Ressources naturelles Canada
Commission géologique du Canada

Natural Resources Canada
Geological Survey of Canada

Mr. Craig Arbeau and Mr. Dave Graves
Corridor Resources Inc.
12317 Rte. 114
Penobsquis, NB, E4G 2X9

January 18, 2019

Subject : Complete analytical results for water sampled in the 11 GSC monitoring wells

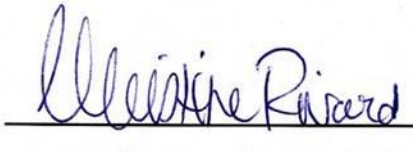
Dear Mr. Arbeau and Mr. Graves,

Between 2015 and 2018, you gave us permission to drill 11 monitoring wells (named PO-01 to PO-09, and PO-13 to PO-14; see Table 1 for details) on the Corridor wellpads in the McCully gas field, and to sample and analyze water from these wells on multiple occasions. As explained at the beginning, this activity is part of a project carried out by Natural Resources Canada, which aims at evaluating the potential impacts of shale gas activities on groundwater quality in the McCully gas field and Elgin areas, near Sussex. The sampling is now finished, and the analytical results obtained from the monitoring wells drilled on the pads and from the other wells sampled in the area have allowed us to assess the quality of groundwater, better understand the groundwater circulation in this area, and identify, when present, the origin of hydrocarbons in groundwater. While some data still need to be analyzed, our preliminary interpretation based on the available results of our chemical analyses of the groundwater and rock is that the methane in groundwater in your region originates from shallow depths (likely within the upper 100 m or 300 ft), where it is either naturally produced by microorganisms or slowly released from shallow bedrock pores, which naturally contain hydrocarbons at some locations. The small concentrations of methane locally measured in some wells would thus not be related to hydraulic fracturing or activities associated to natural gas production in this area and its presence is harmless. In the coming year, data analysis will be completed, and we will send you a summary of our final interpretation concerning methane in groundwater in the McCully/Elgin region.

The groundwater samples collected from the monitoring wells drilled on the Corridor wellpads were analyzed for a series of physico-chemical parameters. As you will see, the wells were sampled for a wide suite of analytes on the first occasion, and then for a smaller selection of analytes on subsequent visits. You will find enclosed the results of all analyses, and a brief explanation on the analyzed parameters. Please note that all monitoring wells drilled on the Corridor wellpads were properly decommissioned during summer 2018. A report on their decommissioning is currently being prepared and will be sent shortly.

We take this opportunity to thank you again for your collaboration. Please do not hesitate to contact us if you have any question. We will of course send you any manuscript related to this project, prior to its publication.

Yours sincerely,



Geneviève Bordeleau, Ph.D.
Research scientist, geochemistry
418-654-2556
genevieve.bordeleau@canada.ca

Christine Rivard, Ph.D.
Research scientist and project leader
418-654-3173
christine.rivard@canada.ca

A) Choice of analyzed parameters

The parameters analyzed in this project were chosen in order to characterize the natural quality of groundwater from a geochemical standpoint. Firstly, concentrations of natural gas dissolved in water were analyzed. Natural gas is mainly composed of methane, with possible occurrence of other gases such as ethane and propane. Concentrations of these three gases were therefore analyzed, in addition to a series of 54 other volatile organic compounds (VOCs). Moreover, a series of general parameters was targeted, which are commonly analyzed in groundwater used for human consumption. These include various metals, and several anions such as nitrate and chloride. On the other hand, certain parameters which are not naturally or commonly found in groundwater (for example, pesticides), were not analyzed even if they are subjected to regulations regarding drinking water quality. Likewise, microbiological analyses (bacteria, viruses) were not performed. Finally, isotopic analyses were conducted on selected compounds, which help us characterize and understand the groundwater system.

B) Applicable water quality criteria

Some of the parameters analyzed in this project do not pose a known risk to human health, and are therefore not subjected to water quality guidelines. Inversely, for parameters which are known to pose a risk to human health, drinking water quality guidelines, expressed as Maximum Acceptable Concentrations (MACs), have been adopted by the Office of the Chief Medical Officer of Health - Public Health branch (OCMOH). Finally, other parameters analyzed within this project do not pose a health risk, but above certain concentrations they may cause a degradation of aesthetic properties of water (color, odor, taste…) or technical nuisance such as stains on clothes, the use of more soap than usual, or formation of mineral deposits (scale) in water heaters and pipes. For these parameters the OCMOH has adopted non-enforceable recommendations in the form of Aesthetic Objectives (AOs). You will find the MACs and AOs in the tables presenting your analytical results. They can also be consulted on the OCMOH website at: http://www2.gnb.ca/content/gnb/en/departments/ocmoh/healthy_environments/content/drinking_water_guidelines.html. Moreover, Health Canada has established a few other AOs and MACs that have not been retained by the OCMOH. For your information, we included these guidelines in the tables. For each AO or MAC, we indicate which regulatory organization (OCMOH or Health Canada) it is related to. Of note, a few VOCs (Table 4) have both an AO from OCMOH and a MAC from Health Canada, as different concentrations of these compounds can be associated with an unpleasant odor or a health risk.

C) Summary of analytical results

The results obtained on-site with a multi-parameter probe (Table 2), or from chemical analyses conducted in the laboratory (Tables 3-6), showed that water from the (now decommissioned) observation wells was of generally good quality. Only a few AOs (aesthetic objectives) were exceeded for pH, temperature, iron, manganese, sodium, chloride, sulfate and total dissolved solids. None of the MACs (health-based maximum allowed concentrations) were exceeded.

An in-depth interpretation of hydrocarbon origin will be sent in the following year.

Table 1. Location and depth of the monitoring wells.

