CRAIG HYDROGEOLOGIC INC.

Groundwater and Soil Contamination
Groundwater Protection
Resource Development
Site Remediation
Site Professional

Water Supply Source Assessment

Step One Application

Chatham Wellfield Groundwater Exploration

Prepared For: Miramichi Department of Public Works
Mr. Jay Shanahan
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September 1, 2015

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Chatham Wellfield Groundwater Exploration

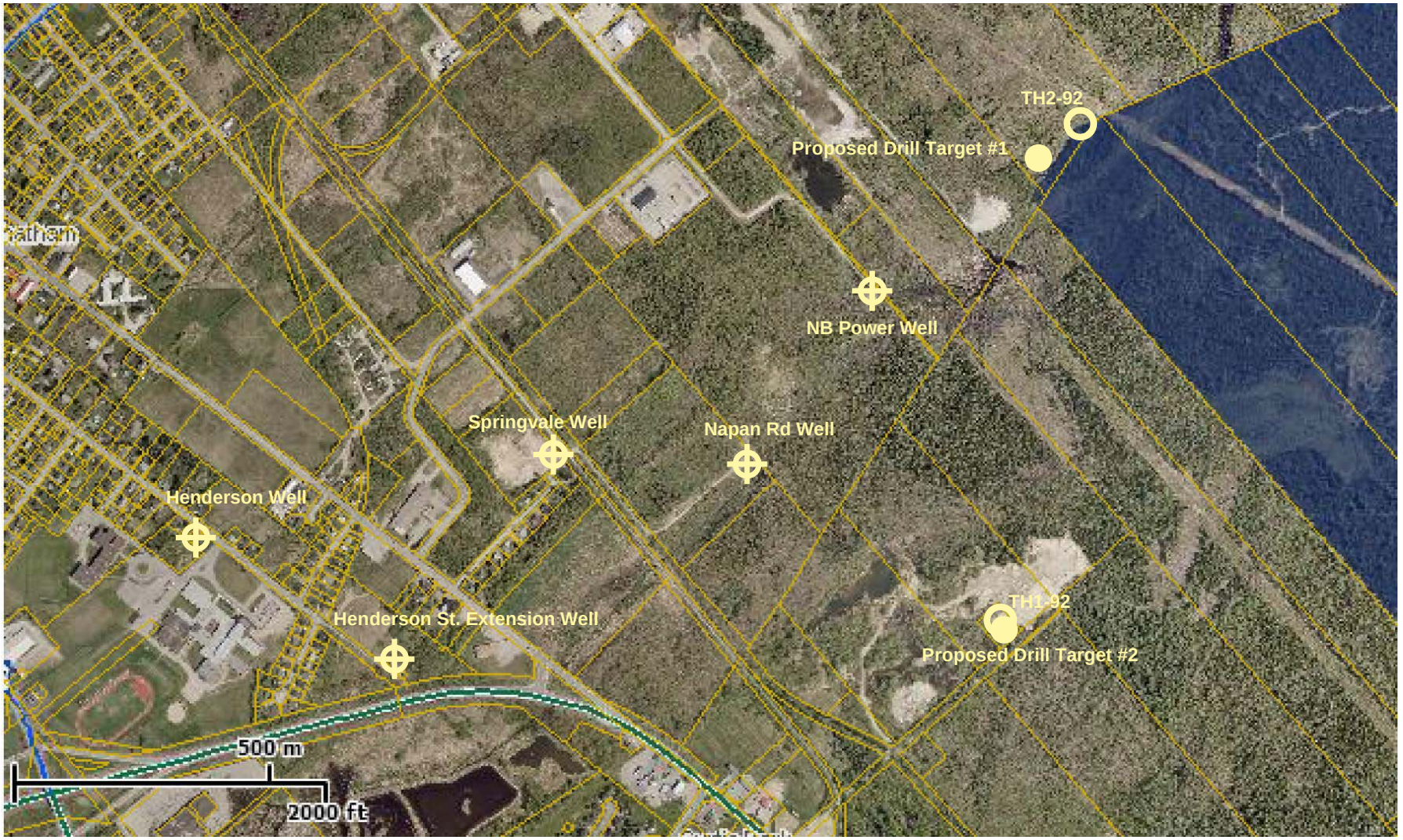
1) Name of proponent: City of Miramichi, NB, Mr. Jay Shanahan, Director of Public Works, 141 Henry Street, Miramichi, NB, E1V 2N5. Phone 506-623-2020.

2) Location of drill targets and the purpose of the proposed water supply: Two drill targets are proposed and the locations are shown in Figure 1 as Proposed Drill Target #1 and #2. Proposed Drill Target #1 is located on PID 40052755 and Proposed Drill Target #2 is located on PID 40368391. The proposed wells are intended to form part of the municipal groundwater supply for Miramichi (former Chatham Area).

3) Required water quantity (in m^3/day): The quantity of water is unknown at this time. Test hole TH2-92 (Figure 1) was originally pump tested for 24 hours at 150 and 200 igpm in 1992. It is anticipated that the new well would produce somewhere between 150 and 200 igpm.

4) List alternate water supply sources in area (including municipal systems): The proposed target locations are shown in Figure 1. There are alternative areas that could be developed, particularly in the relatively undeveloped area east of these location along Black Brook. The City's long term plan is to examine the groundwater resource in the general area shown in Figure 1 to provide future water supplies for the Chatham area. As test well TH2-92 is located within the wetland area setback we propose to drill two new test wells at the locations shown in the attached figure outside the wetland area setback.

5) Discuss area hydrogeology as it relates to the project requirements. Two separate well



Project:			
Chatham Well Field	Existing Wells and Proposed Drill Targets 2015		*Craig HydroGeoLogic Inc.*
	Scale: As Shown	Figure: 1	
	Date: 21/08/15		

log searches were conducted around the two drill target PIDs in August, 2015. The surficial overburden at the site is red clay till of approximately 1.2 to 10.4 meters (4 to 34 feet) in thickness. Significant accumulations of sand or gravel are not known to be present and during the site visit no indications of such materials were observed. The overburden is not used for ground water supplies in the area.

The bedrock in the area is mapped as Pennsylvanian age sedimentary rocks composed of red and grey conglomerate, sandstone, siltstone, and shale, which also forms the local bedrock aquifer. The bedrock is known to be relatively transmissive (readily conducts the flow of ground water). The bedrock units or layers tend to be lenticular (i.e. of variable lateral extent and thickness) and are thought to have formed as a result of sedimentary particles deposited from flowing water (alluvial deposition). The individual beds average less than 1 meter in thickness; however, the total bedrock unit can be several hundred meters thick. This bedrock aquifer covers a large portion of New Brunswick, stretching from the Fredericton area northeast to Shippigan and southeast to the Shediac area.

Based on common knowledge of the area, the bedrock aquifer has been successfully developed for both municipal and private residential wells by a number of individuals over the general area. The general conditions found in the aquifer are suitable for water supply development. Local well drillers with knowledge of the area confirmed the potential for water supply development. In some of the local areas, zones of the aquifer can be quite soft and prone to caving, a condition that requires careful well logging and casing or lining of those soft zones.

Proposed Drill Target #1: A search of the NBDOE well log database for records located within a 750 meter radius around the proposed test well was carried out August 2015 and the search yielded 11 usable well logs. A summary of the information contained in the well logs is provided in Table 1, immediately below.

Table 1: Summary of hydrogeologic information derived from search of NBDOE well log database for Proposed Drill Target 1.

