Appendix B

Hydrogeological Assessment and Effects Assessment Report and Groundwater Supply Feasibility and Effects Desktop Assessment

Hydrogeological Assessment and Effects Assessment – Belle River Wind Project

Report

Hydrogeological Assessment and Effects Assessment – Belle River Wind Project

Prepared by:

AECOM
105 Commerce Valley Drive West, Floor 7 905 886 7022 tel
Markham, ON, Canada L3T 7W3 905 886 9494 fax
www.aecom.com

Project Number:

60321891

Date:

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AECOM Signatures

Report Prepared By:

Erin Wilson, B.Sc (Hons)
Environmental Scientist

Report Reviewed By:

Jason A. Murchison, P.Geo.
Senior Hydrogeologist
Manager, Water & Natural Resources

M. Wardman.

Marie Wardman, P. Eng. QP (ESA-O Reg 153-04)
Senior Geological Engineer

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1. Introduction

SP Belle River Wind, GP Inc. (Belle River Wind) is proposing to construct a wind energy project (the “Project”) in the Town of Lakeshore, County of Essex, Ontario.

This Hydrogeological Assessment was prepared in accordance with the requirements of the Renewable Energy Approval (REA) process outlined in Ontario Regulation 359/09 (*O. Reg. 359/09*) and the Technical Guide to Renewable Energy Approvals (Ontario Ministry of the Environment (MOE), 2011).

A desktop study was conducted to provide a high-level characterization of existing geological and hydrogeologic conditions and to identify potential effects to groundwater through construction and installation of the Project. Subsurface stratigraphy and general groundwater usage within the Project Study Area (PSA) was inferred from available secondary source data including:

- Quaternary geological mapping from the Ministry of Northern Development and Mines;
- Bedrock geological mapping from Ontario Geological Survey;
- Ministry of the Environment and Climate Change (MOECC) Water Well Records;
- Geology terrain mapping from the Ontario Geological Survey; and
- Geotechnical borehole data from the Oil, Gas and Salt Resource Library.

2. Existing Conditions

2.1 Topography and Physiography

The Project Study Area (PSA) is located within the Essex Clay Plain physiographic region, a sub-region of the St. Clair Clay Plains physiographic region (Chapman and Putnam, 1984). The region is described as a low relief extensive clay plain that slopes gently to the north, toward Lake St. Clair. The prominent soil type within the region is Brookston clay loam, a dark-surfaced gleysolic soil that was developed under a swamp forest (Chapman and Putnam, 1984). Currently, land use is dominated by general crop and livestock farming, which has been made possible by the installation of dredged ditches and tile underdrains to provide satisfactory moisture conditions within the imperfectly drained soils. Peat and muck accumulation, within areas of poorly drained soils, are also common within the region.

Ground surface topography within the PSA is characterized as having low relief, with minor undulations near river valleys and shoreline of Lake St. Clair. Generally, ground surface elevation within the PSA decreases towards the north from a high of approximately 190 meters above sea level (mASL) near the southwesterly limits to about 180 mASL toward Lake St. Clair, at the northern extend of the PSA (**Figure 1**).

2.2 Geological Setting

2.2.1 Bedrock Geology

Thick successions of Middle Devonian aged Paleozoic sedimentary rocks subcrop beneath glacial cover across the PSA. The PSA is primarily underlain by limestone of the Dundee Formation. The Dundee Formation can be described as a brown and tan microcrystalline limestone with occasional sand grains and brown chert (Telford and Russell, 1981). Average thickness of the Dundee Formation is 35 to 40 m (Strynatka, S., *et al.*, 2007).

The Hamilton Group, the youngest unit to subcrop in the County of Essex, is found to subcrop overburden sediments within the southwestern portion of the PSA. The Hamilton Group consists of grey shales and argillaceous limestone that can be divided into several formations. The Hamilton Group within the PSA consists primarily of mudstone and shale with thin lateral carbonate horizons (Johnson *et al.* 1994).

Thickened overburden sediments, indicating a possible bedrock valley feature, is observed extending from Belle River in a southeast direction to north of Wheatly.

2.2.2 Overburden Geology

Bedrock within the PSA is overlain by thick overburden deposits consisting primarily of fine-textured glacial sediments. The County of Essex was directly affected by the Nissouri and Port Bruce stades of glacial ice advance and periods of ice-margin retreat. During two periods of glacial ice advance, till units were deposited in the County of Essex; the older Catfish Creek Till and the overlying Tavistock Till (Strynatka, S., *et al.*, 2007). A series of recessional moraines are also associated with the till deposits in the County of Essex. The moraines consist of silt and silty clay with subordinate sand and some form subtle linear ridges which rise up to 6 m above the surrounding plain. Some moraines are capped with a thin veneer of beach sand (Morris, 1994). During periods of glacial ice retreat, the till was overlain by a stratified, clayey silt glaciolacustrine unit. The clay settled in depressions overlying the till creating the present-day low relief surface topography.

Surficial geology across the PSA is illustrated on **Figure 1**.

Published geological mapping obtained from the Geological Survey of Canada, indicates that the PSA is underlain by approximately 28 to 44 m of overburden sediments consisting primarily of fine-textured glacial and proglacial deposits (Morris *and* Cousineau*,* 1994). The following surficial sediments are found within the PSA, as indicated in **Figure 1**:

Recent Deposits

Modern alluvial deposits of clay, silt, sand and gravel were laid down in river floodplains during the post-glacial period. Within the PSA, these deposits are primarily located within the floodplain of the two major river systems that transect the PSA; being the Belle River and Ruscom River.

A landfill, located at the western extent of the PSA, is represented on **Figure 1** as man-made deposits.

Tavistock Till

The Tavistock Till was deposited during re-advance of the Huron-Georgian Bay ice lobe during the Port Bruce Stade. Tavistock Till can be described as a massive, fine-grained, clayey silt to silty clay till with low stone content. The till is reported to be very soft when wet but compact when dry (Morris, 1994). The Tavistock Till is exposed at surface within the eastern portion of the PSA and varies in thickness between 15 to 28 m (Morris, 1994).

A series of recessional moraines, recognized by Morris (1994) as the Bryndale Moraine, extends through the southern portion of the PSA in an east-west direction. The moraine is identified by a slightly higher elevation than the glaciolacustrine clays, forming subtle linear ridges up to 6 m high. Recessional moraines within the area have relatively stony surfaces and are slightly sandier than the adjacent glaciolacustrine sediments and the Tavistock Till (Morris, 1994). The bulk of material which comprises the moraines is till, and therefore not considered beach ridges.

Glaciolacustrine Deposits

Glaciolacustrine deposits of rhythmically laminated silt and clay dominate the surficial deposits within the central and western portion of the PSA. This deposit directly overlies the Tavistock Till and ranges in thickness from approximately 1 m in the northeast to about 6 m, thickening in a westward direction (Morris, 1994).

