

**Water Source Supply
Assessment - Etang Ruisseau Bay**

Haut-Shippagan, NB

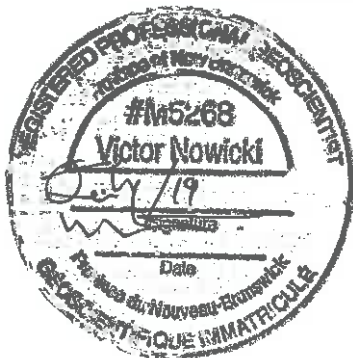
Prepared for

Dr. A Mallet, Etang Ruisseau Bay Ltee

Prepared by

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WATER SUPPLY SOURCE ASSESSMENT – L'ÉTANG RUISSEAU BAR LTÉE

1) *Name of proponent*

L'Étang Ruisseau Bar Ltée. President is André Mallet (Oyster Farm- Haut-Shippagan)
(Figure 1)

2) *Location of drill targets (including property PID) and purpose of the proposed water supply*

The PID is 20152224. The drill target is located in the north west corner of the property, as per the attached **Figure 2**. The oyster facility apparently has a high capacity well drilled in 2009 located near the shore (see attached). The driller rated the well at 230 usgal/min.

It is proposed that this become the Return Well and a new Source Well be drilled to the north west. **(Figure 2)**

3) *Required water quantity (in m³/day) and/or required pumping rate*

The existing well provided a stabilized flow rate of 0.6m³/min (360 min constant rate test by owner at 600L/min). Corbo Engineering (Design Consultant) gave 0.42 m³/min (112 usgal/min) as required for the open well system.

4) *List alternate water supply sources in area (including municipal systems)*

The property already has a high capacity well, which is rated at 0.6 m³/min. This well has worked without flow problems since construction 10 years ago. The well is located at the front of the property near the shoreline. This well only pumps 4 m³/day as this is all the facility needs at present. This water is used for washing the floor; backwash the filters; and flushing the wash bags.

The property also has a dug well +/-7m deep located to the north of the drilled well. This water is used for the laboratory and the toilets.

No other water sources lie within 325 metres of the proposed new well. There is a summer cottage well located 325 metres to the north west, adjacent to the shoreline on PID 20565198. **(Figure 3)**

The highest capacity wells in the area lie in the Town of Shippagan, 4 km to the east of the property. To the north of the property at a distance of 0.9 km, there are numerous private residential wells.

5) Discuss area hydrogeology as it relates to the project requirements

Site Geology

The well log for the present well is attached. The log provides the geology beneath the site. It consists of a thin 6 ft layer of surficial material underlain by sandstone units. The initial unit beneath the surficial material is weathered to a depth of 45 ft where more competent sandstone units are present. These sandstone units are present to 95ft where the sandstone unit became intercalated with thin shale bands. This unit continued to the full depth of the well at 115 ft.

Regional Geology

Weathering in upper bedrock units, such as the above, is common throughout the Shippagan region. The geology consists of horizontally to near horizontally bedded sandstone units alternating with finer grained units such as shale and siltstone. At the Town of Shippagan, more distinct shale/siltstone units are present. The Town of Shippagan wells lie some 4 km to the northeast of the property. These high capacity wells serving the Town have transmissivities of 5,218 m² /day (350,000 g/d/ft) or more. The underlying horizontally to near-horizontally bedded sandstone pass outwards towards the sea. This makes them susceptible to saltwater intrusion at some locations (Town of Shippagan Wells) when the freshwater aquifer is stressed by over-pumping.

The groundwater on the Shippagan peninsula recharges in the centre of the peninsula and then flows outwards to discharge to the sea, which occurs along the entire shoreline of the peninsula.

It would seem from the well log and the water blown from the well at the plant that high transmissivities are also present beneath the property. The existing well in operation for 9 yrs has not developed any evidence of salt intrusion based on taste from the workers. In addition, a short term pump test conducted by the owner for 6 hrs saw the well stabilize with 5m of drawdown and no salty taste to the water after 360 minutes.