750 meter radius search

Well Depth (feet)	Estimated Yield (igpm)	Depth to Bedrock (feet)	Casing Length (feet)
Average: 86.4	Average: 21.9	Average: 17.6	Average: 53.5
Median: 82	Median: 12	Median: 22	Median: 50
Minimum: 51	Minimum: 5	Minimum: 4	Minimum: 30
Maximum: 125	Maximum: 100	Maximum: 34	Maximum: 85

From the characteristics of the well logs it appears that they are all domestic private wells and none of the municipal wells are included in the data set. As can be seen from the above information the average private well in the area is approximately 82 feet deep with an estimated average yield of approximate 21.9 igpm. As expected in any rock unit the yields are variable with a minimum yield of 5 igpm being estimated in a 125 foot deep well. In general, the area has relatively shallow wells with relatively high yields for private wells.

A search of the NBDOE well chemistry database for locations in a 750 radius around the proposed development was carried out in August 2015 and the search yielded seven chemistry records. The precise locations of the wells from which the ground water chemistry was obtained are not available due to right to privacy considerations for the property owners. These well chemistry analytical results are provided in Table 3, which follows.

Proposed Drill Target #1

Table 3

CDWQG = Canadian Drinking Water Quality Guideline

NBDOE Groundwater Chemistry Database

Parameter	ALK_T (mg/L)	Al (mg/L)	As (µg/L)	B (mg/L)	Ba (mg/L)	Br (mg/L)	COND (µSIE/cm)	Ca (mg/L)	Cd (µg/L)
	101	0.025	1.5	0.063	0.086	0.1	262	34.3	0.5
	97.7	0.025	1.5	0.038	0.09	0.1	217	25.5	0.5
	119	0.025	1.5	0.075	0.262	0.1	967	30.6	0.5
	125	0.025	1.5	0.085	0.152	0.1	256	30.6	0.5
	13.4	0.025	1.5	0.01	0.115	0.1	306	16.2	0.5
	84.8	0.025	1.55	0.2	0.195	0.1	179	22.4	0.5
	110	0.025	4.14	0.032	0.324	0.1	229	27.6	0.5
Mean	**93.0**	**0.025**	**1.9**	**0.072**	**0.175**	**0.1**	**345**	**26.7**	**0.5**
CDWQG			**<10**	**<5.0**	**<1.0**				**<5.0**

Parameter	Cl (mg/L)	Cr (µg/L)	Cu (µg/L)	E_coli P/A (P/A)	F (mg/L)	Fe (mg/L)	HARD (mg/L)	K (mg/L)	Mg (mg/L)
	20.2	11	10	Ab	0.191	0.01	105	1.7	4.7
	4.54	12	10	Ab	0.141	**0.872**	83.7	1.23	4.83
	231	10	17	Ab	0.213	0.192	99.1	1.7	5.5
	3.95	11	10	Ab	0.26	0.068	97.3	1.3	5.07
	78.1	10	40	Ab	0.1	0.01	77.6	2.4	9.01
	2.4	10	10	Ab	0.13	0.07	79.5	2.52	5.73
	2.47	14	10	Ab	0.148	0.176	92.6	2.85	5.76
Mean	**49.0**	**11**	**15**		**0.17**	**0.200**	**90.7**	**1.96**	**5.80**
CDWQG	**<250**	**<50**	**<1000**		**<1.5**	**<0.3**		.	

Table 3

CDWQG = Canadian Drinking Water Quality Guideline

NBDOE Groundwater Chemistry Database

Parameter	Mn (mg/L)	NO2 (mg/L)	NO3 (mg/L)	NOX (mg/L)	Na (mg/L)	PH (pH)	Pb (µg/L)	SO4 (mg/L)	Sb (µg/L)
	0.006	0.05	0.05	0.05	13	7.87	1	7.27	1
	0.398	0.05	0.05	0.05	8.3	7.17	1	6.22	1
	0.086	0.05	0.05	0.05	25.9	**8.53**	1	5.66	1
	0.37	0.05	0.05	0.05	13.6	8.16	1	5.68	1
	0.01	0.05	1.8	1.9	21.7	6.61	1	5.48	1
	0.289	0.05	0.05	0.05	6.63	8.21	1	7.48	1
	0.652	0.05	0.05	0.05	11.9	7.95	1	5.43	1
Mean	**0.259**	**0.05**	**0.30**	**0.31**	**14.43**	**7.79**	**1.0**	**6.17**	**1.00**
CDWQG	**<0.05**	**<10**	**<10**	**<10**	**<200**	**6.5-8.5**	**<10**	**<500**	**6**

Parameter	Se (µg/L)	TC-P/A (P/A)	TURB (NTU)	Tl (µg/L)	U (µg/L)	Zn (µg/L)	TDS (mg/L)
	1.5	Ab	**2.68**	1	0.5	5	142
	1.5	Ab	**1.75**	1	0.5	5	111
	1.5	Ab	**14**	1	0.5	8	373
	1.5	**Pr**	**3.29**	1	0.5	5	136
	1.5	Ab	0.2	1	0.5	57	150
	1.5	Ab	0.1	1		6	99
	1.5	**Pr**	0.4	1	0.5	19	123
Mean	**1.5**		**3.2**	**1**	**0.5**	**15**	**162**
CDWQG			**<1.0**		**<20**	**<5000**	**<500**

The average value of the measured result and the Canadian Drinking Water Quality Guideline (CDWQG) are included in the table for the purpose of comparison. Any parameter which exceeds the Canadian Drinking Water Quality Guideline concentration is bolded and shaded for ease of recognition in the data table.

Out of the seven chemistry records available, one well had an exceedance of the CDWQG for iron of 0.3 mg/L and five wells exceeded the CDWQG concentration for manganese of 0.05 mg/L. The guidelines for iron and/or manganese are based on esthetic considerations, not health. Iron and/or manganese can cause staining of plumbing fixtures and laundry. Iron and/or manganese can usually be readily removed by commercial water softeners at the hardness observed in this water or by filters. The presence of Iron and/or manganese in the groundwater from this aquifer is not uncommon and is commonly the result of natural conditions. In the Miramichi area elevated concentrations of iron and manganese in groundwater are quite common.

A single well exceeded the pH range upper limit of 8.5 with a measured value of 8.53. This is felt to be insignificant.

A total of four out of the seven chemistry records available had elevated turbidity present in the samples. The elevated levels of turbidity may be related to the relative newness of the wells and they may not have had sufficient time, or use, to clear naturally. Most new wells clear naturally with time and use. At levels in excess of 5 NTUs turbidity may become noticeable to consumers and therefore, objectionable. The turbidity may be the result of elevated concentrations of iron and or manganese or the presence of particulate in the water. In either case, turbidity can be treated by water softeners and/or particulate filters.

The observed water chemistries are of acceptable drinking water quality and can be considered to be typical of this bedrock unit. The elevated turbidity observed in a number of the well in the sample sets may be related to the newness of the wells and the fact that they have not been pumped sufficiently to clear the water Elevated turbidity values may also impact analytical results leading to overestimates of iron and manganese concentrations. Overall, the review of the inorganic ground water chemistry provided in the NBDOE water quality database for the area

did not reveal or indicate significant problems with other water quality parameters.

Proposed Drill Target #2: A search of the NBDOE well log database for records located within a 1250 meter radius around the proposed test well was carried out August 2015 and the search yielded 5 usable well logs. A summary of the information contained in the well logs is provided in Table 2, immediately below.

Table 2: Summary of hydrogeologic information derived from search of NBDOE well log database for Proposed Drill Target 1.