Well ID	Drilling date	x coordinate	y coordinate	Projection	Corresponding Corridor wellpad	Total well depth (m)
PO-01	26-11-2015	310 809	5 070 597	UTM NAD 83 zone 20	O-76	50.3
PO-02	26-11-2015	313 893	5 072 388	UTM NAD 83 zone 20	N-57	50.3
PO-03	27-11-2015	316 438	5 073 673	UTM NAD 83 zone 20	G-48	50.3
PO-04	27-11-2015	310 110	5 067 616	UTM NAD 83 zone 20	C-75	50.3
PO-05	28-11-2015	320 805	5 073 135	UTM NAD 83 zone 20	H-28	50.3
PO-06	29-11-2015	314 936	5 070 566	UTM NAD 83 zone 20	P-56	50.3
PO-07	05-07-2016	310 116	5 067 610	UTM NAD 83 zone 20	C-75	50.3
PO-08	07-07-2016	336 133	5 078 234	UTM NAD 83 zone 20	G-41	39.6
PO-09	09-07-2016	314 941	5 070 570	UTM NAD 83 zone 20	P-56	80.2
PO-13	06-06-2018	313 892	5 072 390	UTM NAD 83 zone 20	N-57	50.6
PO-14	07-06-2018	310 812	5 070 601	UTM NAD 83 zone 20	O-76	50.7

Table 2. Physico-chemical parameters measured in the field. Cells highlighted in green indicate exceedance of the aesthetic objective (AO).

Well ID	Sampling Date	Sampling depth[1] (m)	Compound:	pH	Redox potential (ORP)[2]	Redox potential (Eh)[2]	Dissolved oxygen (DO)	Dissolved oxygen (DO)	Specific Conductivity	Salinity	Temperature
			Unit:		mV	mV	%	mg/L	µS/cm	PSU	ºC
			Detection Limit:								
			MAC[3]:								
			Reg. org.[5]:								
			AO[4]:	7.0-10.5							15
			Reg. org.[5]:	Health Can							Health Can
PO-01	2015-12-02	45.0		7.68	132.5	337.5	33.80	4.00	2653	1.38	7.32
	02-03-2016	45.0		7.64	188.4	393.4	23.40	2.79	2909	1.51	6.81
	08-08-2016	40.0		8.21	46.5	251.5	20.80	2.25	3015	1.58	11.47
	08-11-2016	40.0		7.62	59.7	264.7	20.1	2.24	3238	1.72	9.56
	07-03-2017	40.0		7.45	80.6	285.6	25.4	3.07	3123	1.64	6.76
	22-06-2017	40.0		7.64	134.7	339.7	26.90	2.88	3194	1.68	12.01
	11-10-2017	40.0		7.68	99.8	304.8	30.40	3.49	3282	1.73	8.83
	14-02-2018	40.0		7.61	63.0	268.0	19.30	2.26	3209	1.69	7.84
PO-02	2015-12-02	artesian		7.65	61.4	266.4	64.7	7.84	987	0.49	7.89
	01-03-2016	artesian		7.48	65.6	270.6	69.3	8.26	679	0.33	7.51
	08-08-2016	artesian		7.81	131.3	336.3	60.30	7.10	755	0.37	7.85
	08-11-2016	artesian		8.85	-568.0	-363.0	0	0	439	0.21	12.73
PO-03	2015-12-02	45.0		8.05	120.3	325.3	93.8	11.01	173	0.08	7.84
	01-03-2016	45.0		8.00	94.9	299.9	73.6	9.16	184	0.09	5.89
	08-08-2016	33.0		7.61	105.3	310.3	77.7	8.2	166	0.08	12.53
	08-11-2016	33.0		7.48	174.7	379.7	79.2	8.88	191	0.09	9.17
PO-04	2015-12-02	45.0		7.25	48.8	253.8	7.9	0.92	458	0.22	7.98
	02-03-2016	45.0		7.62	154.0	359.0	49.2	5.77	378	0.18	7.11
	08-08-2016	18.4		7.43	11.6	216.6	0.00	0.00	419	0.20	14.99
	09-11-2016	18.4		7.27	20.4	225.4	0	0	431	0.21	12.48
	07-03-2017	18.4		7.10	-3.3	201.7	0	0	445	0.22	8.35
	22-06-2017	18.4		7.36	-115.7	89.3	2.00	0.21	449	0.22	12.50
	11-10-2017	18.4		7.15	-40.9	164.1	4.5	0.48	386	0.19	12.37
	14-02-2018	18.4		7.46	-114.6	90.4	0	0	465	0.23	9.24
	11-06-2018	18.4									
	21-08-2018	18.4									
PO-05	2015-12-03	20.0		5.93	62.7	267.7	13.30	1.52	204	0.10	8.3
	01-03-2016	20.0		5.46	201.7	406.7	13.50	1.60	121	0.06	7.08
	10-08-2016	16.5		6.60	129.4	334.4	4.6	0.46	142	0.07	16.04
	09-11-2016	16.5		5.86	188.0	393.0	0.00	0.00	118	0.06	11.38
PO-06	2015-12-03	45.0		7.84	86.5	291.5	26.50	2.96	274	0.13	9.09
	01-03-2016	45.0		7.58	81.6	286.6	10.1	1.18	304	0.15	8.24
	10-08-2016	46.0		8.56	-24.9	180.1	8.50	0.89	282	0.14	13.62
	09-11-2016	46.0		7.63	15.7	220.7	0	0	290	0.14	11.25
	07-03-2017	46.0		7.53	90.2	295.2	11.4	1.26	293	0.14	10.28
	11-07-2017	46.0		7.72	57.8	262.8	14.60	1.58	292	0.14	11.51

Table 2 (continued). Physico-chemical parameters measured in the field. Cells highlighted in green indicate exceedance of the aesthetic objective (AO).