6) *Outline the proposed hydrogeological testing and work schedule*

The new source well will be drilled at the north west corner of the property. It is expected to be completed to a similar depth as the present well. After cleaning, the well will be monitored across one tidal cycle to estimate the tidal effect. The same effect will be monitored at the existing well.

The initial testing would be on the existing well. Two or three steps could be undertaken to determine the pumping rate for the well. A 48 hrs pumping test or to stabilization through two tidal cycles would be undertaken to aid in estimating the aquifer parameters and allow water samples to be obtained. An observation well would be drilled 10 to 15 m from the existing well. The new source well could also act as an observation well for this test.

A pump would be installed in the new source well and a pump test completed for a period of 72 hrs or to stabilization through two tidal cycles. If the well behaves the same as the existing well, that step test data will be used to estimate the pumping rate.

Following the pump tests, recovery tests would be completed. Water samples would be taken to assess water quality. For the new source well test, observations wells will be the present well (new return well) and the new observation well.

7) *Identify any existing pollution or contamination hazards within a minimum radius of 500 m from the proposed drill targets. Historical land use that might pose a contamination hazard (i.e. tannery, industrial, waste disposal, etc.) should also be discussed*

No hazardous materials or contamination is known on or near the site. The land around the site has not been developed and has remained so for many years. The surrounding property is privately owned.

A survey of the building and property will be made before testing to assess if any hazardous materials are present. If any are present security of the materials would be assessed and if needed developed.

A small amount of Javex is kept for disinfection of equipment; gasoline is present in small containers used for the outboard motors; 5L of dilute acid (10%).

8) Identify any groundwater use problems (quantity or quality) that have occurred in the area

The on-site well has shown no water quality problems other than occasional iron and manganese presence. The owner says the well water has no salty taste. The well has never run dry or not been able to supply water to the facility. The owner is not aware of any other water supply or quality problems in the area.

9) Identify any watercourse(s) (stream, brook, river, wetland, etc.) within 60 m of the proposed drill targets

No watercourses or wetlands lie within 60m of the drill target. The nearest wetland lies some 125m to the north west of the site and lies adjacent to the shoreline. A second wetland lies some 625m to the north east of the site. **(Figure 4)**

There is a small pond to the north west of the drill target. It is not known how this was created, whether this was dug or was simply an arm of the sea that became closed off with a sand berm.

10) Identify site supervisory personnel involved in the source development (municipal officials, consultants and drillers)

Modern Well Drilling Ltd of St. Isidore will be the driller and V. Nowicki, the Site Professional. Geothermal system design engineers are Corbo Inc. of Caraquet.

11) Attach a 1:10000 map and/or recent air photo clearly identifying the following:

- proposed location of drill targets and property PID
- domestic or production wells within a 500 m radius from the drill target(s)
- any potential hazards identified in question 7

See Figures 2, 3 and 5.

12) Attach a land use/ zoning map of the area (if any)

Superimpose drill targets on this map

No zoning map is available. Land use adjacent to the site is shown on **Figure 5.**

13) Contingency plan for open loop earth energy systems (see Section 2.3)

Salt water in well water

Several courses of action are possible:

- 1) The heat pumps would be designed accordingly for the salt water;
- 2) A new source could be drilled further inland;
- 3) Cased to seal off the salt water, if it occurs in a distinct unit.

Flowing well

Unlikely, as existing well has never flowed due to artesian pressure. Recharge areas inland are not elevated to any great degree. No flowing wells known on the peninsula.

Caving formations or swelling clays/shales

Sealed off with casing. Well construction will be designed accordingly.

Rising sea levels

Site is protected by barrier wall at shoreline. Also, well head protection can be installed.

Well Fouling

Disinfect, clean well.