1250 meter radius search

Well Depth (feet)	Estimated Yield (igpm)	Depth to Bedrock (feet)	Casing Length (feet)
Average: 60.6	Average: 11.8	Average: 25	Average: 36.6
Median: 60	Median: 10	Median: 27	Median: 37
Minimum: 51	Minimum: 7	Minimum: 8	Minimum: 23
Maximum: 73	Maximum: 20	Maximum: 34	Maximum: 50

From the characteristics of the well logs it appears that they are all domestic private wells and none of the municipal wells are included in this data set. As can be seen from the above information the average private well in the area is approximately 60.6 feet deep with an estimated average yield of approximate 11.8 igpm. As expected in any rock unit the yields are variable with a minimum yield of 7 igpm being estimated in a well of 60 foot depth. In general, the area has relatively shallow wells with relatively high yields for private wells.

A search of the NBDOE well chemistry database for locations in a 1250 radius around the proposed development was carried out in August 2015 and the search yielded five chemistry records. The precise locations of the wells from which the ground water chemistry was obtained

Proposed Drill Target #2

Table 4

CDWQG = Canadian Drinking Water Quality Guideline

NBDOE Groundwater Chemistry Database

Parameter	ALK_T (mg/L)	Al (mg/L)	As (µg/L)	B (mg/L)	Ba (mg/L)	Br (mg/L)	COND (µSIE/cm)	Ca (mg/L)	Cd (µg/L)
	98.9	0.025	1.5	0.01	0.153	0.1	230	38.4	0.5
	171	0.025	1.1	0.2	0.048	0.499	1070	18.2	0.5
	84.8	0.025	1.55	0.2	0.195	0.1	179	22.4	0.5
	124	0.025	3.4	0.2	0.173	0.1	275	32.3	0.5
	110	0.025	4.14	0.032	0.324	0.1	229	27.6	0.5
Mean	**117.7**	**0.025**	**2.3**	**0.128**	**0.179**	**0.2**	**397**	**27.8**	**0.5**
CDWQG			**<10**	**<5.0**	**<1.0**				**<5.0**

Parameter	Cl (mg/L)	Cr (µg/L)	Cu (µg/L)	E_coli P/A (P/A)	F (mg/L)	Fe (mg/L)	HARD (mg/L)	K (mg/L)	Mg (mg/L)
	1.67	10	11	Ab	0.1	0.186	109	1.2	3.13
	201	14	10	Ab	0.753	**3.1**	62.3	2.73	4.1
	2.4	10	10	Ab	0.13	0.07	79.5	2.52	5.73
	5.38	10	12	Ab	0.11	0.13	111	3.4	7.34
	2.47	14	10	Ab	0.148	0.176	92.6	2.85	5.76
Mean	**42.6**	**12**	**11**		**0.25**	**0.732**	**90.9**	**2.54**	**5.21**
CDWQG	**<250**	**<50**	**<1000**		**<1.5**	**<0.3**		.	

Table 4

CDWQG = Canadian Drinking Water Quality Guideline

NBDOE Groundwater Chemistry Database

Parameter	Mn (mg/L)	NO2 (mg/L)	NO3 (mg/L)	NOX (mg/L)	Na (mg/L)	PH (pH)	Pb (µg/L)	SO4 (mg/L)	Sb (µg/L)
	0.13	0.05	0.05	0.05	5.64	7.88	3.5	16.7	1
	0.274	0.05	0	0.05	192	8.3	1.5	53.6	1
	0.289	0.05	0.05	0.05	6.63	8.21	1	7.48	1
	0.68	0.05	0.05	0.05	11.1	8.14	1	8.95	1
	0.652	0.05	0.05	0.05	11.9	7.95	1	5.43	1
Mean	**0.405**	**0.05**	**0.04**	**0.05**	**45.45**	**8.10**	**1.6**	**18.43**	**1.00**
CDWQG	**<0.05**	**<10**	**<10**	**<10**	**<200**	**6.5-8.5**	**<10**	**<500**	**6**

Parameter	Se (µg/L)	TC-P/A (P/A)	TURB (NTU)	Tl (µg/L)	U (µg/L)	Zn (µg/L)	TDS (mg/L)
	1.5	Ab	**1.1**	1	0.5	14	127
	1.4	**Pr**	**5.9**	1		27	
	1.5	Ab	0.1	1		6	99
	1.5	**Pr**	0.3	1		241	144
	1.5	**Pr**	0.4	1	0.5	19	123
Mean	**1.5**		**1.6**	**1**	**0.5**	**61**	**123**
CDWQG			**<1.0**		**<20**	**<5000**	**<500**

are not available due to right to privacy considerations for the property owners. These well chemistry analytical results are provided in Table 4, which follows.

The average value of the measured result and the Canadian Drinking Water Quality Guideline (CDWQG) are included in the table for the purpose of comparison. Any parameter which exceeds the Canadian Drinking Water Quality Guideline concentration is bolded and shaded for ease of recognition in the data table.

Out of the five chemistry records available, one well had an exceedance of the CDWQG for iron of 0.3 mg/L and five wells exceeded the CDWQG concentration for manganese of 0.05 mg/L. The guidelines for iron and/or manganese are based on esthetic considerations, not health. Iron and/or manganese can cause staining of plumbing fixtures and laundry. Iron and/or manganese can usually be readily removed by commercial water softeners at the hardness observed in this water or by filters. The presence of Iron and/or manganese in the groundwater from this aquifer is not uncommon and is commonly the result of natural conditions. In the Miramichi area iron and manganese in groundwater is quite common.

A total of two out of the five chemistry records available had elevated turbidity present in the samples. The elevated levels of turbidity may be related to the relative newness of the wells and they may not have had sufficient time, or use, to clear naturally. Most new wells clear naturally with time and use. At levels in excess of 5 NTUs turbidity may become noticeable to consumers and therefore, objectionable. The turbidity may be the result of elevated concentrations of iron and or manganese or the presence of particulate in the water. In either case, turbidity can be treated by water softeners and/or particulate filters.

The observed water chemistries are of acceptable drinking water quality and can be considered to be typical of this bedrock unit. The elevated turbidity observed in a number of the well in the sample sets may be related to the newness of the wells and the fact that they have not been pumped sufficiently to clear the water Elevated turbidity values may also impact analytical results leading to overestimates of iron and manganese concentrations. Overall, the review of the inorganic ground water chemistry provided in the NBDOE water quality database for the area

Location of proposed drill targets relative to existing wells. There are questions as to how closely should new wells be located within the area of the existing Chatham area wellfield. That is, how close they should be located to each other without undue interference occurring. The existing documentation for pump tests on wells in the immediate area was reviewed and found that the report for the pump test on TH2-92 (JWEL 3380-9, 1992) contained some distance drawdown data. Although the data is limited it does provide us with an estimate of the zero drawdown distance based on that pump test.

The pump test on TH2-92 was at 200 igpm (15L/s) for 24 hours. A graph of the distance-drawdown data is attached. It is clear from the graph that the zero drawdown radius around TH2-92 is about 750 meters. It is common; however, to allow some limited interference between pumping wells in a wellfield, say about 1.0 meters. The 1.0 meters interference radius for the test is approximately 200 meters. As interference is additive (if we had two identical wells located 200 meters apart then the total interference would be 2.0 meters) in order to limit the interference between the wells to 1.0 meters the two wells should be approximately 400 meters apart.

6) Outline the proposed hydrogeological testing and work schedule: TH2-92 is an existing well which we propose to use as an observation well. We propose to drill the new test wells as soon as approval to proceed is granted. It is proposed that the new potential production well will be pump tested for a 72 hour period during the fall season, 2015, dependent on acceptable weather conditions.