Lacustrine Deposits

Coarse-textured lacustrine beach, bar and near shore deposits of sand and minor gravel are exposed at surface within the central portion of the study area. According to Morris (1994), these deposits are less than 1 m thick and do not extend laterally past the surface exposure. However, one (1) MOECC water well record, located in close proximity to the lacustrine deposit, shows approximately 20 m of sand extending from surface and a water level of less than 2 m below ground surface (mbgs).

2.3 Hydrogeological Setting

Surficial geology and physiography of the County of Essex provides a foundation to characterize the general hydrostratigraphy of the PSA. Hydrostratigraphy is the classification of various major stratigraphic units into aquifers and aquitards, with some simplification or combination of units with similar properties. Previous groundwater resource studies, published by Strynatka *et al.* (2007), provide a generalized framework to characterize groundwater resources, flow and quality within the County of Essex. A review of available secondary source information was used in this investigation.

2.3.1 Hydrostratigraphy

An aquifer is classically defined as a geological unit that is sufficiently permeable to permit the extraction of a useable supply of water. Aquifer units within the County of Essex are typically comprised of coarse-textured unconsolidated (overburden) sediments and limestone and shale bedrock. Coarse-textured surficial sediments within the PSA are limited to the isolated lacustrine beach bar deposit located near the center of the PSA, as well as modern alluvial deposits found within the Belle River and Ruscom River valleys. The coarse-textured alluvial sediments have limited depth and areal extent, causing them to be poor groundwater aquifers.

Dominant surficial sediments within the PSA consist of fine-textured tills and glaciolacustrine deposits. The till deposits typically possess low hydraulic conductivity and a limited ability to transmit groundwater, however, heterogeneities, secondary porosity, permeability features and fractures may locally permit a low yield, and/or provide groundwater recharge-discharge pathways.

The following defines the local surficial sediments into hydrostratigraphic units:

- Modern Alluvial Deposits (Clay, Silt, Sand, Gravel, may contain Organics) ***– Unconfined Aquifer or Aquitard***
- Tavistock Till (Clayey Silt to Silty Clay Till) ***– Aquitard***
- Recessional Moraines (Clayey Silt to Silty Clay Till) ***– Aquitard***
- Glaciolacustrine Deposits (Silt and Clay, massive to well laminated) ***– Aquitard***
- Coarse-Textured Lacustrine Deposits (Sand ,minor Gravel) ***– Unconfined Aquifer***

A review of local MOECC water well records was completed for the purpose of characterizing the hydrostratigraphy of the PSA beneath the surficial sediments. In general, the PSA is underlain by fine-textured glaciolacustrine clay and a clayey-silt till. These sediments extend to a depth of up to approximately 28 m. In most areas within the PSA the thick clay is underlain by a thin sand and gravel deposit, approximately 3 m thick. In some areas, this sand and gravel deposit directly overlies bedrock. More commonly, the sand and gravel deposit overlies basal clay unit that extends to bedrock. A lack of MOECC water well records completed within the thin sand and gravel deposit indicates poor aquifer potential.

2.3.2 Groundwater Resources

Within the County of Essex, water for municipal supply is provided from surface water sources in the Great Lakes system. There are no municipal supply wells currently providing water to the region (ERCA, 2012). Approximately 95% of the population within the Region is served by municipal water. However, the remaining 5% depend on groundwater as the primary water supply for properties outside the municipally serviced areas (ERCA, 2012).

Groundwater Use

Figure 2 depicts the locations of MOECC water well records within and adjacent to the PSA, primary use of the wells, distinguishes between bedrock and overburden wells, and highlights shallow wells that are screened at a depth of less than 10 m below ground surface. Review of the MOECC database has identified approximately 105 well records within the PSA. As shown in **Table 1**, available well records indicate that 31% of groundwater use in the PSA is for agricultural purposes (irrigation or livestock uses). Domestic supply use accounts for 25% of the MOECC water well records, followed by monitoring/test holes (12%), commercial and/or industrial use (4%), and public sources (3%). Approximately 18% of MOECC water well records did not specify the well use and therefore are classified as ‘Unknown’. Approximately, 7% of the MOECC water well records indicate the well is no longer in use, accounting for decommissioning records and dry wells.

Table 1. Summary of MOECC Water Well Record Information

Primary Water Use	Number of Well Records	Well Depth (m)	Primary Well Type
Commercial/Industrial	4	31.1 to 47.9	2 Overburden, 2 Bedrock
Domestic	26	25.9 to 44.2	4 overburden, 22 bedrock
Irrigation/Livestock	33	19.5 to 64.6	8 overburden, 25 bedrock
Monitoring/Test Hole	13	5.2 to 7.6	13 unknown
Public	3	29.6 to 39.6	0 overburden, 3 bedrock
Not Used	7	30.2 to 65.2	0 overburden, 4 bedrock, 3 unknown
Unknown	19	3.2 to 61.6	3 overburden, 8 bedrock, 8 unknown

The location and depth of MOECC water well records gives some indication of the presence of viable groundwater resources within the PSA. Approximately 61% of the wells within the PSA obtain their source water from the bedrock aquifer. Only 16% of the MOECC water well records within the PSA were completed in overburden sediments. This gives further evidence that the overburden is considered a poor groundwater resource.

Depth to Water Table

The lack of shallow MOECC overburden wells, sourcing water from an unconfined aquifer, presents difficulty in characterizing the depth to the water table within the PSA. One (1) MOECC water well located in close proximity to the lacustrine beach deposit shows a static water level of approximately 1.2 m below ground surface (mbgs). Fluctuations in the groundwater level may occur due to seasonal changes and variations in precipitation. For the purposes of this investigation it is assumed that the depth to the water table within the PSA is approximately 1 mbgs.

3. Water Taking Assessment

3.1 Temporary Water Takings and Construction Considerations

As described in the *Technical Guide to Renewable Energy Approvals* (MOE, 2013), an important environmental effect to consider is the potential for the Project to interfere with existing uses of a water resource. Groundwater takings for the purposes of providing dry working conditions during turbine foundation construction, collection line installation, road construction, dust suppression and general maintenance activities may be required during construction of the Project. Any water taking conducted during the construction phase of the Project is subject to the REA application and as such does not require a separate Permit to Take Water (PTTW). However, a similar assessment that would typically be required to obtain a PTTW for water takings exceeding 50,000 L/day is to be submitted as part of the REA application.