Well ID	Sampling Date	Sampling depth[1] (m)	Compound:	pH	Redox potential (ORP)[2]	Redox potential (Eh)[2]	Dissolved oxygen (DO)	Dissolved oxygen (DO)	Specific Conductivity	Salinity	Temperature
			Unit:		mV	mV	%	mg/L	µS/cm	PSU	°C
			Detection Limit:								
			MAC[3]:								
			Reg. org.[5]:								
			AO[4]:	7.0-10.5							15
			Reg. org.[5]:	Health Can							Health Can
PO-07	08-08-2016	17.5		7.39	-60.8	144.2	2.7	0.29	388	0.19	10.66
	09-11-2016	17.5		7.76	28.3	233.3	0	0	448	0.22	13.98
	07-03-2017	17.5		7.62	32.6	237.6	0	0	463	0.22	8.63
	22-06-2017	17.5		7.38	-6.0	199.0	1	0.1	395	0.19	14.19
	11-10-2017	17.5		7.29	39.7	244.7	12.5	1.3	420	0.20	13.03
	14-02-2018	17.5		7.16	9.2	214.2	12.2	1.39	359	0.18	9.19
	11-06-2018	17.5									
	21-08-2018	17.5									
PO-08	10-08-2016	39.6									
	10-11-2016	39.6									
	12-10-2017	39.6									
PO-09	09-08-2016	45.8		7.88	-134.1	70.9	5.2	0.55	269	0.13	12.95
	09-11-2016	45.8		7.75	-27.1	177.9	0	0	289	0.14	10.64
	07-03-2017	45.0		7.76	20.2	225.2	4.4	0.48	294	0.14	10.49
	22-06-2017	45.0		7.71	-39.9	165.1	13.8	1.36	290	0.14	15.16
	11-10-2017	45.0		7.74	25.7	230.7	12.3	1.26	292	0.14	13.47
	14-02-2018	45.0		7.70	52.7	257.7	16.1	1.77	321	0.16	10.42
	11-06-2018	45.0									
	21-08-2018	45.0									
PO-13	11-06-2018	49.0									
PO-14	10-06-2018	49.7									

Table 3. Dissolved gas concentrations, and gas dryness ratio. nd= non detected

Well ID	Sampling Date	Sampling depth[1] (m)	Compound:	Methane	Methane	Ethane	Propane	Molar dryness ratio $C_1/(C_2+C_3)$
			Unit:	mg/L	µg/L	µg/L	µg/L	
			Detection Limit:	0.006	6	2	1	
			MAC[3]: Reg. org.[5]:					
			AO[4]: Reg. org.[5]:					
PO-01	02-12-2015	45.0		nd	nd	nd	trace	-
	02-03-2016	45.0		nd	nd	nd	nd	-
	08-08-2016	40.0		nd	nd	nd	nd	-
	08-11-2016	40.0		0.12	123	nd	nd	-
	07-03-2017	40.0		nd	nd	nd	nd	-
	22-06-2017	40.0		nd	nd	nd	nd	-
	11-10-2017	40.0		nd	nd	nd	nd	-
	14-02-2018	40.0		nd	nd	nd	nd	-
PO-02	02-12-2015	artesian		nd	nd	nd	nd	-
	01-03-2016	artesian		nd	nd	nd	nd	-
	08-08-2016	artesian		nd	nd	nd	nd	-
	08-11-2016	artesian		nd	nd	nd	nd	-
PO-03	02-12-2015	45.0		trace	trace	nd	nd	-
	01-03-2016	45.0		nd	nd	nd	nd	-
	08-08-2016	33.0		nd	nd	nd	nd	-
	08-11-2016	33.0		nd	nd	nd	nd	-
PO-04	02-12-2015	45.0		0.14	143	nd	trace	-
	02-03-2016	45.0		nd	nd	nd	nd	-
	08-08-2016	18.4		0.78	780	nd	nd	-
	09-11-2016	18.4		0.12	124	nd	nd	-
	07-03-2017	18.4		0.004	4	nd	nd	-
	22-06-2017	18.4		0.39	385	5	nd	144
	11-10-2017	18.4		nd	nd	nd	nd	-
	14-02-2018	18.4		0.14	139	nd	nd	-
	11-06-2018	18.4		0.34	335	nd	1	-
	21-08-2018	18.4		0.11	108	nd	nd	-
PO-05	03-12-2015	20.0		nd	nd	nd	nd	-
	01-03-2016	20.0		nd	nd	nd	nd	-
	10-08-2016	16.5		nd	nd	nd	nd	-
	09-11-2016	16.5		nd	nd	nd	nd	-
PO-06	03-12-2015	45.0		trace	trace	nd	trace	-
	01-03-2016	45.0		nd	nd	nd	nd	-
	10-08-2016	46.0		nd	nd	trace	5	-
	09-11-2016	46.0		nd	nd	nd	nd	-
	07-03-2017	46.0		nd	nd	nd	nd	-
	11-07-2017	46.0		nd	nd	nd	nd	-

Table 3 (continued). Dissolved gas concentrations, and gas dryness ratio. nd= non detected