7) Identify any existing pollution or contamination hazards within a minimum 500 m radius of the proposed drill targets. If groundwater use problems (quantity or quality) have occurred in the past, then these should be identified. Historical land use that might pose a contamination hazard (i.e. tannery, industrial, disposal, etc.) should also be discussed. The sites are located in an area of undeveloped woodland. No existing developments are present within the 500 meter radius. A historical NB Power Ash Dump is located approximately 530 meters north of Proposed Drill Target #1 as shown in Figure 2. The ash dump operated from 1986 until 2001

Project: Chatham Well Field	NB Power Ash Dump		*Craig HydroGeoLogic Inc.*
	Scale: As Shown	Figure: 2	
	Date: September 1, 2015		

when it was closed. The site was a clay lined facility with 600 mm of nominal 10-8 clay with a perimeter collection ditch. The site was capped when it was closed.

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In order to assess the potential significance of this dump the former monitoring information from NB Power and NB Environment for groundwater monitoring wells and the lagoon was obtained and analyzed. The data consisted of several 10's of thousand s of data points which have been reduced to the following Table 5 to simplify interpretation. The first 11 stations in the table represent monitoring wells with the number designation and the following letter I = intermediate, D = deep and S = shallow depths. The final station (ADSL) represents the lagoon. The CDWQG are presented in the bottom line of the table for the purpose of comparison and data that exceeds these criteria are colour shaded for ease of recognition. The significant fact of this information is that none of the trace metal concentrations exceed the CDWQG criteria, with the exception of a single Barium concentration in well 2D. The systematic exceedances are for iron, manganese and turbidity for which the CDWQG criteria are not health related.

Another factor to consider would be the proportion of water that the former ash dump would contribute to the recharge sustaining any production well. This would be based on the land area of the dump compared to the total land area contributing recharge to the production well. Based on the size of the existing groundwater capture areas for the existing production wells, the ash dump area would comprise no more than approximately 5% of the recharge land area. In addition, the clay liner and cap would greatly reduce the recharge to the groundwater aquifer from the ash dump site.

Based on the above information, that the potential contamination at the ash dump appear to be relatively innocuous, and that the site should not significantly provide recharge to any production well, it appears that groundwater development in the area of Proposed Drill Target #1 can proceed.

8) Identify any watercourse(s) (stream, brook, river, wetland, etc.) within 60 m of the proposed drill targets. There are no watercourses within 60 m of the proposed drill targets.

Station	As	B	Ba	Ca	Cd	Cl	Cond	Cr	Cu	Fe	Fl	Hard
10I	<0.05	<0.1	0.2	17.00	<0.005	3.77	117.00	<0.01	<0.01	0.530	0.130	57
11I	<0.05	<0.1	0.2	22.25	<0.005	3.38	150.45	<0.01	<0.01	0.272	0.139	74
13I	<0.05	<0.1	0.2	12.95	<0.005	3.69	90.41	<0.01	<0.01	0.377	<0.009	45
1D	<0.05	<0.1	0.1	18.22	<0.005	13.31	136.04	<0.01	<0.01	0.432	0.200	55
2D	<0.05	<0.1	3.0	39.39	<0.005	6.42		<0.01	<0.01	20.582	0.030	122
3S	<0.05	<0.1	0.0	66.39	<0.005	13.20	193.61	<0.01	<0.01	0.289	0.124	193
4S	<0.05	<0.1	<0.2	17.19	<0.005	6.11	151.61	<0.01	<0.01	0.141	0.012	37
5S	<0.05	<0.1	<0.2	5.50	<0.005	3.39	54.27	<0.01	<0.01	0.224	0.015	34
6S	<0.05	<0.1	<0.2	17.16	<0.005	5.42	150.23	<0.01	<0.01	0.743	0.014	49
7S	<0.05	<0.1	<0.2	8.16	<0.005	3.03	99.27	<0.01	<0.01	1.638	0.014	44
9S	<0.05	<0.1	<0.1	4.13	<0.005	3.99	37.56	<0.01	<0.01	0.092	0.000	28
ADSL	<0.05	0.03	<0.1	72.69	<0.005			<0.01	<0.01	0.088		
CDWQG	0.025	5	1	200	0.005	250		0.01	0.01	0.3	1.5	200

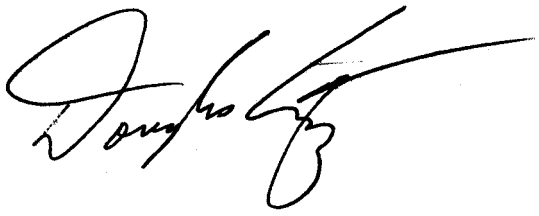
Station	Hg	Mn	Na	Ni	NO3	Pb	pH	SS	Sul	TDS	Turb	Zn
10I	<0.001	0.010	2.90	<0.01	0.210	<0.02	8.1	32	6.7	65.2	7.0	<0.01
11I	<0.001	0.024	3.62	<0.01	0.604	<0.02	8.0	32	3.6	79.0	11.9	<0.01
13I	<0.001	0.026	2.54	<0.01	0.191	<0.02	7.1	68	5.1	51.7	22.4	<0.01
1D	<0.001	0.044	4.28	<0.01	0.358	<0.02	6.6	91	17.9	76.4	6.9	<0.01
2D	<0.001	0.426	4.99	<0.01	0.318	<0.02	7.5	28	5.8	128.5	3.6	<0.01
3S	<0.001	0.187	6.49	<0.01	0.800	<0.02	5.8	19	147.6	195.4	7.1	<0.01
4S	<0.001	0.088	2.80	<0.01	0.444	<0.02	6.0	18	33.3	46.0	13.3	<0.01
5S	<0.001	0.065	2.93	<0.01	0.175	<0.02	5.9	38	12.3	33.3	41.9	<0.01
6S	<0.001	0.263	3.68	<0.01	0.420	<0.02	6.0	72	35.8	56.1	86.8	<0.01
7S	<0.001	0.228	2.99	<0.01	0.885	<0.02	6.1	133	15.0	41.2	93.5	<0.01
9S	<0.001	0.076	2.57	<0.01	0.082	<0.02	6.2	54	5.9	36.0	12.3	<0.01
ADSL	<0.001			<0.01		<0.02	9.5	7	101.1	203.7	15.6	<0.01
CDWQG		0.05	200		10	0.01	6.5-8.5		500		1	5

9) **Identify site supervisory personnel involved in the source development (municipal officials, consultants and drillers:** Mr. Jay Shanahan (City of Miramichi, 506-623-2020) Mr. Doug Craig (Craig Hydrogeologic Inc., 506-659-3064) and Mr. Donald Green, (Green's Well Drilling, 506 369-2603).

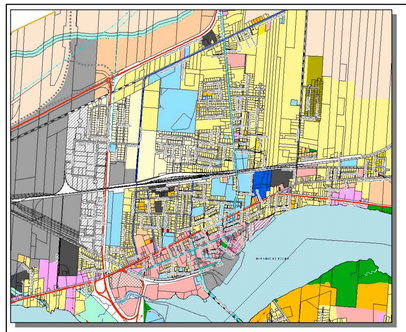
10) **Figure 1 (site plan) and Figure 2 (Ash Dump):** Please See Attached.