During the construction phase of the Project, water may be required to support turbine construction (i.e., dust suppression and directional drilling fluids). Water demands during construction of the Project are expected to have peak water demands up to 40,000 Litres per day (L/day). Actual daily demands will vary based on day-to-day operations and will typically be lower in volume than the estimated peak volume. As described in the Water Supply Feasibility and Effects Assessment for the Project, found in **Appendix B**, the proposed source of water for general construction use is a groundwater supply well located at the Operations and Maintenance (O&M) building.

Review of existing secondary source information provided by the Ontario Geological Survey and through the analysis of local MOECC water well records indicates that groundwater takings for the purpose of turbine foundation construction is expected to be of relatively low volume, if any. The majority of the PSA is underlain by fine-textured glacial till and glaciolacustrine deposits that do not readily transmit groundwater. Therefore, turbine foundations excavated in this material are not anticipated to require significant dewatering during construction. In the central portion of the PSA, in the proximity of where the coarse-textured lacustrine beach sand is exposed at surface, higher groundwater taking requirements for turbine foundation construction is anticipated. In conclusion, there is limited potential for groundwater takings to exceed 50,000 L/day at a turbine site, but is dependent on the surficial material being excavated, the depth to groundwater, and other hydrogeological characteristics that may be determined during geotechnical analysis.

At least one geotechnical borehole will be drilled for each turbine base location and site specific soil data and depth to groundwater will become available. Should groundwater taking from a turbine foundation excavation be expected to exceed 50,000 L/day, mitigation and monitoring efforts as detailed in Table 2, will be performed.

Water removal from turbine foundation excavations due to overland flow of surface water into the excavation, the interception of tile drains and farm drains, and direct precipitation inputs are not considered a groundwater taking. The contractor will be responsible to record daily water taking quantities and the source of water (groundwater, surface run-off, tile drains, etc.) to ensure the groundwater taking allowance of 50,000 L/day is not exceeded.

3.2 Long Term Water Takings and Operation Considerations

During operation of the Project, it is expected that approximately up to 15 full time employees will regularly use the O&M building. Non-potable water taking during operation will be limited to regular personnel requirements, which are expected to be approximately 4,500 Litres per day and are not expected to exceed 50,000 Litres per day. Facilities that will provide this non-potable water will require the construction of one or more new well(s). A Water Supply Feasibility and Effects Assessment for the Project has been completed to evaluate the feasibility of meeting projected water demand using groundwater supply wells and assess the potential effects of this water taking on existing local users and environmental features (**Appendix B**).

4. Assessment of Impacts and Monitoring

Potential environmental impacts, mitigation measures, residual effects, and a monitoring plan associated with potential effects to groundwater are described in **Table 2** below.

Table 2. Mitigation Measures, Net Effects and Monitoring Plan: Geology and Groundwater

Potential Effect	Performance Objective	Mitigation Strategy	Net Effects	Monitoring Plan and Contingency Measures
Temporary reduction in groundwater flow to natural features (waterbodies, watercourses and wetlands) during groundwater dewatering activities associated with turbine foundation construction.	• Minimize reduction of groundwater contribution to near-by natural features.	• Direct dewatering discharge to the downgradient watercourse (following sediment and erosion control practices) to negate the potential that groundwater drawdown will decrease baseflow into streams and groundwater discharge into wetlands. • Limit duration of dewatering to as short a time frame as possible. • Implement groundwater cut-offs, where practical, to limit groundwater taking quantities.	• Reduction in groundwater quantity and quality minimized through application of mitigation measures. • Low likelihood and negligible magnitude of long term effects based on the amount of dewatering required and the duration of expected dewatering activities.	• Should groundwater dewatering activities be expected to exceed 50,000 L/day, the following measures will be implemented: ○ Inlet pump head shall be surrounded with clear stone and filter fabric. ○ The discharge shall be regulated at such a rate that there is no flooding in the receiving water body and that no soil erosion is caused that impacts the receiving water body.
Temporary reduction in groundwater quantity and quality to existing groundwater users (private water wells) during groundwater dewatering activities associated with turbine foundation construction.	• Minimize reduction of groundwater quantity and quality to existing groundwater users.	• Limit duration of dewatering to as short a time frame as possible. • Implement groundwater cut-offs , where practical, to limit groundwater taking quantities. • Maintain a setback of 120 m from known active residential groundwater supply wells (private water wells), where possible.	• Reduction in groundwater quantity and quality minimized through application of mitigation measures. • Low likelihood and negligible magnitude of long term effects based on the amount of dewatering required and the duration of expected dewatering activities.	• Should groundwater dewatering activities exceed 50,000 L/day and a private water well becomes dry as a result of such activities, a temporary potable water supply will be provided to the property owner.
Contamination of groundwater resources due to accidental spills or releases of contaminants (i.e., fuel, lubricating oils and other fluids) during the refuelling, operation or maintenance of Project equipment.	• Prevent contaminant discharge to the environment.	• Develop a spill response plan and train staff on procedures and protocols. • Refuel Project equipment and vehicles on spill collection pads and/or in designated areas. • Dispose of any waste material from construction activities by authorized and approved off-site vendors.	• Groundwater contamination minimized through application of mitigation measures. • Low likelihood and limited magnitude of effects on groundwater.	• Routine inspections performed by the contractor of construction equipment for leaks and spills. • In the event of a spill all work will stop until the spill is cleaned up. • Notify MOECC's Spill Action Centre of any leaks or spills.
Reduction in groundwater quantity from an increase in impervious area created by turbine foundations and access roads resulting in reduced infiltration to unconfined aquifers (coarse-textured lacustrine deposit)	• Minimize the increase in impervious areas.	• Direct runoff from the constructed impervious surfaces to ground surface to prevent any decrease in infiltration and recharge. • Minimize vehicle and construction equipment traffic on exposed soils to avoid compaction and a reduction of water infiltration.	• Reduced infiltration near groundwater recharge areas minimized through application of mitigation measures. • Low likelihood and limited magnitude of effects based on surface area of turbine foundations and the primary land use of surrounding area.	• No monitoring or contingency measures required.

5. Conclusions and Recommendations

This desktop hydrogeological assessment was completed for the purpose of providing a high level review of existing hydrogeological conditions within the PSA, describe potential groundwater taking needs of the Project during construction and operation, outline potential effects of the Project on groundwater resources and provide a mitigation strategy and contingency measures the negate these adverse effects.

Results of this desktop investigation indicate that the dominate soil type within the PSA is a clayey silt to silty clay till and/or a fine-textured glaciolacustrine deposits, and that these materials do not readily transmit groundwater. Therefore, turbine foundations excavated within these materials are not anticipated to require significant dewatering during construction. Site specific geotechnical work has not yet been completed to confirm soil conditions at each turbine site. Should turbines be excavated in coarser-grained materials (e.g., sand and/or gravel), below the water table, dewatering requirements may exceed 50,000 L/day.

