 pH
Temperature	5.90 °C
Colour	clear
Odour	none
Sediment	few particles
Turbidity	none
Debris	none

Exceedances	
Was there an exceedance of the GCDWQ criteria?	NO
If yes, when was the Landowner notified?	

Baseline Water Well Test Report

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Yield Test						
Distance from ground to top of casing	Location from which water level measurements taken	Non-pumping water level	Is the well flowing?	Was the pressure system disconnected?	If not, explain	Constant pumping rate
						36.00 L/min

Was a yield test performed?	If no, explain	If a spring, what is the flow rate
No	Landowner declined testing	

Was free gas observed in FTC?	Flow rate of water through FTC	Total volume of water passed through FTC	Total volume of gas collected in FTC	Location of sample in water distribution system	Sample collected after pressure tank?
No	36.00 L/min	1080.00 Litres		Hose attached to hydrant	No

FTC = Flow Through Cell

Drawdown			Recovery	
Time of Measurement (min)	Water Level (m)	Discharge Rate (L/min)	Time of Measurement (min)	Water Level (m)

Yield Test Comments
No comments

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Baseline Water Well Testing Report		
Test ID	Date Of Test	Resource Development Company
1194455	August 13, 2007	Encana Corporation

Background Information				Contact Information		
Purpose of Well Test	Is the resource well completed above or below the Base of Groundwater Protection?	Is this a Pre-or-Post-drill Test?	Did the Landowner refuse testing?	APEGA overseer company name	Yield test company name	Water sampler company name
CBM Development			NO	Hydrogeological Consultants Ltd. (HCL)	Lousana Water Wells (1987) Ltd.	Lousana Water Wells (1987) Ltd.

Water Well Information								
GIC Well ID	Legal Land Location	GPS Coordinates	Elevation * amsl(m)	Description of water well location	Current well use	Year Drilled	Well Depth	Is the well in a pit?
	15-02-040-24-W4	52.416361N, -113.346805W		Unknown	Domestic	0		

*amsl = above mean sea level

Landowner Comments

Water Quality			
Lab Name	Lab Location	Lab Sample Number	Date received by lab
Bodycote Testing Group	Edmonton	566324-1	August 13, 2007
Description of sampling location		Comments on sample collection	
[unknown]			

Parameter Name	Result	GCDWQ Criteria	Type of objective: MAC or Aesthetic
Bicarbonate	556 mg/L		
Calcium	61 mg/L		
Carbonate	< 6 mg/L		
Chloride	0.8 mg/L	250 mg/L	Aesthetic
Electrical Conductivity	871 µS/cm		
Fecal Coliforms	< 1 cfu/100mL	0 cfu/100mL	MAC
Fluoride	0.12 mg/L	1.5 mg/L	MAC
Ionic Balance	100 %		
Iron	0.66 mg/L	0.3 mg/L	Aesthetic
Iron (Total)	1.1 mg/L	0.3 mg/L	Aesthetic
Iron Related Bacteria	2300 cfu/mL		
Magnesium	21.9 mg/L		
Manganese	0.123 mg/L	0.05 mg/L	Aesthetic
Manganese (total)	0.116 mg/L	0.05 mg/L	Aesthetic
Nitrate as Nitrogen	< 0.01 mg/L	10 mg/L	MAC
Nitrite + Nitrate as Nitrogen	< 0.02 mg/L	10 mg/L	MAC
Nitrite as Nitrogen	< 0.005 mg/L	1 mg/L	MAC
pH	8	6.5 - 8.5	Aesthetic
Potassium	2.4 mg/L		
Sodium	126 mg/L	200 mg/L	Aesthetic
Sulphate	65.5 mg/L	500 mg/L	Aesthetic
Sulphate Reducing Bacteria	< 0.3 mpn/mL		
Temperature of sample upon receipt by lab	21.4 °C	4 °C	CBM Standard
Total alkalinity	456 mg/L		
Total Coliforms	< 1 cfu/100mL	0 cfu/100mL	MAC
Total dissolved solids	552 mg/L	500 mg/L	Aesthetic
Total hardness	243 mg/L		

Water Analysis Comments

Bacterial Analysis Comments

Gas Composition		
Lab Name	Lab Location	Lab Sample Number
Compound	Concentration (ppm)	Detection Limit (ppm)

Iso Analysis *		
Lab Name	Lab Location	Lab Sample Number
Compound	Stable carbon isotope ratio (delta-13C per mil PDB)	
Gas Analysis Comments		

Field Measurements and Observations	
Electrical Conductivity	
Dissolved Oxygen	
pH	
Temperature	
Colour	
Odour	
Sediment	
Turbidity	
Debris	

Exceedances	
Was there an exceedance of the GCDWQ criteria?	
If yes, when was the Landowner notified?	

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Yield Test						
Distance from ground to top of casing	Location from which water level measurements taken	Non-pumping water level	Is the well flowing?	Was the pressure system disconnected?	If not, explain	Constant pumping rate
0.61 metres	Top of Casing	62.780 metres		Yes		22.44 L/min

Was a yield test performed?	If no, explain	If a spring, what is the flow rate

Was free gas observed in FTC?	Flow rate of water through FTC	Total volume of water passed through FTC	Total volume of gas collected in FTC	Location of sample in water distribution system	Sample collected after pressure tank?