11) **Figure 3 (land use/zoning map**): Please See Attached

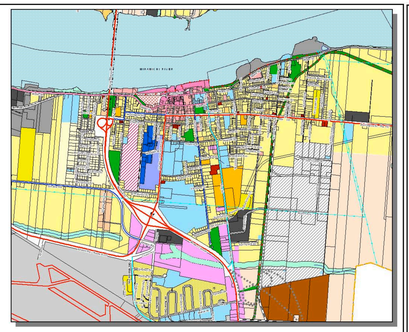
Prepared By



Doug Craig
Craig Hydrogeologic



Miramichi West



Miramichi East

FOR REFERENCE PURPOSES ONLY

Legend:

- Major Arterial Road
- Minor Arterial Road
- Residential Collector Road
- Industrial / Commercial Collector Road
- Other Local Road / Municipal Street
- Non - Maintained Road
- Railroad Track
- Runway
- Walking Trails
- Transmission Line
- Municipal Boundary
- Water Cover
- Wet Area

ZONES:

Residential

- Single Unit Dwelling (R-1)
- Single or Two Unit Dwelling (R-2)
- Medium Density A (R-3)
- Medium Density B (R-4)
- High Density A (R-5)
- High Density B (R-6)
- Mobile/Mini Home Park (RP)
- Mobile/Mini Home (RM)
- Residential Retirement Community (RR)

Commercial

- Neighbourhood Commercial (NC)
- General Commercial (GC)
- Highway Commercial (HC)
- Shopping Centre Commercial (SC)
- Central Commercial (CC)
- Commercial Recreation (CR)
- Adult Entertainment (AE)

Industrial

- General Industrial (GI)
- Industrial Park (IP)
- Heavy Industrial (HI)
- Business Park - Airport (BP)

Community Use

- Institutional (IN)
- University and Community College (UC)
- Mixed Use (MU)
- Park (PK)
- Open Space (OS)

Rural

- Resource Extraction (RE)
- Rural (RU)

Greater Miramichi / Ville de MIRAMICHI

MIRAMICHI OUR RIVER. OUR PEOPLE. OUR FUTURE.

Drawing Title:

SCHEDULE "A" ZONING MAP

Project Title:

City of Miramichi Municipal Plan

Zoning Amendments (Since July, 2005)

PID	Location	By-Law Filed
40265373	1639 King George Hwy.	October 27, 2006
40106403 (portion)	2540 King George Hwy.	February 14, 2007
40181455, 40175069	624 & 650 Newcastle Blvd.	February 14, 2007
40174450, 40174435	505 Old King George Hwy.	August 16, 2006
40159414 (portion)	Rennie Road	February 23, 2007
40026338	Water Street	September 1, 2006
40182033, 40334880	Hutchison Drive	September 10, 2007
40119406	King George Highway	September 10, 2007
40260614	55 Jackson Drive	

Scale:
Map: 1 : 17,000
0 250 500 1,000 metres
Insets: 1 : 15,000

Project: 99-755-02

Drawing No: 99-755-02-13-A

Created: November 2000

Revised: November 2001, December 2002, February 2004, October 2004, January 2005, June 2007

Plotted: October 2007

Source:
Land Use Survey - July, 1999
MPDC
ETB96-NBGIC
Service NB Property Data (April 2007)

FGA CONSULTANTS LTD

Chatham Area Target 1, PID 40052755

750 meter radius

Well Depth (Feet)	**Estimated Yield** (igpm)	**Depth to Bedrock** (Feet)	**Casing Length** (Feet)
88	12	11	30
125	12	22	60
106	100	10	60
125	5	22	85
60	7	27	40
80	20	4	62
75	20	6	40
103	8	6	44
82	25	23	80
55	20	29	50
51	12	34	37
Well Depth (Feet)	**Estimated Yield** (igpm)	**Depth to Bedrock** (Feet)	**Casing Length** (Feet)

Median	82	12	22	50	Median
average	86.4	21.9	17.6	53.5	AVERAGE
max	125	100	34	85	max
min	51	5	4	30	min
count	11				

New Nouveau Brunswick

Environment

Report Number **8526**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	10/04/2003

Casing Information

Casing above ground 0ft — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
8526	**Steel**	**5 inch**	**0ft**	**30ft**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	35ft	12 igpm	1hr	75ft	0 igpm	No	0 igpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 0 ig

Pump Installed
N/A

Intake Setting (BTC)
75ft

Driller's Log

Well Log	From	End	Colour	Rock Type
8526	**0ft**	**11ft**	**Brown**	**Clay and Sand**
8526	**11ft**	**88ft**	**Brown and grey**	**Sandstone**

Overall Well Depth
88ft

Bedrock Level
11ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
8526	**88ft**	**12 igpm**

Setbacks

Well Log	Distance	Setback From
8526	**200ft**	**Right of any Public Way Road**

New Nouveau Brunswick

Environment

Report Number **8527**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well		10/04/2003

Casing Information

Casing above ground 0ft — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
8527	**Steel**	**6 inch**	**0ft**	**60ft**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
	35ft	12 igpm	1hr	74ft	0 igpm	No	0 igpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 0 ig

Pump Installed
N/A

Intake Setting (BTC)
75ft

Driller's Log

Well Log	From	End	Colour	Rock Type
8527	**0ft**	**22ft**	**Brown**	**Slate and Granite**
8527	**22ft**	**52ft**	**Brown**	**Sandstone and Shale**
8527	**52ft**	**88ft**	**Grey**	**Sandstone**

Overall Well Depth
125ft

Bedrock Level
22ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
8527	**88ft**	**12 igpm**

Setbacks

Well Log	Distance	Setback From
8527	**230ft**	**Right of any Public Way Road**

New Nouveau Brunswick

Environment

Report Number **11118**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	01/01/2005

Casing Information

Casing above ground 1ft 6in — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
11118	**Steel**	**5 1/2 Inch**	**0ft**	**60ft**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	35ft	100 igpm	1hr 35min	35ft	100 igpm	No	0 igpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)

Qty 0 ig

Pump Installed
N/A

Intake Setting (BTC)
0ft

Driller's Log

Well Log	From	End	Colour	Rock Type
11118	**0ft**	**10ft**	**Unknown Rock Colour**	**Gravel**
11118	**10ft**	**17ft**	**Red**	**Clay**
11118	**17ft**	**50ft**	**Brown**	**Sandstone**
11118	**50ft**	**58ft**	**Grey**	**Shale**
11118	**58ft**	**106ft**	**Grey**	**Sandstone**

Overall Well Depth
106ft

Bedrock Level
0ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
11118	**106ft**	**100 igpm**

Setbacks

Well Log	Distance	Setback From
11118	**100ft**	**Septic Tank**
11118	**120ft**	**Leach Field**
11118	**250ft**	**Right of any Public Way Road**

New Nouveau Brunswick

Environment

Report Number **16364**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	Deepened	Rotary	07/07/2007

Casing Information

Casing above ground 1ft 6in — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
16364	**Steel**	**6 inch**	**0ft**	**85ft**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	35ft	15 igpm	1hr	70ft	5 igpm	No	0 igpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 0 ig

Pump Installed
N/A

Intake Setting (BTC)
85ft

Driller's Log

Well Log	From	End	Colour	Rock Type
16364	**88ft**	**125ft**	**Grey**	**Sandstone**

Overall Well Depth
125ft

Bedrock Level
22ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
16364	**100ft**	**5 igpm**
16364	**120ft**	**15 igpm**

Setbacks

There is no Setback information.