In conclusion, there is limited potential for groundwater takings to exceed 50,000 L/day at a turbine site, but is dependent on the surficial material being excavated, the depth to groundwater (relative to the excavation extent), and other hydrogeological characteristics that will be determined during geotechnical analysis. Should groundwater dewatering rates be expected to exceed 50,000 L/day from a turbine foundation excavation, mitigation measures to minimize the potential impact to groundwater resources will be applied.

6. References

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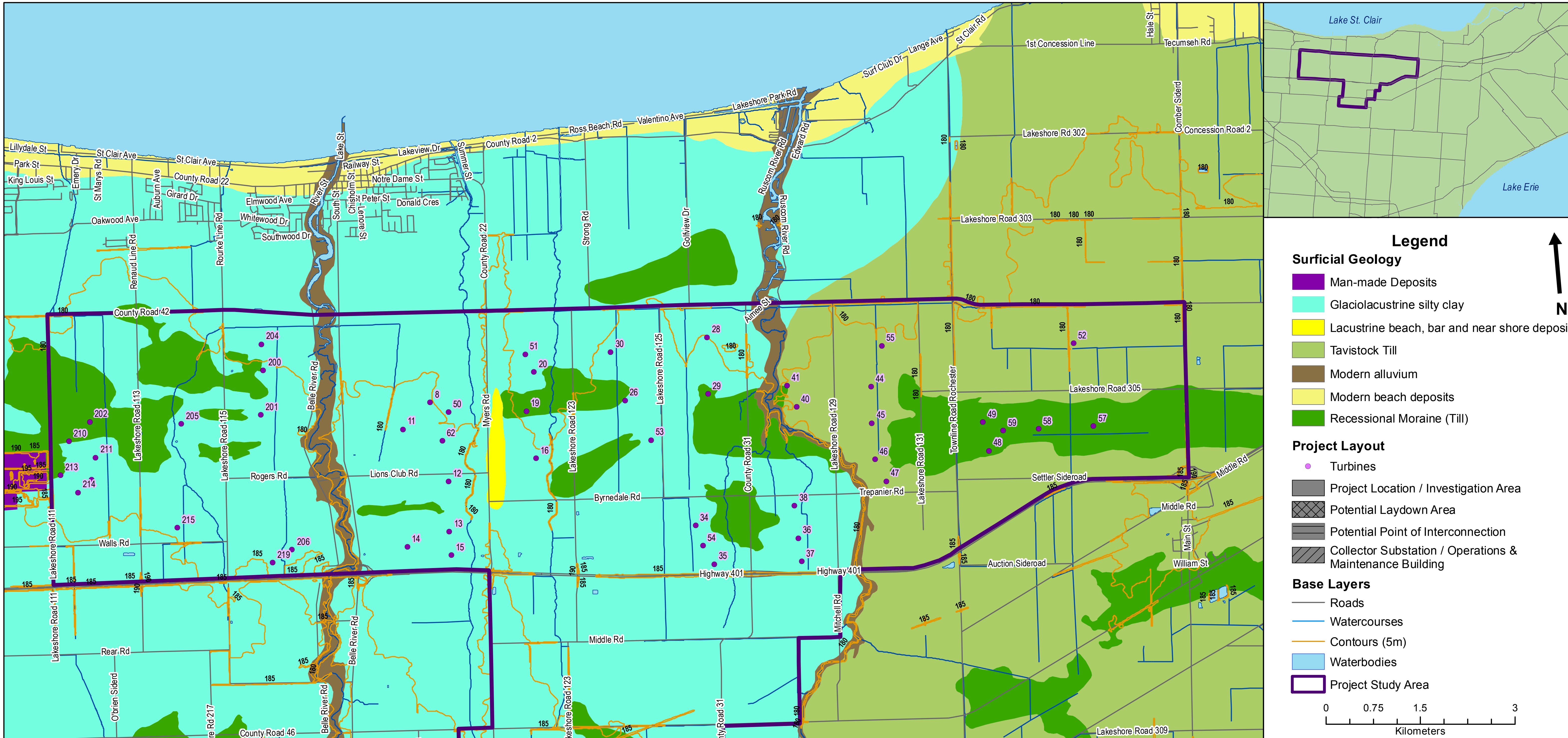
Figures



Belle River Wind Project

Surficial Geology

May 2015	1:60,000	Datum: NAD83, Zone 17 Source: OMB
P#: 60321891	V#: 001	

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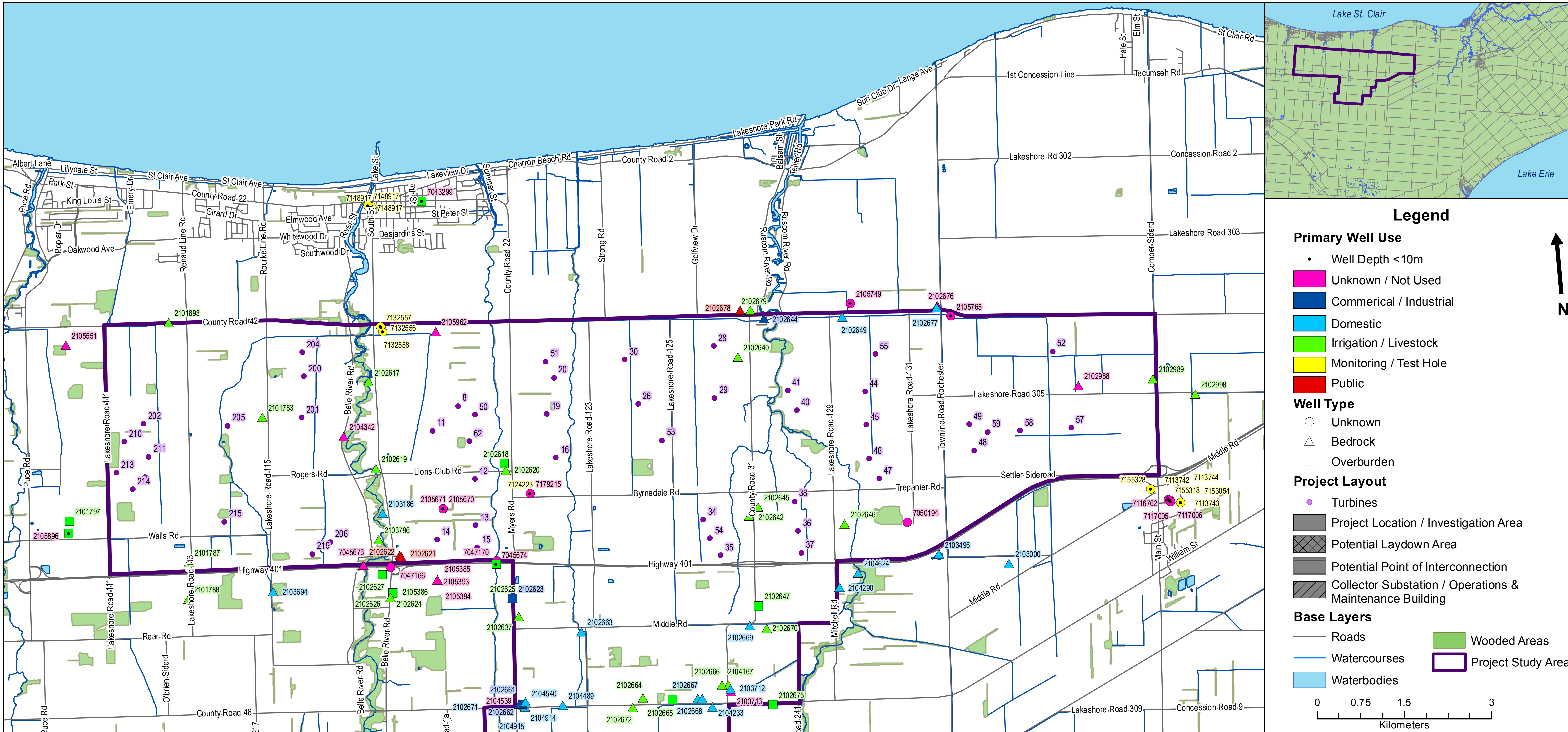
Figure 1