Well ID	Sampling Date	Sampling depth[1] (m)	Compound:	Methane	Methane	Ethane	Propane	Molar dryness ratio $C_1/(C_2+C_3)$
			Unit:	mg/L	µg/L	µg/L	µg/L	
			Detection Limit:	0.006	6	2	1	
			MAC[3]: Reg. org.[5]:					
			AO[4]: Reg. org.[5]:					
PO-07	08-08-2016	17.5		0.84	843	trace	nd	-
	09-11-2016	17.5		0.19	192	nd	nd	-
	07-03-2017	17.5		nd	nd	nd	nd	-
	22-06-2017	17.5		0.20	195	7	nd	52
	11-10-2017	17.5		nd	nd	nd	nd	-
	14-02-2018	17.5		0.07	66	nd	nd	-
	11-06-2018	17.5		0.19	185	nd	nd	-
	21-08-2018	17.5		0.05	50	nd	nd	-
PO-08	10-08-2016	39.6		nd	nd	nd	nd	-
	10-11-2016	39.6		nd	nd	nd	nd	-
	12-10-2017	39.6		nd	nd	nd	nd	-
PO-09	09-08-2016	45.8		nd	nd	45	nd	-
	09-11-2016	45.8		nd	nd	nd	9	-
	07-03-2017	45.0		nd	nd	nd	nd	-
	22-06-2017	45.0		0.02	18	nd	nd	-
	11-10-2017	45.0		nd	nd	nd	nd	-
	14-02-2018	45.0		nd	nd	nd	nd	-
	11-06-2018	45.0		nd	nd	nd	1	-
	21-08-2018	45.0		0.01	9	nd	nd	-
PO-13	11-06-2018	49.0		nd	nd	nd	1	-
PO-14	10-06-2018	49.7		0.01	9	nd	1	-

Table 4. Volatile organic compounds (VOCs)[6]. nd= non detected

Well ID	Sampling date	Sampling depth[1] (m)	Compound:	benzene	toluene	ethylbenzene	m- and para-xylene[7]	o-xylene[7]	1,3,5-trimethyl-benzene	naphthalene	styrene
			Unit:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
			Detection Limit:	0.00015	0.00009	0.00012	0.00007	0.00007	0.00006	0.00027	0.00007
			MAC[3]:	0.005	0.06	0.14	0.09	0.09			
			Reg. org.[5]:	OCMOH	Health Can.	Health Can.	Health Can.	Health Can.			
			AO[4]:		0.024	0.0024	0.3	0.3			
			Reg. org.[5]:		OCMOH	OCMOH	OCMOH	OCMOH			
PO-01	02-12-2015	45.0		nd	0.006	0.002	0.0015	0.0015	nd	nd	nd
	02-03-2016	45.0		trace	trace	nd	nd	nd	nd	trace	nd
	08-08-2016	40.0		nd	0.0003	nd	trace	nd	trace	nd	nd
	08-11-2016	40.0									
	07-03-2017	40.0									
	22-06-2017	40.0									
	11-10-2017	40.0									
	14-02-2018	40.0									
PO-02	02-12-2015	artesian		nd	0.0065	0.002	0.0015	0.0015	nd	nd	nd
	01-03-2016	artesian		trace	0.00024	trace	0.00007	trace	nd	nd	nd
	08-08-2016	artesian		nd	0.00014	nd	nd	nd	nd	nd	nd
	08-11-2016	artesian									
PO-03	02-12-2015	45.0		nd	0.008	0.002	0.0015	0.0015	nd	nd	nd
	01-03-2016	45.0		nd	nd	trace	nd	nd	trace	nd	nd
	08-08-2016	33.0		nd	0.0008	nd	trace	nd	0.00011	trace	nd
	08-11-2016	33.0									
PO-04	02-12-2015	45.0		nd	0.007	0.002	0.0015	0.0015	nd	nd	nd
	02-03-2016	45.0		nd	0.00024	trace	trace	trace	trace	trace	nd
	08-08-2016	18.4		nd	0.0007	trace	trace	nd	trace	trace	nd
	09-11-2016	18.4									
	07-03-2017	18.4									
	22-06-2017	18.4									
	11-10-2017	18.4									
	14-02-2018	18.4									
	11-06-2018	18.4									
	21-08-2018	18.4									
PO-05	03-12-2015	20.0		nd	0.005	0.002	0.0015	0.0015	nd	nd	nd
	01-03-2016	20.0		nd	0.00032	trace	trace	trace	0.00008	trace	nd
	10-08-2016	16.5		nd	0.0023	trace	trace	nd	0.00004	trace	nd
	09-11-2016	16.5									
PO-06	03-12-2015	45.0		nd	0.009	0.002	0.0015	0.0015	nd	nd	nd
	01-03-2016	45.0		nd	nd	nd	nd	nd	nd	nd	nd
	10-08-2016	46.0		nd	0.0008	trace	trace	nd	nd	nd	trace
	09-11-2016	46.0									
	07-03-2017	46.0									
	11-07-2017	46.0									

Table 4 (continued). Volatile organic compounds (VOCs)[6]. nd= non detected

Well ID	Sampling date	Sampling depth[1] (m)	Compound:	benzene	toluene	ethylbenzene	m- and para-xylene[7]	o-xylene[7]	1,3,5-trimethyl-benzene	naphthalene	styrene
			Unit:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
			Detection Limit:	0.00015	0.00009	0.00012	0.00007	0.00007	0.00006	0.00027	0.00007
			MAC[3]:	0.005	0.06	0.14	0.09	0.09			
			Reg. org.[5]:	OCMOH	Health Can.	Health Can.	Health Can.	Health Can.			
			AO[4]:		0.024	0.0024	0.3	0.3			
			Reg. org.[5]:		OCMOH	OCMOH	OCMOH	OCMOH			
PO-07	08-08-2016	17.5		nd	0.0012	trace	trace	nd	nd	nd	trace
	09-11-2016	17.5									
	07-03-2017	17.5									
	22-06-2017	17.5									
	11-10-2017	17.5									
	14-02-2018	17.5									
	11-06-2018	17.5									
	21-08-2018	17.5									
PO-08	10-08-2016	39.6		nd	0.0005	nd	trace	nd	nd	nd	trace
	10-11-2016	39.6									
	12-10-2017	39.6									
PO-09	09-08-2016	45.8		nd	0.0011	nd	trace	nd	nd	trace	trace
	09-11-2016	45.8									
	07-03-2017	45.0									
	22-06-2017	45.0									
	11-10-2017	45.0									
	14-02-2018	45.0									
	11-06-2018	45.0									
	21-08-2018	45.0									
PO-13	11-06-2018	49.0									
PO-14	10-06-2018	49.7									