New Nouveau Brunswick

Environment

Report Number **17803**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Non-Drinking Water, Industrial	New Well	Rotary	05/27/2008

Casing Information

Casing above ground 1ft 6in — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
17803	Steel	6 inch	0ft	40ft	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Bailer	24ft	14 igpm	1hr	24ft	7 igpm	No	0 igpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
Foam

Disinfectant
N/A

Qty 0 ig

Pump Installed
N/A

Intake Setting (BTC)
40ft

Driller's Log

Well Log	From	End	Colour	Rock Type
17803	0ft	3ft	Brown	Fill Shale
17803	3ft	27ft	Red	Clay
17803	27ft	33ft	Grey	Sandstone
17803	33ft	34ft	Grey	Clay
17803	34ft	38ft	Grey	Sandstone
17803	38ft	39ft	Red	Clay
17803	39ft	60ft	Grey	Sandstone

Overall Well Depth
60ft

Bedrock Level
0ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
17803	50ft	10 igpm
17803	60ft	14 igpm

Setbacks

Well Log	Distance	Setback From
17803	30ft	Right of any Public Way Road

New Nouveau Brunswick

Environment

Report Number **25762**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Non-Drinking Water, Heat Pump	New Well	Rotary	07/29/2010

Casing Information

Casing above ground 2ft — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
25762	Steel	6 inch	0ft	62ft	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	24ft	60 igpm	1hr	24ft	20 igpm	No	0 igpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
Foam

Disinfectant
N/A

Qty 0 ig

Pump Installed
N/A

Intake Setting (BTC)
0ft

Driller's Log

Well Log	From	End	Colour	Rock Type
25762	0ft	1ft	Brown	Shale
25762	1ft	2ft	Brown	Soil
25762	2ft	4ft	Brown	Soils and Sand and Clay
25762	4ft	21ft	Brown	Sandstone
25762	21ft	26ft	Dark brown	Sandstone
25762	26ft	41ft	Brown	Sandstone
25762	41ft	42ft	Grey	Clay
25762	42ft	46ft	Grey	Sandstone
25762	46ft	58ft	Brown	Sandstone
25762	58ft	61ft	Dark brown	Soft Sandstone
25762	61ft	80ft	Brown	Sandstone

Overall Well Depth
80ft

Bedrock Level
0ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
25762	40ft	55 igpm
25762	60ft	75 igpm

Setbacks

Well Log	Distance	Setback From
25762	66ft	Right of any Public Way Road
25762	170ft	Right of any Public Way Road

New Nouveau Brunswick

Environment

Report Number **25763**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	07/29/2010

Casing Information

Casing above ground 1ft 10in Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
25763	**Steel**	**6 inch**	**0ft**	**40ft**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	24ft	35 igpm	1hr	24ft	20 igpm	Yes	0 igpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
Foam

Disinfectant
N/A

Qty 0 ig

Pump Installed
N/A

Intake Setting (BTC)
60ft

Driller's Log

Well Log	From	End	Colour	Rock Type
25763	**0ft**	**6ft**	**Brown**	**Fill Shale**
25763	**6ft**	**26ft**	**Brown**	**Sandstone**
25763	**26ft**	**32ft**	**Dark brown**	**Sandstone**
25763	**32ft**	**36ft**	**Brown**	**Sandstone**
25763	**36ft**	**39ft**	**Dark brown**	**Soft Sandstone**
25763	**39ft**	**75ft**	**Brown**	**Sandstone**

Overall Well Depth
75ft

Bedrock Level
0ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
25763	**75ft**	**35 igpm**
25763	**60ft**	**20 igpm**

Setbacks

Well Log	Distance	Setback From
25763	**115ft**	**Right of any Public Way Road**
25763	**115ft**	**Right of any Public Way Road**

New Nouveau Brunswick

Environment

Report Number **33672**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	09/24/2012

Casing Information

Casing above ground 1ft 10in Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
33672	**Steel**	**6 inch**	**0ft**	**44ft**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	36ft	10 igpm	1hr	44ft	8 igpm	No	0 igpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
Foam

Disinfectant
Bleach (Javex)
Qty 0 ig

Pump Installed
N/A
Intake Setting (BTC)
75ft

Driller's Log

Well Log	From	End	Colour	Rock Type
33672	**0ft**	**5ft**	**Brown**	**Fill Shale**
33672	**5ft**	**6ft**	**Brown**	**Topsoil**
33672	**6ft**	**21ft**	**Brown**	**Sandstone**
33672	**21ft**	**22ft**	**Brown**	**Clay**
33672	**22ft**	**26ft**	**Brown**	**Sandstone**
33672	**26ft**	**31ft**	**Brown**	**Clay**
33672	**31ft**	**38ft**	**Brown**	**Sandstone**
33672	**38ft**	**42ft**	**Brown**	**Clay**
33672	**42ft**	**55ft**	**Brown**	**Sandstone**
33672	**55ft**	**85ft**	**Grey**	**Sandstone**
33672	**85ft**	**103ft**	**Red**	**Clay**

Overall Well Depth
103ft

Bedrock Level
0ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
33672	**51ft**	**5 igpm**
33672	**79ft**	**10 igpm**

Setbacks

Well Log	Distance	Setback From
33672	**67ft**	**Center of road**

New Nouveau Brunswick

Environment

Report Number **33678**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	11/11/2011

Casing Information

Casing above ground 0ft — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
33678	Steel	6 inch	0ft	80ft	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	27ft	35 igpm	1hr	27ft	25 igpm	No	0 igpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
Foam

Disinfectant
N/A

Qty 0 ig

Pump Installed
N/A

Intake Setting (BTC)
60ft

Driller's Log

Well Log	From	End	Colour	Rock Type
33678	0ft	2ft	Brown	Fill Shale
33678	2ft	10ft	Brown	Soil
33678	10ft	11ft	Mix	Gravel
33678	11ft	14ft	Brown	Clay
33678	14ft	15ft	Mix	Gravel
33678	15ft	23ft	Brown	Clay
33678	23ft	31ft	Brown	Sandstone
33678	31ft	33ft	Brown	Clay
33678	33ft	42ft	Brown	Sandstone
33678	42ft	44ft	Dark brown	Soil
33678	44ft	52ft	Brown	Sandstone
33678	52ft	53ft	Brown	Sandstone
33678	53ft	56ft	Brown	Sandstone
33678	56ft	58ft	Brown	Clay
33678	58ft	72ft	Brown	Sandstone
33678	72ft	82ft	Grey	Sandstone

Overall Well Depth
82ft

Bedrock Level
0ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
33678	72ft	25 igpm
33678	81ft	35 igpm

Setbacks

Well Log	Distance	Setback From
33678	79ft	Septic Tank
33678	76ft	Leach Field
33678	293ft	Right of any Public Way Road

New Nouveau Brunswick

Environment

Report Number **91182400**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well (NEW WELL)		08/06/1998

Casing Information

Casing above ground 0ft — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
91182400	**Steel**	**5 inch**	**0ft**	**50ft**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
	27ft	20 igpm	1hr	46ft	0 igpm	No	0 igpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 0 ig

Pump Installed
N/A

Intake Setting (BTC)
49ft

Driller's Log

Well Log	From	End	Colour	Rock Type
91182400	**0ft**	**25ft**	**Brown**	**Clay**
91182400	**25ft**	**29ft**	**Soft grey and red**	**Mud and Stone and Shale**
91182400	**29ft**	**47ft**	**Red**	**Soft Rock**
91182400	**47ft**	**47ft**	**White and red**	**Coal**
91182400	**47ft**	**55ft**	**Grey**	**Sandstone**

Overall Well Depth
55ft

Bedrock Level
25ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
91182400	**55ft**	**20 igpm**

Setbacks

There is no Setback information.