Belle River Wind Project

MOECC Water Well Locations

May 2015	1:65,000	Datum: NAD83, Zone 17 Source: OBM
P#: 60333000	V#: 002	Figure 2

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Appendix A

MOE Water Well Records

Appendix A. MOE Water Well Records

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Well ID	UTM Zone	Easting (NAD83)	Northing (NAD83)	Lot	Concession	Elevation (mASL)	Construction Date	Well Type	Primary Water Use	Water Kind	Deepest Depth (m)	Depth to Bedrock (m)	Well Depth (m)	Top of Screen (m)	Static Level
2101783	17	356692.9	4680222	013	02	182	11/18/1957	Bedrock	Livestock	Not stated	39.62	33.53	40.23		2.74
2101787	17	355217.9	4677852	017	03	185	4/13/1959	Bedrock	Livestock	SULPHUR	43.89	43.28	43.89		4.88
2101788	17	355152.9	4677222	018	03	186	5/12/1955	Bedrock	Livestock	SULPHUR	38.40	37.49	38.71		5.18
2101797	17	353232.9	4678732	016	04	187	8/1/1954	Overburden	Livestock	SULPHUR			39.32		3.35
2101893	17	355233	4681992	007		181	8/22/1955	Bedrock	Livestock	SALTY	42.98	30.48	43.28	28.96	1.83
2102617	17	358563	4680672	008	01	176	6/7/1950	Bedrock	Livestock	SULPHUR	30.78	29.87	30.78		2.44
2102618	17	360763	4679072	012	01	181	4/8/1952	Overburden	Livestock	FRESH	19.51		19.51		1.22
2102619	17	358563	4679172	012	01	180	5/19/1954	Bedrock	Livestock	SULPHUR	29.87	27.74	29.87		3.66
2102620	17	360788	4678947	012	01	180	1/7/1958	Bedrock	Livestock	FRESH	42.67	37.19	52.73		2.74
2102621	17	358862.9	4677622	016	01	184	12/31/1956	Bedrock	Public	SULPHUR		34.44	39.62		3.05
2102622	17	358837.9	4677647	016	01	184	7/31/1964	Bedrock	Public	SULPHUR	34.44	34.44	34.75		2.13
2102623	17	360713	4676747	018	02	185	9/14/1951	Overburden	Industrial	FRESH	31.70		31.70		2.74
2102624	17	358622.9	4676947	018	01	185	5/11/1953	Bedrock	Livestock	FRESH	41.45	36.58	41.45		1.22
2102625	17	360713	4676747	018	01	185	10/10/1953	Bedrock	Livestock	MINERIAL	31.09	30.48	31.09		2.13
2102626	17	358662.9	4677022	018	01	185	7/31/1963	Overburden	Livestock	FRESH	33.22		33.53		1.52
2102627	17	358512.9	4677347	017	01	183	8/13/1963	Overburden	Livestock	FRESH	31.70		33.53	32.00	1.52
2102637	17	360788	4676422	020	02	186	4/11/1961	Bedrock	Livestock	SULPHUR	39.32	28.04	42.67		4.88
2102640	17	364936.2	4680544	013	03	180	6/14/1950	Bedrock	Livestock	SULPHUR	28.35	28.04	28.35		7.62
2102642	17	364887.9	4677797	017	04	183	6/26/1953	Bedrock	Livestock	SULPHUR	33.22	32.31	33.22		4.57
2102643	17	363387.9	4673312	025	04	185	4/9/1953	Overburden	Livestock	FRESH	29.26		29.26		3.05
2102644	17	365438	4681162	012	05	176	3/27/1950	Bedrock	Commerical	Not stated	31.09	30.48	31.09		7.62
2102645	17	365053	4677947	017	05	183	9/15/1961	Bedrock	Livestock	SULPHUR	32.00	31.39	32.00		2.74
2102646	17	366512.9	4677522	018	05	182	8/6/1958	Bedrock	Livestock	SULPHUR	36.27	35.97	36.58		2.74
2102647	17	364912.9	4676247	020	05	183	6/26/1951	Overburden	Livestock	SULPHUR	32.92		32.92		2.74
2102649	17	366787.9	4681072	012	06	175	10/15/1956	Bedrock	Domestic	FRESH	42.06	41.76	42.37		5.49
2102661	17	360663	4674922	005		186	7/15/1954	Bedrock	Commerical	SULPHUR	41.15	37.19	47.85		2.74
2102662	17	360723	4674922	005		186	6/8/1961	Overburden	Commerical	FRESH	32.92		35.97	34.75	2.44
2102663	17	361837.9	4676072	006		184	1/2/1967	Bedrock	Domestic	SULPHUR	30.78	30.18	30.78		2.44
2102664	17	362792.9	4674847	008		184	4/26/1950	Bedrock	Livestock	SULPHUR	34.44	32.61	34.44		4.27
2102665	17	363292.9	4674772	009		185	8/25/1950	Overburden	Livestock	FRESH	35.36		35.36		1.83
2102666	17	364167.9	4674947	010		183	6/11/1954	Bedrock	Livestock	FRESH	35.05	34.44	35.05		2.44
2102667	17	363812.9	4674747	010		184	10/20/1955	Bedrock	Domestic	SULPHUR	34.44	32.92	34.44		3.66
2102668	17	363737.9	4674752	010		184	7/16/1959	Bedrock	Domestic	SULPHUR	35.05	34.44	44.20		3.66
2102669	17	364732.9	4675922	011		180	6/29/1956	Bedrock	Domestic	FRESH	33.22	31.70	33.22		3.05
2102670	17	365022.9	4675847	012		181	5/3/1951	Bedrock	Livestock	SULPHUR	34.14	34.14	34.44		1.83
2102671	17	359413	4674822	003		187	6/19/1964	Bedrock	Domestic	SULPHUR	38.40	37.80	38.40		0.61
2102672	17	362602.9	4674697	008		185	5/27/1961	Bedrock	Livestock	SULPHUR	34.14	33.53	34.14		2.44
2102675	17	365012.9	4674532	012		184	2/15/1957	Overburden	Livestock	FRESH	32.61		32.92		3.66
2102676	17	368428	4681132	008		181	8/11/1956	Bedrock	Not Used	SALTY	44.20	39.32	65.23		6.71
2102677	17	368413	4681097	008		180	8/14/1956	Bedrock	Domestic	SALTY	41.76	39.32	43.28		6.71
2102678	17	365043	4681347	008		178	4/8/1950	Bedrock	Public	SULPHUR	29.57	27.74	29.57		2.74
2102679	17	365213	4681327	008		179	5/15/1950	Bedrock	Livestock	SULPHUR	31.39	28.35	31.39		2.44
2102988	17	370727.9	4679542	004	04	182	5/25/1953	Bedrock				34.75	41.45		
2102989	17	372013	4679547	006	04	181	4/15/1953	Bedrock	Livestock	MINERIAL	39.62	37.80	39.62		4.88
2102998	17	372713	4679222	008	05	182	5/20/1954	Bedrock	Livestock	SULPHUR	38.10	34.75	38.10		4.27
2103000	17	369272.9	4676597	002	07	183	9/18/1961	Bedrock	Domestic	SULPHUR	36.58	35.66	36.58		6.10
2103186	17	358612.9	4678397	014	01	181	5/6/1968	Bedrock	Domestic	SULPHUR	33.22	31.09	33.22		
2103496	17	368084.2	4676863	018	07	185	7/9/1971	Bedrock	Domestic	SULPHUR	35.36	35.36	35.66		4.88
2103694	17	356612.9	4677222	017	01	185	4/10/1972	Bedrock	Domestic	FRESH	28.35	28.35	30.18		1.52
2103712	17	364312.9	4674872	011		185	7/19/1972	Bedrock	Domestic	SULPHUR	32.31	32.00	35.05		3.05
2103713	17	364312.9	4674822	011		185	7/15/1972	Bedrock	Not Used	SULPHUR	32.00	32.00	38.10		3.05
2103796	17	358501.9	4677948	015	01	181	1/6/1973	Bedrock	Livestock	FRESH	27.43	32.31	32.92	27.43	
2103938	17	359432	4674042	003		185	8/5/1974	Bedrock	Domestic	FRESH	33.53	35.36	35.66	33.53	1.22
2104167	17	364272.9	4674942	010		184	6/24/1976	Bedrock	Livestock	SULPHUR	34.14	33.22	34.14		3.66
2104168	17	360752.9	4673602	005		188	6/26/1976	Bedrock	Domestic	SULPHUR	36.27	38.10	38.10		1.83