Table 5. Dissolved metals. Cells highlighted in green indicate exceedance of the aesthetic objective (AO). nd= non detected

Well ID	Sampling date	Sampling depth[1] (m)	Compound:	Alu-minum (Al)	Anti-mony (Sb)	Silver (Ag)	Arsenic (As)	Barium (Ba)	Beryl-lium (Be)	Bis-muth (Bi)	Boron (B)	Cad-mium (Cd)	Calcium (Ca)	Chro-mium (Cr)	Cobalt (Co)	Copper (Cu)	Tin (Sn)	Iron (Fe)	Li-thium (Li)	Magne-sium (Mg)	Manga-nese (Mn)	Molyb-denum (Mo)	Nickel (Ni)	Lead (Pb)	Potas-sium (K)	Selen-ium (Se)	Sili-cium (Si)	Stron-tium (Sr)	Sodium (Na)	Ura-nium (U)	Tita-nium (Ti)	Vana-dium (V)	Zinc (Zn)
			Unit:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
			Detection Limit:	0.01	0.001	0.0001	0.001	0.002	0.0005	0.0003	0.02	0.0002	0.3	0.0005	0.0005	0.0005	0.001	0.1	0.01	0.1	0.0004	0.0005	0.001	0.0001	0.1	0.001	0.1	0.002	0.1	0.001	0.01	0.002	0.005
			MAC[3]:		0.006		0.01	1			5	0.005		0.05										0.01		0.01				0.02			
			Reg. org.[5]:		OCMOH		OCMOH	OCMOH			OCMOH	OCMOH		OCMOH										OCMOH		OCMOH				OCMOH			
			AO[4]:								1							0.3			0.05								200				5
			Reg. org.[5]:								OCMOH							OCMOH			OCMOH								OCMOH				Health Can
PO-01	02-12-2015	45.0		nd	nd	nd	nd	0.0078	nd	nd	0.23	nd	400	0.0011	nd	0.00095	nd	nd	0.04	10.0	nd	0.00055	nd	nd	6.8	0.0011	5.2	13.00	260	0.02	nd	nd	nd
	02-03-2016	45.0																															
	08-08-2016	40.0																															
	08-11-2016	40.0																															
	07-03-2017	40.0																															
	22-06-2017	40.0																															
	11-10-2017	40.0																															
	14-02-2018	40.0																															
PO-02	02-12-2015	artesian		nd	nd	nd	nd	0.47	nd	nd	0.051	nd	140	nd	nd	0.00078	nd	0.21	0.017	5.3	0.0048	0.00054	nd	0.00029	3.4	nd	5.5	5.6	49	0.0092	nd	nd	nd
	01-03-2016	artesian																															
	08-08-2016	artesian																															
	08-11-2016	artesian																															
PO-03	02-12-2015	45.0		nd	nd	nd	nd	0.31	nd	nd	nd	nd	26	0.00054	nd	nd	nd	nd	nd	1.8	nd	nd	nd	nd	0.68	nd	6	0.072	3.9	nd	nd	nd	nd
	01-03-2016	45.0																															
	08-08-2016	33.0																															
	08-11-2016	33.0																															
PO-04	02-12-2015	45.0		nd	nd	nd	nd	0.79	nd	nd	0.02	nd	80	nd	nd	nd	nd	0.11	nd	4.2	0.023	nd	0.0014	nd	4	nd	5.9	0.54	9	0.0015	nd	nd	nd
	02-03-2016	45.0																															
	08-08-2016	18.4																															
	09-11-2016	18.4																															
	07-03-2017	18.4																															
	22-06-2017	18.4																															
	11-10-2017	18.4																															
	14-02-2018	18.4																															
	11-06-2018	18.4																															
	21-08-2018	18.4																															
PO-05	03-12-2015	20.0		nd	nd	nd	nd	0.35	nd	nd	nd	nd	8	0.0011	0.00053	0.0019	nd	0.48	nd	8.40	0.12	0.00084	0.0035	nd	1.7	nd	5.5	0.03	15	nd	nd	0.0026	0.017
	01-03-2016	20.0																															
	10-08-2016	16.5																															
	09-11-2016	16.5																															
PO-06	03-12-2015	45.0		nd	nd	nd	nd	0.1	nd	nd	nd	nd	38	nd	nd	nd	nd	nd	nd	6.90	0.01	0.0013	0.001	0.00011	2.1	nd	4.5	0.07	6.1	nd	nd	nd	nd
	01-03-2016	45.0																															
	10-08-2016	46.0																															
	09-11-2016	46.0																															
	07-03-2017	46.0																															
	11-07-2017	46.0																															

Table 5 (continued). Disolved metals. Dissolved metals. Cells highlighted in green indicate exceedance of the aesthetic objective (AO). nd= non detected