New Nouveau Brunswick

Environment

Report Number **92035300**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Cable Tool	05/30/2001

Casing Information

Casing above ground 2ft — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
92035300	**Steel**	**5 inch**	**0ft**	**37ft**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Bailer	24ft	12 igpm	1hr	24ft	12 igpm	No	0 igpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)

Qty 0.5 ig

Pump Installed
N/A

Intake Setting (BTC)
44ft

Driller's Log

Well Log	From	End	Colour	Rock Type
92035300	**0ft**	**4ft**	**Brown**	**Fill**
92035300	**4ft**	**18ft**	**Brown**	**Clay**
92035300	**18ft**	**34ft**	**Grey**	**Clay**
92035300	**34ft**	**51ft**	**Grey**	**Sandstone**

Overall Well Depth
51ft

Bedrock Level
0ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
92035300	**42ft**	**2 igpm**
92035300	**50ft**	**12 igpm**

Setbacks

There is no Setback information.

Chatham Area Target 2, PID40368391

1250 meter radius

Well Depth (Feet)	**Estimated Yield** (igpm)	**Depth to Bedrock** (Feet)	**Casing Length** (Feet)
64	10	8	23
60	7	27	40
55	20	29	50
73	10	27	33
51	12	34	37
Well Depth (Feet)	**Estimated Yield** (igpm)	**Depth to Bedrock** (Feet)	**Casing Length** (Feet)

Median	60	10	27	37	Median
average	60.6	11.8	25.0	36.6	AVERAGE
max	73	20	34	50	max
min	51	7	8	23	min
count	5				

New Nouveau Brunswick

Environment

Report Number **8526**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	10/04/2003

Casing Information

Casing above ground 0ft — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
8526	**Steel**	**5 inch**	**0ft**	**30ft**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	35ft (BTC - Below top of casing)	12 igpm	1hr	75ft	0 igpm	No	0 igpm

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 0 ig

Pump Installed
N/A

Intake Setting (BTC)
75ft

Driller's Log

Well Log	From	End	Colour	Rock Type
8526	**0ft**	**11ft**	**Brown**	**Clay and Sand**
8526	**11ft**	**88ft**	**Brown and grey**	**Sandstone**

Overall Well Depth
88ft

Bedrock Level
11ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
8526	**88ft**	**12 igpm**

Setbacks

Well Log	Distance	Setback From
8526	**200ft**	**Right of any Public Way Road**

New Nouveau Brunswick

Environment

Report Number **8527**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well		10/04/2003

Casing Information

Casing above ground 0ft — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
8527	**Steel**	**6 inch**	**0ft**	**60ft**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
	35ft (BTC - Below top of casing)	12 igpm	1hr	74ft	0 igpm	No	0 igpm

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 0 ig

Pump Installed
N/A

Intake Setting (BTC)
75ft

Driller's Log

Well Log	From	End	Colour	Rock Type
8527	**0ft**	**22ft**	**Brown**	**Slate and Granite**
8527	**22ft**	**52ft**	**Brown**	**Sandstone and Shale**
8527	**52ft**	**88ft**	**Grey**	**Sandstone**

Overall Well Depth
125ft

Bedrock Level
22ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
8527	**88ft**	**12 igpm**

Setbacks

Well Log	Distance	Setback From
8527	**230ft**	**Right of any Public Way Road**

New Nouveau Brunswick

Environment

Report Number **11118**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	01/01/2005

Casing Information

Casing above ground 1ft 6in — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
11118	**Steel**	**5 1/2 Inch**	**0ft**	**60ft**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	35ft (BTC - Below top of casing)	100 igpm	1hr 35min	35ft	100 igpm	No	0 igpm

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)
Qty 0 ig

Pump Installed
N/A
Intake Setting (BTC)
0ft

Driller's Log

Well Log	From	End	Colour	Rock Type
11118	**0ft**	**10ft**	**Unknown Rock Colour**	**Gravel**
11118	**10ft**	**17ft**	**Red**	**Clay**
11118	**17ft**	**50ft**	**Brown**	**Sandstone**
11118	**50ft**	**58ft**	**Grey**	**Shale**
11118	**58ft**	**106ft**	**Grey**	**Sandstone**

Overall Well Depth
106ft

Bedrock Level
0ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
11118	**106ft**	**100 igpm**

Setbacks

Well Log	Distance	Setback From
11118	**100ft**	**Septic Tank**
11118	**120ft**	**Leach Field**
11118	**250ft**	**Right of any Public Way Road**

New Nouveau Brunswick

Environment

Report Number **16364**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	Deepened	Rotary	07/07/2007

Casing Information

Casing above ground 1ft 6in — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
16364	**Steel**	**6 inch**	**0ft**	**85ft**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	35ft (BTC - Below top of casing)	15 igpm	1hr	70ft	5 igpm	No	0 igpm

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 0 ig

Pump Installed
N/A

Intake Setting (BTC)
85ft

Driller's Log

Well Log	From	End	Colour	Rock Type
16364	**88ft**	**125ft**	**Grey**	**Sandstone**

Overall Well Depth
125ft

Bedrock Level
22ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
16364	**100ft**	**5 igpm**
16364	**120ft**	**15 igpm**

Setbacks

There is no Setback information.

New Nouveau Brunswick

Environment

Report Number **17803**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Non-Drinking Water, Industrial	New Well	Rotary	05/27/2008

Casing Information

Casing above ground 1ft 6in — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
17803	**Steel**	**6 inch**	**0ft**	**40ft**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Bailer	24ft (BTC - Below top of casing)	14 igpm	1hr	24ft	7 igpm	No	0 igpm

Well Grouting

There is no Grout information.

Drilling Fluids Used
Foam

Disinfectant
N/A

Qty 0 ig

Pump Installed
N/A

Intake Setting (BTC)
40ft

Driller's Log

Well Log	From	End	Colour	Rock Type
17803	**0ft**	**3ft**	**Brown**	**Fill Shale**
17803	**3ft**	**27ft**	**Red**	**Clay**
17803	**27ft**	**33ft**	**Grey**	**Sandstone**
17803	**33ft**	**34ft**	**Grey**	**Clay**
17803	**34ft**	**38ft**	**Grey**	**Sandstone**
17803	**38ft**	**39ft**	**Red**	**Clay**
17803	**39ft**	**60ft**	**Grey**	**Sandstone**

Overall Well Depth
60ft

Bedrock Level
0ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
17803	**50ft**	**10 igpm**
17803	**60ft**	**14 igpm**

Setbacks

Well Log	Distance	Setback From
17803	**30ft**	**Right of any Public Way Road**

New Nouveau Brunswick

Environment

Report Number **25762**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Non-Drinking Water, Heat Pump	New Well	Rotary	07/29/2010

Casing Information

Casing above ground 2ft — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
25762	**Steel**	**6 inch**	**0ft**	**62ft**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	24ft (BTC - Below top of casing)	60 igpm	1hr	24ft	20 igpm	No	0 igpm

Well Grouting

There is no Grout information.