Appendix A. MOE Water Well Records

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Well ID	UTM Zone	Easting (NAD83)	Northing (NAD83)	Lot	Concession	Elevation (mASL)	Construction Date	Well Type	Primary Water Use	Water Kind	Deepest Depth (m)	Depth to Bedrock (m)	Well Depth (m)	Top of Screen (m)	Static Level
2104169	17	362412.9	4673502	008		184	6/29/1976	Bedrock	Domestic	FRESH	31.09	32.61	32.61	29.57	0.91
2104233	17	363972.9	4674582	010		183	9/23/1976	Bedrock	Domestic	FRESH	31.09	32.61	33.53		2.74
2104252	17	360772.9	4673462	025	02	187	4/11/1977	Bedrock	Domestic	Not stated	37.19	39.01	39.01	37.49	0.91
2104290	17	366332.9	4676442	019	06	183	7/13/1977	Bedrock	Domestic	SULPHUR	33.53	32.92	34.14		2.13
2104320	17	362062.9	4673472	007		185	8/6/1977	Bedrock		FRESH	33.53	37.19	37.19		
2104321	17	362062.9	4673522	007		185	8/8/1977	Bedrock	Livestock	SULPHUR	39.01	37.19	39.62		0.91
2104342	17	358063	4679772	011	01	180	8/25/1977	Bedrock		SULPHUR	24.38	24.38	25.91		
2104489	17	361412.9	4674842	006		185	5/1/1979	Bedrock	Domestic	FRESH	32.31	32.31	34.44	32.31	0.00
2104539	17	360713	4674922	005		186	7/10/1979	Bedrock		FRESH	32.92	33.22	41.15		1.83
2104540	17	360713	4674902	005		186	7/11/1979	Overburden	Domestic	FRESH	32.92		36.58	32.31	1.83
2104624	17	366672.9	4676662	019	06	180	10/30/1980	Bedrock	Domestic	FRESH	33.22	33.53	33.83		15.24
2104722	17	360872.9	4672922	026	03	187	10/5/1982	Overburden	Domestic	FRESH	25.60		29.57	26.52	1.83
2104914	17	360758	4674867	005		186	11/8/1986	Bedrock	Domestic			34.75	36.58		
2104915	17	360773	4674952	005		186	11/7/1986	Bedrock	Domestic			34.75	41.15		
2105385	17	359455.9	4677179	017	01	184	8/24/1994	Bedrock	Not Used	SULPHUR	34.14	32.00	35.97		2.13
2105386	17	359455.9	4677179	017	01	184	5/24/1994	Bedrock	Irrigation	SULPHUR	38.10	33.53	61.57		4.57
2105393	17	359455.9	4677179	017	01	184	8/24/1994	Bedrock		SULPHUR	38.10	33.53	61.57		-4.57
2105394	17	359455.9	4677179	017	01	184		Bedrock	Not Used	SULPHUR	34.14	32.00	35.97		2.13
2105403	17	360148	4673317	025	02	185	10/28/1994	Overburden	Domestic	Not stated	25.91		25.91		3.05
2105422	17	360110.9	4672756	026	02	186	7/20/1995	Overburden	Domestic	FRESH	24.38		27.43	25.60	2.44
2105551	17	353435.5	4681758	011	04	180	7/19/1999	Bedrock				36.88	47.24		
2105670	17	359651.3	4678386	014	01	181	8/15/2002								
2105671	17	359651.3	4678386	014	01	181	8/15/2002								
2105749	17	366939.2	4681300	008		179	12/18/2003								
2105765	17	368643	4680929	001	04	180	4/16/2004		Not Used						
2105896	17	353200	4678520	014	04	187	5/25/2004	Overburden					3.20	2.50	
2105962	17	359796	4681438	006	01	178	5/5/2006	Bedrock				43.28	60.96		
7043299	17	359752	4683692			176	4/3/2007	Overburden					5.11	1.18	
7045673	17	358202	4677535			180	5/1/2007	Bedrock				29.57	32.92	1.52	
7045674	17	360481	4677353			184	5/3/2007	Overburden					6.10	4.57	
7047166	17	358670	4677460			185	7/3/2007		Not Used				38.40	38.10	
7047170	17	360497	4677418			183	7/11/2007		Not Used				30.18	29.88	
7050194	17	367587	4677459	017	06	183	9/4/2007			SULPHUR	35.66		35.66		2.74
7113742	17	372097	4677448			185	9/24/2008		Monitoring and Test Hole				6.10	3.10	
7113743	17	372117	4677446			184	9/24/2008		Monitoring and Test Hole				6.10		
7113744	17	372130	4677416			185	9/24/2008		Monitoring and Test Hole				6.10	3.10	
7116762	17	372117	4677446			184	11/5/2008								
7117005	17	372130	4677416			185	11/5/2008								
7117006	17	372097	4677448			185	11/5/2008								
7124223	17	361166	4678512	016	02	183	5/26/2009		Monitoring	FRESH	1.50		7.60	6.00	
7132556	17	358888	4681512	006	01	177	9/17/2009		Monitoring and Test Hole				5.50	2.50	
7132557	17	358855	4681602	006	01	176	9/17/2009		Monitoring and Test Hole				5.50	2.50	
7132558	17	358866	4681590	006	01	177	9/17/2009		Monitoring and Test Hole				6.40	3.40	
7148917	17	358873	4683667			175	6/23/2010		Monitoring and Test Hole	FRESH			6.10	2.80	
7148917	17	358849	4683667			175	6/23/2010		Monitoring and Test Hole	FRESH			6.10	2.80	
7148917	17	358826	4683692			175	6/23/2010		Monitoring and Test Hole	FRESH			6.10	2.80	
7153054	17	372297	4677384			185	10/4/2010		Monitoring				5.18	2.13	
7155318	17	372297	4677384				11/2/2010		Monitoring		0.91			3.05	
7155328	17	371812	4677666				11/8/2010		Monitoring		5.33		7.62	4.65	
7179215	17	361163	4678520	016	02		7/4/2011								