Well ID	Sampling date	Sampling depth[1] (m)	Compound:	Aluminum (Al)	Antimony (Sb)	Silver (Ag)	Arsenic (As)	Barium (Ba)	Beryllium (Be)	Bismuth (Bi)	Boron (B)	Cadmium (Cd)	Calcium (Ca)	Chromium (Cr)	Cobalt (Co)	Copper (Cu)	Tin (Sn)	Iron (Fe)	Lithium (Li)	Magnesium (Mg)	Manganese (Mn)	Molybdenum (Mo)	Nickel (Ni)	Lead (Pb)	Potassium (K)	Selenium (Se)	Silicium (Si)	Strontium (Sr)	Sodium (Na)	Uranium (U)	Titanium (Ti)	Vanadium (V)	Zinc (Zn)
			Unit:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
			Detection Limit:	0.01	0.001	0.0001	0.001	0.002	0.0005	0.0003	0.02	0.0002	0.3	0.0005	0.0005	0.0005	0.001	0.1	0.01	0.1	0.0004	0.0005	0.001	0.0001	0.1	0.001	0.1	0.002	0.1	0.001	0.01	0.002	0.005
			MAC[3]:		0.006		0.01	1			5	0.005		0.05										0.01		0.01				0.02			
			Reg. org.[5]:		OCMOH		OCMOH	OCMOH			OCMOH	OCMOH		OCMOH										OCMOH		OCMOH				OCMOH			
			AO[4]:													1		0.3			0.05								200				5
			Reg. org.[5]:													OCMOH		OCMOH			OCMOH								OCMOH				Health Can
PO-07	08-08-2016	17.5		nd	nd	nd	nd	0.84	nd	nd	nd	nd	78	0.0011	nd	0.0007	nd	nd	nd	3.2	0.12	0.00085	0.0025	nd	1.4	nd	5.2	0.093	8.7	nd	nd	nd	0.009
	09-11-2016	17.5																															
	07-03-2017	17.5																															
	22-06-2017	17.5																															
	11-10-2017	17.5																															
	14-02-2018	17.5																															
	11-06-2018	17.5																															
	21-08-2018	17.5																															
PO-08	10-08-2016	39.6																															
	10-11-2016	39.6																															
	12-10-2017	39.6																															
PO-09	09-08-2016	45.8		nd	nd	nd	nd	0.079	nd	nd	0.025	nd	38	nd	nd	nd	nd	nd	nd	7.7	0.047	0.0038	0.0012	nd	2	nd	4	0.089	7.6	0.0011	nd	nd	0.009
	09-11-2016	45.8																															
	07-03-2017	45.0																															
	22-06-2017	45.0																															
	11-10-2017	45.0																															
	14-02-2018	45.0																															
	11-06-2018	45.0																															
	21-08-2018	45.0																															
PO-13	11-06-2018	49.0		nd	nd	nd	0.00057	0.21	nd	nd	0.043	nd	170	0.00056	nd	nd	nd	nd	0.023	6.4	0.0019	0.00063	nd	nd	3.9	nd	6.8	7.1	64	0.014	nd	nd	nd
PO-14	10-06-2018	49.7		nd	nd	nd	0.00086	0.0078	nd	nd	0.22	nd	350	0.0013	nd	nd	nd	nd	0.037	9	0.0025	0.00062	0.0014	nd	6.1	0.0013	6.2	11	250	0.019	nd	nd	nd

Table 6. Major anions and general chemical parameters. Cells highlighted in green indicate exceedance of the aesthetic objective (AO). nd= non detected

Well ID	Sampling Date	Sampling depth[1] (m)	Compound:	Ammonia nitrogen ($N\text{-}NH_3$)	Fluoride (F)	Inorganic phosphorus (P)	Sulfide ($as\ S_2^-$)	Total alkalinity ($as\ CaCO_3$) pH 4.5	Bromide (Br^-)	Chloride (Cl^-)	Nitrate and Nitrite (as N)	Sulfate (SO_4)	Dissolved inorganic carbon (DIC)	Dissolved organic carbon (DOC)	Calculated hardness (Ca+Mg)	Calculated hardness (Ca+Mg)	Hardness class[8]	Total dissolved solids (TDS)	Salinity class (soft, brackish or saltwater)[9]
			Unit:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L $CaCO_3$	grains/gallon		mg/L	
			Detection Limit:	0.05	0.1	0.02	0.02	1	0.1	0.05	0.02	0.5	0.05	0.05					
			MAC[3]:		1.5						10								
			Reg. org.[5]:		OCMOH						OCMOH								
			AO[4]:				0.05			250		500						500	
			Reg. org.[5]:				Health Can			OCMOH		OCMOH						Health Can	
PO-01	02-12-2015	45.0		nd	nd	nd	nd	47	0.1	390	0.07	890	10.3	0.4	1041	61	very hard	1994	brackish
	02-03-2016	45.0											10.2						
	08-08-2016	40.0																	
	08-11-2016	40.0																	
	07-03-2017	40.0																	
	22-06-2017	40.0																	
	11-10-2017	40.0																	
	14-02-2018	40.0																	
PO-02	02-12-2015	artesian		nd	nd	nd	nd	75	nd	240	0.53	45	17.5	0.27	372	22	very hard	537	soft
	01-03-2016	artesian											19.6						
	08-08-2016	artesian																	
	08-11-2016	artesian																	
PO-03	02-12-2015	45.0		nd	nd	0.05	nd	76	nd	3.7	0.34	2.8	17.3	0.3	72	4	moderately soft	96	soft
	01-03-2016	45.0											17.2						
	08-08-2016	33.0																	
	08-11-2016	33.0																	
PO-04	02-12-2015	45.0		nd	nd	0.02	nd	210	nd	14	0.18	3.6	51.6	1.29	217	13	very hard	245	soft
	02-03-2016	45.0											24.9						
	08-08-2016	18.4											56.3						
	09-11-2016	18.4											59.0						
	07-03-2017	18.4																	
	22-06-2017	18.4																	
	11-10-2017	18.4																	
	14-02-2018	18.4																	
	11-06-2018	18.4																	
	21-08-2018	18.4																	
PO-05	03-12-2015	20.0		nd	nd	0.34	nd	42	nd	28	0.48	4.9	26.8	1.1	54	3.2	soft	98	soft
	01-03-2016	20.0											19.5						
	10-08-2016	16.5																	
	09-11-2016	16.5																	
PO-06	03-12-2015	45.0		nd	0.1	0.03	nd	130	nd	3.1	nd	6.2	30.5	0.8	123	7	hard	148	soft
	01-03-2016	45.0											34.0						
	10-08-2016	46.0																	
	09-11-2016	46.0																	
	07-03-2017	46.0																	
	11-07-2017	46.0																	

Table 6 (continued). Major anions and general chemical parameters. Cells highlighted in green indicate exceedance of the aesthetic objective (AO). nd= non detected