Drilling Fluids Used
Foam

Disinfectant
N/A

Qty 0 ig

Pump Installed
N/A

Intake Setting (BTC)
0ft

Driller's Log

Well Log	From	End	Colour	Rock Type
25762	**0ft**	**1ft**	**Brown**	**Shale**
25762	**1ft**	**2ft**	**Brown**	**Soil**
25762	**2ft**	**4ft**	**Brown**	**Soils and Sand and Clay**
25762	**4ft**	**21ft**	**Brown**	**Sandstone**
25762	**21ft**	**26ft**	**Dark brown**	**Sandstone**
25762	**26ft**	**41ft**	**Brown**	**Sandstone**
25762	**41ft**	**42ft**	**Grey**	**Clay**
25762	**42ft**	**46ft**	**Grey**	**Sandstone**
25762	**46ft**	**58ft**	**Brown**	**Sandstone**
25762	**58ft**	**61ft**	**Dark brown**	**Soft Sandstone**
25762	**61ft**	**80ft**	**Brown**	**Sandstone**

Overall Well Depth
80ft

Bedrock Level
0ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
25762	**40ft**	**55 igpm**
25762	**60ft**	**75 igpm**

Setbacks

Well Log	Distance	Setback From
25762	**66ft**	**Right of any Public Way Road**
25762	**170ft**	**Right of any Public Way Road**

New Nouveau Brunswick

Environment

Report Number **25763**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	07/29/2010

Casing Information

Casing above ground 1ft 10in Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
25763	**Steel**	**6 inch**	**0ft**	**40ft**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	24ft (BTC - Below top of casing)	35 igpm	1hr	24ft	20 igpm	Yes	0 igpm

Well Grouting

There is no Grout information.

Drilling Fluids Used
Foam

Disinfectant
N/A

Qty 0 ig

Pump Installed
N/A

Intake Setting (BTC)
60ft

Driller's Log

Well Log	From	End	Colour	Rock Type
25763	**0ft**	**6ft**	**Brown**	**Fill Shale**
25763	**6ft**	**26ft**	**Brown**	**Sandstone**
25763	**26ft**	**32ft**	**Dark brown**	**Sandstone**
25763	**32ft**	**36ft**	**Brown**	**Sandstone**
25763	**36ft**	**39ft**	**Dark brown**	**Soft Sandstone**
25763	**39ft**	**75ft**	**Brown**	**Sandstone**

Overall Well Depth
75ft

Bedrock Level
0ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
25763	**75ft**	**35 igpm**
25763	**60ft**	**20 igpm**

Setbacks

Well Log	Distance	Setback From
25763	**115ft**	**Right of any Public Way Road**
25763	**115ft**	**Right of any Public Way Road**

New Nouveau Brunswick

Environment

Report Number **33672**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	09/24/2012

Casing Information

Casing above ground 1ft 10in Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
33672	**Steel**	**6 inch**	**0ft**	**44ft**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	36ft (BTC - Below top of casing)	10 igpm	1hr	44ft	8 igpm	No	0 igpm

Well Grouting

There is no Grout information.

Drilling Fluids Used
Foam

Disinfectant
Bleach (Javex)

Qty 0 ig

Pump Installed
N/A

Intake Setting (BTC)
75ft

Driller's Log

Well Log	From	End	Colour	Rock Type
33672	**0ft**	**5ft**	**Brown**	**Fill Shale**
33672	**5ft**	**6ft**	**Brown**	**Topsoil**
33672	**6ft**	**21ft**	**Brown**	**Sandstone**
33672	**21ft**	**22ft**	**Brown**	**Clay**
33672	**22ft**	**26ft**	**Brown**	**Sandstone**
33672	**26ft**	**31ft**	**Brown**	**Clay**
33672	**31ft**	**38ft**	**Brown**	**Sandstone**
33672	**38ft**	**42ft**	**Brown**	**Clay**
33672	**42ft**	**55ft**	**Brown**	**Sandstone**
33672	**55ft**	**85ft**	**Grey**	**Sandstone**
33672	**85ft**	**103ft**	**Red**	**Clay**

Overall Well Depth
103ft

Bedrock Level
0ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
33672	**51ft**	**5 igpm**
33672	**79ft**	**10 igpm**

Setbacks

Well Log	Distance	Setback From
33672	**67ft**	**Center of road**

New Nouveau Brunswick

Environment

Report Number **33678**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	11/11/2011

Casing Information

Casing above ground 0ft — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
33678	Steel	6 inch	0ft	80ft	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	27ft (BTC - Below top of casing)	35 igpm	1hr	27ft	25 igpm	No	0 igpm

Well Grouting

There is no Grout information.

Drilling Fluids Used
Foam

Disinfectant
N/A

Qty 0 ig

Pump Installed
N/A

Intake Setting (BTC)
60ft

Driller's Log

Well Log	From	End	Colour	Rock Type
33678	0ft	2ft	Brown	Fill Shale
33678	2ft	10ft	Brown	Soil
33678	10ft	11ft	Mix	Gravel
33678	11ft	14ft	Brown	Clay
33678	14ft	15ft	Mix	Gravel
33678	15ft	23ft	Brown	Clay
33678	23ft	31ft	Brown	Sandstone
33678	31ft	33ft	Brown	Clay
33678	33ft	42ft	Brown	Sandstone
33678	42ft	44ft	Dark brown	Soil
33678	44ft	52ft	Brown	Sandstone
33678	52ft	53ft	Brown	Sandstone
33678	53ft	56ft	Brown	Sandstone
33678	56ft	58ft	Brown	Clay
33678	58ft	72ft	Brown	Sandstone
33678	72ft	82ft	Grey	Sandstone

Overall Well Depth
82ft

Bedrock Level
0ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
33678	72ft	25 igpm
33678	81ft	35 igpm

Setbacks

Well Log	Distance	Setback From
33678	79ft	Septic Tank
33678	76ft	Leach Field
33678	293ft	Right of any Public Way Road

New Nouveau Brunswick

Environment

Report Number **91182400**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well (NEW WELL)		08/06/1998

Casing Information

Casing above ground 0ft — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
91182400	**Steel**	**5 inch**	**0ft**	**50ft**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
	27ft (BTC - Below top of casing)	20 igpm	1hr	46ft	0 igpm	No	0 igpm

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 0 ig

Pump Installed
N/A

Intake Setting (BTC)
49ft

Driller's Log

Well Log	From	End	Colour	Rock Type
91182400	**0ft**	**25ft**	**Brown**	**Clay**
91182400	**25ft**	**29ft**	**Soft grey and red**	**Mud and Stone and Shale**
91182400	**29ft**	**47ft**	**Red**	**Soft Rock**
91182400	**47ft**	**47ft**	**White and red**	**Coal**
91182400	**47ft**	**55ft**	**Grey**	**Sandstone**

Overall Well Depth
55ft

Bedrock Level
25ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
91182400	**55ft**	**20 igpm**

Setbacks

There is no Setback information.

New Nouveau Brunswick

Environment

Report Number **92035300**

Well Driller's Report

Date printed 2015/08/31

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Cable Tool	05/30/2001

Casing Information

Casing above ground 2ft — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
92035300	**Steel**	**5 inch**	**0ft**	**37ft**	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Bailer	24ft (BTC - Below top of casing)	12 igpm	1hr	24ft	12 igpm	No	0 igpm

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)
Qty 0.5 ig

Pump Installed
N/A
Intake Setting (BTC)
44ft

Driller's Log

Well Log	From	End	Colour	Rock Type
92035300	**0ft**	**4ft**	**Brown**	**Fill**
92035300	**4ft**	**18ft**	**Brown**	**Clay**
92035300	**18ft**	**34ft**	**Grey**	**Clay**
92035300	**34ft**	**51ft**	**Grey**	**Sandstone**

Overall Well Depth
51ft

Bedrock Level
0ft

Water Bearing Fracture Zone

Well Log	Depth	Rate
92035300	**42ft**	**2 igpm**
92035300	**50ft**	**12 igpm**

Setbacks

There is no Setback information.