Appendix B

Water Supply Well Feasibility and Effects Assessment Memorandum

AECOM
105 Commerce Valley Drive West, Floor 7 — 905 886 7022 tel
Markham, ON, Canada L3T 7W3 — 905 886 9494 fax
www.aecom.com

Memorandum

To	Marc Rose (AECOM)	Page	1
Subject	Groundwater Supply Feasibility and Effects Desktop Assessment – Belle River Wind Project		
From	Erin Wilson (AECOM)		
Date	January 28, 2015	Project Number	60321891

Introduction

SP Belle River Wind, LP, by its general partner, SP Belle River Wind, GP Inc. (Belle River Wind (Belle River Wind) is proposing to construct a wind energy project (referred to herein as the "Project") in the Town of Lakeshore, County of Essex, Ontario. During operation of the Project, it is expected that approximately up to 15 full time employees will regularly use the operations and maintenance (O&M) building and that a non-potable supply of water will be required. Water will also be required during the construction phase of the Project for general maintenance and construction activities. Facilities that will provide non-potable water will require the construction of one or more new well(s).

As described in the *Technical Guide to Renewable Energy Approvals* (MOE, 2013), an important environmental effect to consider for any wind energy project is the potential for the Project to interfere with existing local uses of a water resource. As part of the Renewable Energy Approval application, AECOM Canada Limited (AECOM) has evaluated the feasibility of meeting the projected water demand with one or more supply wells and assessed the potential effects of groundwater taking on existing local users (landowners) and natural environment features/functions. This technical memorandum presents the findings of a desktop evaluation of the feasibility and effects related to a potential groundwater supply well located within the area designated for the O&M building.

Description of Proposed Water Taking

The location of the proposed groundwater source will be at the O&M building, shown in yellow on **Figure 1**. During the construction phase of the Project, water may be required to support turbine construction (i.e., dust suppression and directional drilling fluids). Water demands during construction of the Project are expected to have peak water demands up to 40,000 litres per day (L/day). Actual daily demands will vary based on day-to-day operations and will typically be lower in volume than the estimated peak volume.

A non-potable supply of water will also be required during the operation phase of the Project to meet regular personnel demands at the O&M building. According to Environment Canada (2013), the average daily personal use of water amounts to approximately 300 L/day/person. Up to 15 full time employees will occupy the O&M building and therefore the daily water demand to support normal person use is expected to be approximately 4,500 L/day.

Hydrogeological Conditions and Well Feasibility

A desktop study was conducted to provide a high-level characterization of existing geological and hydrogeologic conditions within the Project Study Area (PSA), which is defined in **Figure 1**. Ministry of the Environment and Climate Change (MOECC) Water Well Records and ArcGIS software were used to assess potential groundwater resources for the purposes of constructing a water supply well at the O&M building. Subsurface stratigraphy and general groundwater usage within the PSA was inferred from available secondary source data, including:

- Quaternary geological mapping from the Ministry of Northern Development and Mines;
- Bedrock geological mapping from Ontario Geological Survey;
- Ministry of the Environment and Climate Change (MOECC) Water Well Records;
- Geology terrain mapping from the Ontario Geological Survey; and
- Geotechnical borehole data from the Oil, Gas and Salt Resource Library.

As detailed in the *Hydrogeological Assessment and Effects Assessment* report prepared by AECOM (January 2015) the PSA is underlain by fine-textured glaciolacustrine clay and a clayey-silt till. These sediments extend to a depth of up to approximately 28 m. In most areas within the PSA the thick clay is underlain by a thin sand and gravel deposit, approximately 3 m thick. In some areas, this sand and gravel deposit directly overlies bedrock. Bedrock within the PSA consists of thick successions of Middle Devonian aged limestone and shale of the Dundee Formation and Hamilton Group (respectively).

Figure 1 depicts the locations of MOECC water well records within and adjacent to the PSA, indicates the primary use of the wells, distinguishes between bedrock and overburden wells, and highlights shallow wells that are screened at a depth of less than 10 m below ground surface. Review of the MOECC database has identified approximately 105 well records within and adjacent to the PSA. **Table 1** summarizes important information obtained from MOECC water well records pertaining to well depth, well type and yield. Highlighted in red in **Table 1** are those wells located within 3 km of the O&M building.