Scale/Échelle: 1:2,222

Date: 5/14/2019

Figure 1 - Location of Etang Ruisseau Bar property

Figure 2 Well Drill Targets





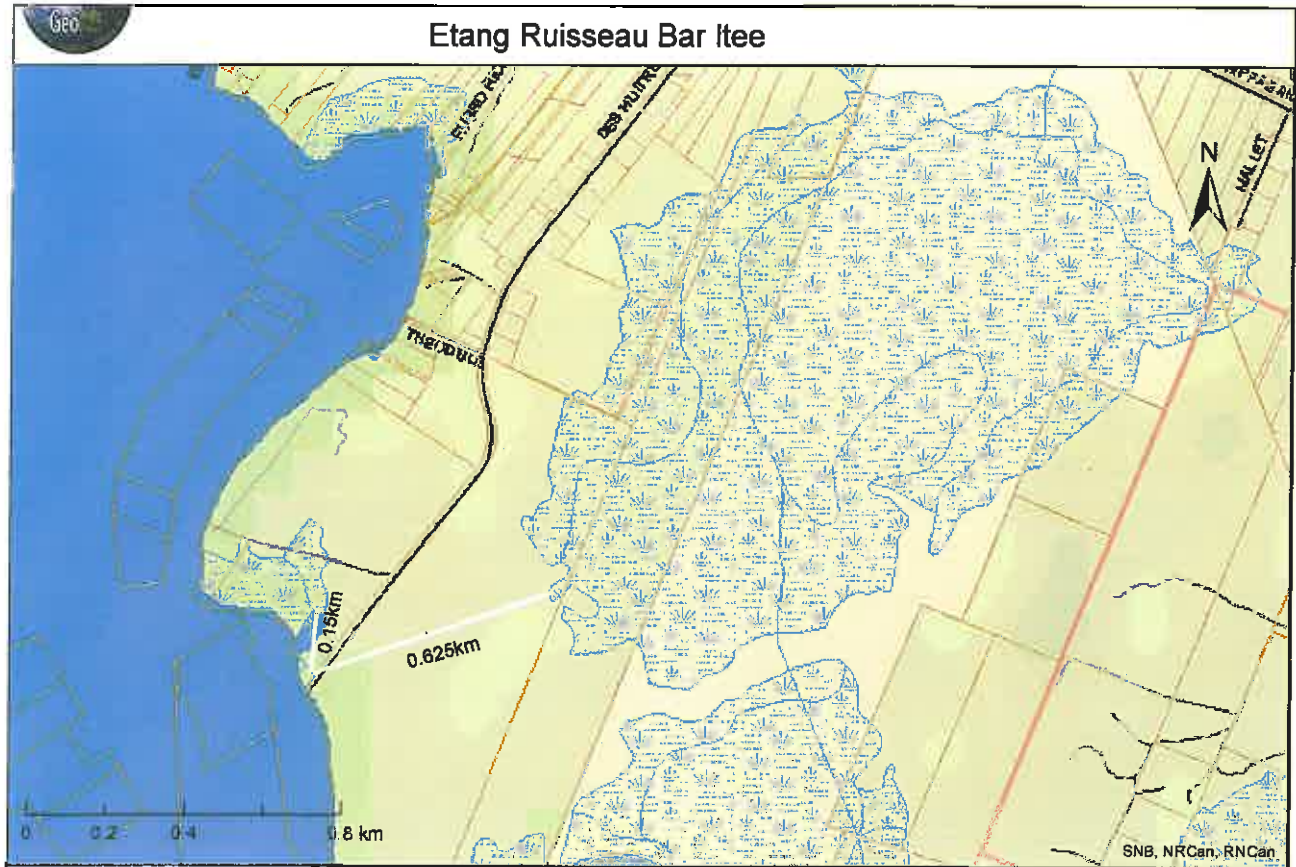
Etang Ruisseau Bar Itee



Scale/Échelle: 1:14,222

Date: 6/2/2019

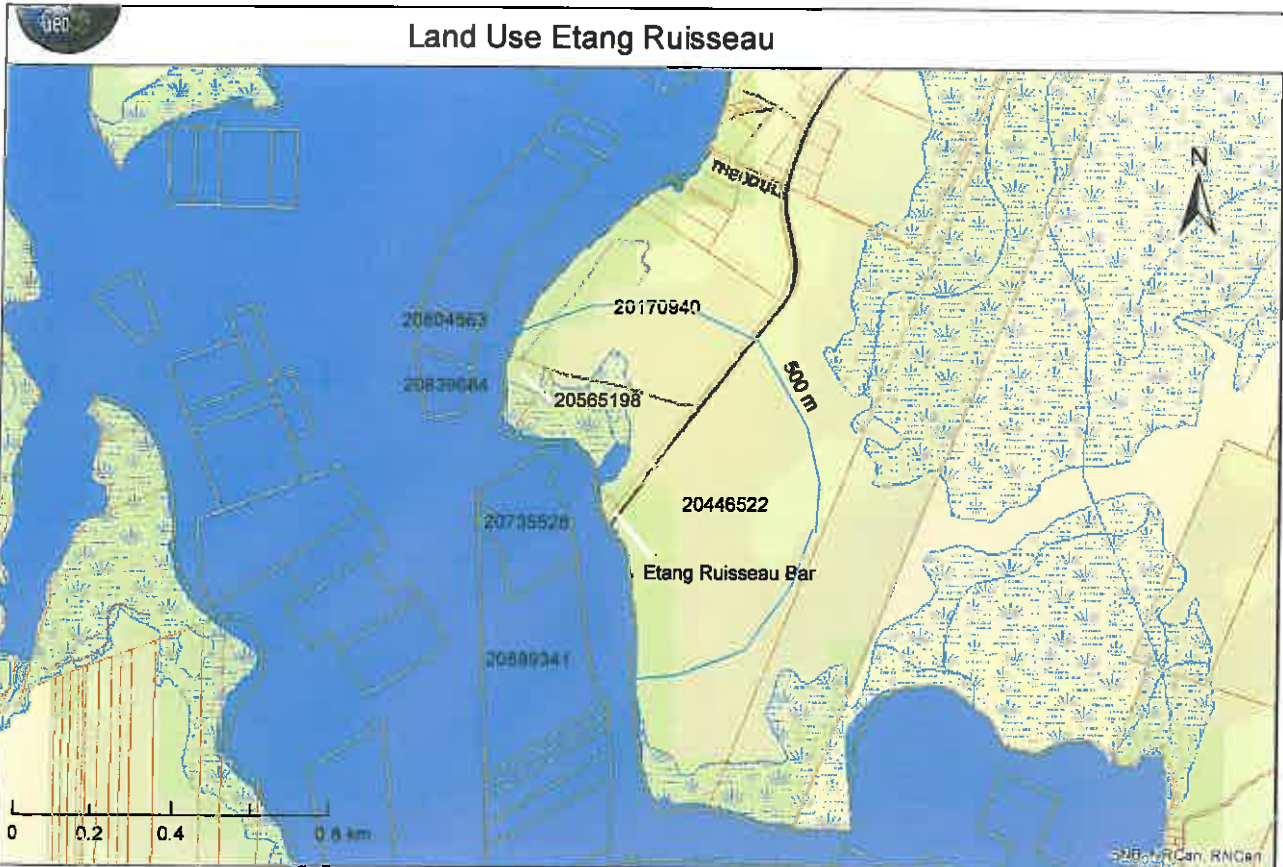
Figure 3 Location of Nearby Wells



Scale/Échelle: 1:14,222

Date: 6/2/2019

Figure 4 Nearby Wetlands and Watercourses



Scale/Échelle: 1:14,222

Date: 6/17/2019

Figure 5 Land Use - Etang Ruisseau Bar

- 20446522 P
- 20170940 P
- 20565198 P
- 20735528 P off shore lease
- 20889342 P off shore lease
- 20839684 P off shore lease
- 20804563 P off shore lease

P Privately owned