FTC = Flow Through Cell

Drawdown			Recovery	
Time of Measurement (min)	Water Level (m)	Discharge Rate (L/min)	Time of Measurement (min)	Water Level (m)
0.00	62.780		1.00	66.650
1.00			2.00	66.020
2.00	65.430	23.09	3.00	64.210
3.00	65.900	23.09	4.00	63.720
4.00	66.100	23.09	6.00	63.270
5.00			8.00	63.120
6.00	66.300	23.09	10.00	63.040
7.00			20.00	62.880
8.00	66.390	23.09	25.00	62.870
9.00			40.00	62.840
10.00	66.470	23.09	50.00	62.830
15.00			80.00	62.830
20.00	66.640	22.33	100.00	62.820
25.00	66.680	22.33	120.00	62.820
30.00				
35.00				
40.00	66.780	22.33		
50.00	66.820	22.33		
60.00				
70.00				
80.00	66.860	22.33		
90.00				
100.00	66.930	22.33		
120.00	66.980	22.33		

Yield Test Comments
Aquifer test conducted by Lousana Water Wells (1987) Ltd. Driller reported groundwater as 'clean and clear'. Groundwater discharged from yard hydrant.

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Baseline Water Well Testing Report		
Test ID	Date Of Test	Resource Development Company
1163875	August 23, 2006	Fairborne Energy

Background Information				Contact Information		
Purpose of Well Test	Is the resource well completed above or below the Base of Groundwater Protection?	Is this a Pre-or-Post-drill Test?	Did the Landowner refuse testing?	APEGA overseer company name	Yield test company name	Water sampler company name
CBM Development			NO	Nor-Alta Environmental Services Ltd.	Nor-Alta Environmental Services Ltd.	Nor-Alta Environmental Services Ltd.

Water Well Information								
GIC Well ID	Legal Land Location	GPS Coordinates	Elevation * amsl(m)	Description of water well location	Current well use	Year Drilled	Well Depth	Is the well in a pit?
	SW-35-039-24-W4	52.394131N, -113.357455W		Unknown	Household	1967	90.00 feet	
*amsl = above mean sea level								
Landowner Comments								

Water Quality			
Lab Name	Lab Location	Lab Sample Number	Date received by lab
Norwest Labs	Edmonton	487589-1	August 24, 2006
Description of sampling location		Comments on sample collection	
Parameter Name	Result	GCDWQ Criteria	Type of objective: MAC or Aesthetic
Bicarbonate	419 mg/L		
Calcium	63.8 mg/L		
Carbonate	< 6 mg/L		
Chloride	3.6 mg/L	250 mg/L	Aesthetic
Colour	< 5 TCU	15 TCU	Aesthetic
Electrical Conductivity	651 µS/cm		
Fecal Coliforms	< 1 cfu/100mL	0 cfu/100mL	MAC
Fluoride	0.14 mg/L	1.5 mg/L	MAC
Hydroxide	< 5 mg/L		
Ionic Balance	102 %		
Iron	0.09 mg/L	0.3 mg/L	Aesthetic
Iron (Total)	< 0.1 mg/L	0.3 mg/L	Aesthetic
Iron Related Bacteria	< 200 cfu/mL		
Magnesium	32.4 mg/L		
Manganese	0.325 mg/L	0.05 mg/L	Aesthetic
Manganese (total)	0.426 mg/L	0.05 mg/L	Aesthetic
Nitrate as Nitrogen	< 0.01 mg/L	10 mg/L	MAC
Nitrite + Nitrate as Nitrogen	< 0.02 mg/L	10 mg/L	MAC
Nitrite as Nitrogen	< 0.005 mg/L	1 mg/L	MAC
pH	8.18	6.5 - 8.5	Aesthetic
Potassium	2.4 mg/L		
Sodium	39.4 mg/L	200 mg/L	Aesthetic
Sulphate	27 mg/L	500 mg/L	Aesthetic
Sulphate Reducing Bacteria	21 mpn/mL		
Total alkalinity	343 mg/L		
Total Coliforms	< 1 cfu/100mL	0 cfu/100mL	MAC
Total dissolved solids	374 mg/L	500 mg/L	Aesthetic
Total hardness	293 mg/L		
Turbidity	22.4 NTU	0.3 NTU	MAC
Water Analysis Comments			
Bacterial Analysis Comments			

Gas Composition		
Lab Name	Lab Location	Lab Sample Number
Compound	Concentration (ppm)	Detection Limit (ppm)

Iso Analysis *		
Lab Name	Lab Location	Lab Sample Number
Compound	Stable carbon isotope ratio (delta-13C per mil PDB)	
Gas Analysis Comments		

Field Measurements and Observations	
Electrical Conductivity	
Dissolved Oxygen	
pH	
Temperature	
Colour	
Odour	
Sediment	
Turbidity	
Debris	

Exceedances	
Was there an exceedance of the GCDWQ criteria?	
If yes, when was the Landowner notified?	

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Yield Test						
Distance from ground to top of casing	Location from which water level measurements taken	Non-pumping water level	Is the well flowing?	Was the pressure system disconnected?	If not, explain	Constant pumping rate
				No		

Was a yield test performed?	If no, explain	If a spring, what is the flow rate

Was free gas observed in FTC?	Flow rate of water through FTC	Total volume of water passed through FTC	Total volume of gas collected in FTC	Location of sample in water distribution system	Sample collected after pressure tank?
No					

FTC = Flow Through Cell

Drawdown			Recovery	
Time of Measurement (min)	Water Level (m)	Discharge Rate (L/min)	Time of Measurement (min)	Water Level (m)

Yield Test Comments
DRAWDOWN AND RECOVERY NOT PERFORMED DUE TO INACCESSIBILITY OF THE WELLS