Well ID	Sampling Date	Sampling depth[1] (m)	Compound:	Ammonia nitrogen (N-NH_3)	Fluoride (F^-)	Inorganic phosphorus (P)	Sulfide (as S_2^-)	Total alkalinity (as $CaCO_3$) pH 4.5	Bromide (Br^-)	Chloride (Cl^-)	Nitrate and Nitrite (as N)	Sulfate (SO_4)	Dissolved inorganic carbon (DIC)	Dissolved organic carbon (DOC)	Calculated hardness (Ca+Mg)	Calculated hardness (Ca+Mg)	Hardness class[8]	Total dissolved solids (TDS)	Salinity class (soft, brackish or saltwater) [9]
			Unit:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L $CaCO_3$	grains/gallon		mg/L	
			Detection Limit:	0.05	0.1	0.02	0.02	1	0.1	0.05	0.02	0.5	0.05	0.05					
			MAC[3]: Reg. org.[5]:		1.5 OCMOH						10 OCMOH								
			AO[4]: Reg. org.[5]:				0.05 Health Can			250 OCMOH		500 OCMOH						500 Health Can	
PO-07	08-08-2016	17.5		0.04	nd	nd	nd	210	nd	8.9	0.04	4.2	56.2	1.22	208	12	very hard	241	soft
	09-11-2016	17.5											61.0						
	07-03-2017	17.5																	
	22-06-2017	17.5																	
	11-10-2017	17.5																	
	14-02-2018	17.5																	
	11-06-2018	17.5																	
	21-08-2018	17.5																	
PO-08	10-08-2016	39.6																	
	10-11-2016	39.6																	
	12-10-2017	39.6																	
PO-09	09-08-2016	45.8		nd	0.2	nd	nd	120	nd	4.4	nd	12	32.4	0.48	127	7	hard	155	soft
	09-11-2016	45.8											33.4						
	07-03-2017	45.0																	
	22-06-2017	45.0																	
	11-10-2017	45.0																	
	14-02-2018	45.0																	
	11-06-2018	45.0																	
	21-08-2018	45.0																	
PO-13	11-06-2018	49.0		nd	nd	nd	nd	71	0.1	300	0.42	110	17.2		451	26	very hard	710	soft
PO-14	10-06-2018	49.7		nd	nd	nd	nd	46	nd	410	0.08	910	11.1		912	53	very hard	1975	brackish

Table 7. Isotopic values.

Well ID	Sampling date	Sampling depth[(1)] (m)	Compound and related isotopic value:	Tritium (^3H)		DIC-^{14}C (corrected to -25‰ $\delta^{13}C$)		DIC-$\delta^{13}C$	DOC-$\delta^{13}C$	H_2O-$\delta^{18}O$	H_2O-$\delta^{17}O$	H_2O-δ^2H	CH_4-$\delta^{13}C$	CH_4-δ^2H	Strontium		^{222}Rn	
			Unit[(10)]:	TU	± 1σ	pmC	± 1σ	‰ (PDB)	‰ (PDB)	‰ (VSMOW)	‰ (VSMOW)	‰ (VSMOW)	(‰ PDB)	(‰ VSMOW)	$^{87}Sr/^{86}Sr$	± 2σ	Bq/L	± 2σ
PO-01	02-12-2015	45.0		<0.8	0.4	27.12	0.13	-13.66		-10.9	-6.3	-74.7			0.708126	0.000015	90.54	
	02-03-2016	45.0																
	08-08-2016	40.0																
	08-11-2016	40.0																
	07-03-2017	40.0																
	22-06-2017	40.0																
	11-10-2017	40.0																
	14-02-2018	40.0																
PO-02	02-12-2015	artesian		<0.8	0.4	44.64	0.19	-14.74		-11.13	-6.58	-75.9			0.708209	0.000016	44.86	
	01-03-2016	artesian																
	08-08-2016	artesian																
	08-11-2016	artesian																
PO-03	02-12-2015	45.0		3.0	0.5	66.15	0.21	-16.74		-11.0	-6.6	-75.5			0.708863	0.000017	46.62	
	01-03-2016	45.0																
	08-08-2016	33.0																
	08-11-2016	33.0																
PO-04	02-12-2015	45.0		3.1	0.4	72.93	0.21	-15.49		-9.96	-5.9	-67.5	-47.8	-214	0.708411	0.000014	100.15	
	02-03-2016	45.0																
	08-08-2016	18.4						-15.52					-34.5	-133				
	09-11-2016	18.4						-15.53					-40.1					
	07-03-2017	18.4																
	22-06-2017	18.4											-51.4	-246				
	11-10-2017	18.4																
	14-02-2018	18.4											-52.2	-243				
	11-06-2018	18.4											-61.1	-287				
	21-08-2018	18.4											-70.1	-281				
PO-05	03-12-2015	20.0		3.3	0.5	106.07	0.25	-24.64		-10.1	-5.8	-71.0			0.710856	0.000015	64.31	
	01-03-2016	20.0																
	10-08-2016	16.5																
	09-11-2016	16.5																
PO-06	03-12-2015	45.0		1.4	0.5	37.31	0.14	-17.3		-10.6	-5.7	-73.4			0.710355	0.000014	38.49	
	01-03-2016	45.0																
	10-08-2016	46.0																
	09-11-2016	46.0																
	07-03-2017	46.0																
	11-07-2017	46.0																

Table 7 (continued). Isotopic values.

Well ID	Sampling date	Sampling depth[(1)] (m)	Compound and related isotopic value:	Tritium (^3H)		DIC-^{14}C (corrected to -25‰ $\delta^{13}C$)		DIC-$\delta^{13}C$	DOC-$\delta^{13}C$	H_2O-$\delta^{18}O$	H_2O-$\delta^{17}O$	H_2O-δ^2H	CH_4-$\delta^{13}C$	CH_4-δ^2H	Strontium		^{222}Rn	
			Unit[(10)]:	TU	± 1σ	pmC	± 1σ	‰ (PDB)	‰ (PDB)	‰ (VSMOW)	‰ (VSMOW)	‰ (VSMOW)	(‰ PDB)	(‰ VSMOW)	$^{87}Sr/^{86}Sr$	± 2σ	Bq/L	± 2σ
PO-07	08-08-2016	17.5		4.1	0.5	74.19	0.22	-15.29		-9.4		-64.0	-47.2	-199	0.709837	0.000015	113.59	
	09-11-2016	17.5						-15.22					-49.2	-207				
	07-03-2017	17.5																
	22-06-2017	17.5											-52.2	-160				
	11-10-2017	17.5																
	14-02-2018	17.5											-51.4	-256				
	11-06-2018	17.5											-55.1	-279				
	21-08-2018	17.5																
PO-08	10-08-2016	?																
	10-11-2016	?																
	12-10-2017	?																
PO-09	09-08-2016	45.8		1.7	0.3	37.36	0.14	-17.26		-10.39		-69.5			0.709946	0.000016	28.90	
	09-11-2016	45.8						-16.7										
	07-03-2017	45.0																
	22-06-2017	45.0																
	11-10-2017	45.0																
	14-02-2018	45.0																
	11-06-2018	45.0																
	21-08-2018	45.0																
PO-13	11-06-2018	49.0		1.2	0.4					-10.7		-73.1			0.708197	0.000005	46.76	2.43
PO-14	10-06-2018	49.7		<0.8	0.3					-10.6		-71.4			0.708110	0.000005	77.10	3.96

(1): Wells were sampled at the depth where the most productive water-bearing fracture was identified using borehole geophysics.

(2): Redox potential values are reported in two ways, namely: 1) the ORP value which is provided by the multi-parameter probe containing an Ag/AgCl electrode, and 2) a corrected value (Eh) relative to the standard hydrogen electrode.

(3): MACs (maximum allowed concentrations) are health-based enforceable guidelines from the New Brunswick Office of the Chief Medical Officer of Health - Public Health branch (OCMOH). In addition, a few VOCs (toluene, ethylbenzene, xylene) have MACs determined by Health Canada, but which have not been retained by the OCMOH. They are nonetheless listed for your information.

(4): AOs (aesthetic objectives) are non-enforceable guidelines from the OCMOH. In addition, a few parameters (temperature, pH, total dissolved solids, sulfide and zinc) have AOs determined by Health Canada, but which have not been retained by the OCMOH. They are nonetheless listed for your information.

(5): Regulatory org. = regulatory organization (either Health Canada or OCMOH).

(6): Only VOCs that were detected in at least one sample are listed in Table 4. The complete list of analyzed VOCs and their detection limit is the following:

Compound	Detection limit (µg/L)	Compound	Detection limit (µg/L)	Compound	Detection limit (µg/L)
tribromomethane	0.14	trans-1,3-dichloropropene	0.20	bromobenzene	0.10
dichloroethene	0.12	toluene	0.09	propylbenzene	0.07
DCM	0.14	cis-1,3-dichloropropene	0.20	2-chlorotoluene	0.09
dichloroethene	0.14	1,1,2-trichloroethane	0.12	1,3,5-trimethylbenzene	0.06
dichloroethane	0.16	1,3-dichloropropane	0.16	4-chlorotoluene	0.08
dichloroethene	0.23	tetrachloroethylene	0.08	tert-butylbenzene	0.08
2,2 dichloropropane	0.23	dibromochloromethane	0.16	1,2,4-trimethylbenzene	0.07
trichloromethane	0.16	1,2-dibromoethane	0.27	(1-methylpropyl)benzene	0.07
bromochloromethane	0.12	chlorobenzene	0.09	isopropyltoluene	0.07
trichloroethane	0.12	1,1,1,2-tetrachloroethane	0.12	dichlorobenzene	0.07
tetrachloromethane	0.20	ethylbenzene	0.12	dichlorobenzene	0.09
1,2-dichloro-1-propene	0.20	m-xylene	0.07	butylbenzene	0.10
benzene	0.15	o-xylene	0.07	dichlorobenzene	0.09
1,2-dichloroethane	0.15	styrene	0.07	trichlorobenzene	0.81
trichloroethylene	0.16	tribromomethane	0.20	1,2-dibromo-3-chloropropane	0.20
1,2-dichloropropane	0.15	isopropylbenzene	0.07	hexachlorobutadiene	0.18
dibromomethane	0.16	tetrachloroethane	0.16	naphthalene	0.27
bromodichloromethane	0.14	1,2,3-trichloropropane	0.16	trichlorobenzene	0.24

(7): MAC and AO for xylene apply to the sum of m-, para- and o-xylene

(8): Hardness classes are computed from the Ca+Mg hardness (measured as Ca-CO_3 at pH 4.5), based on Health Canada criteria: 0-60 mg/L is soft, 60-120 mg/L is moderately soft, 120-180 is hard, >180 is very hard.

(9): Water salinity classes are related to total dissolved solids (TDS): 0-1000 mg/L is softwater, 1000-10 000 mg/L is brackish water, > 10 000 mg/L is saltwater. Classes are based on Freeze, A. and Cherry, J. (1979) Groundwater. Prentice-Hall inc., Englewood Cliffs, New Jersey, 604.p.

(10): Isotopic units are the following, and +/- (x)σ is the uncertainty reported by the laboratory:

TU= tritium units pmC= percent modern carbon

‰ (PDB)= per mil relative to the Pee Dee Belemnite standard for carbon

‰ (VSMOW)= per mil relative to the Vienna Standard Mean Ocean Water standard for carbon and hydrogen

Bq/L= Becquerel per liter