The location and depth of MOECC water well records gives some indication of the presence of viable groundwater resources within the PSA. Approximately 61% of the wells within the PSA obtain their source water from the bedrock aquifer. Only 16% of the MOECC water well records within the PSA were completed in overburden sediments. This low value provides evidence that the overburden underlying the PSA is a poor groundwater resource.

Table 1 provides the pumping test rate for each of the MOECC well records located within and adjacent to the PSA depicting an estimated yield for the well. Groundwater supply wells in the area are reported to possess pumping test rates of between approximately 6,500 and 980,000 L/day. MOECC well records with pumping test rates exceeding 50,000 L/day are primarily bedrock wells screened in the weathered upper bedrock and overlying sand and gravel layer. Eleven (11) MOECC water well records are located within 3 km of the proposed O&M building, of which only seven (7) detail pumping test rates. All seven (7) of these wells are screened within the limestone bedrock at depths ranging between approximately 29.6 m and 36.6 m below ground surface. These wells are reported to possess pumping test rates ranging between about 26,000 L/day and 52,000 L/day. Five

(5) of the wells are reported to produce water high in sulphur, which is most likely the cause of a sulphur smell emitted during the drilling and/or pumping test reported by the water well drillers.

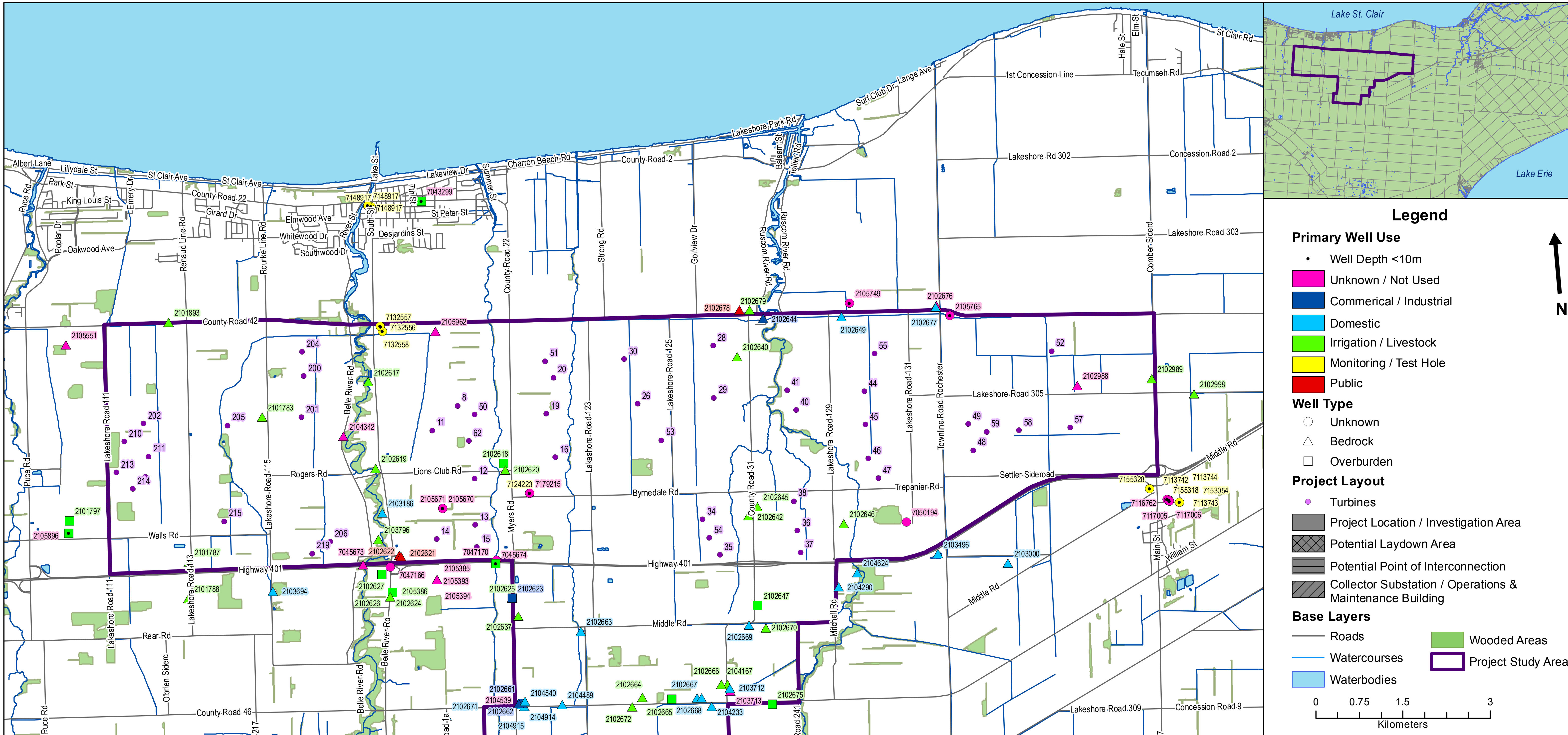
In general, groundwater supply wells within the PSA are capable of producing yields in excess of 50,000 L/day. However, lower yield supply wells also are common within the area. The lack of MOECC water well records within close proximity (less than 500 m) of the proposed groundwater supply well at the O&M building provides a level of uncertainty regarding local groundwater conditions and predicting yield. Therefore, the feasibility of establishing a single groundwater supply well with yields exceeding 50,000 L/day at the O&M building is considered low. However, inadequacies in the well yield during peak water demand can be compensated by increasing the water storage within the water supply system. This can be achieved by utilizing a pressure tank, a large storage tank (intermediate storage) or increase the depth of the drilled borehole to increase storage capacity in the well. Alternatively, two (2) non-adjacent groundwater supply wells could be constructed at the O&M building to meet the Project's water supply demands.

Environmental Impact Assessment

Any water taking conducted during the construction phase of the Project is subject to the REA application and as such does not require a separate Permit to Take Water (PTTW) from the MOECC. However, an assessment similar to that which would typically be required to obtain a PTTW is to be submitted as part of the REA application. The proposed water taking described herein is not expected to exceed 50,000 L/day. Adverse effects on local groundwater users (landowners) and natural ecological features are not known to occur from the operation of groundwater supply wells at such low rates. Therefore, no adverse environmental impacts are expected to occur during operation of the proposed groundwater supply well(s).

Closure

This technical memorandum was prepared on behalf of the Proponent for the purposes of meeting REA reporting requirements and to assess the feasibility and potential effects of establishing a groundwater supply to support construction and operation of the Belle River Wind Project. This memorandum represents a desktop investigation and is based on information collected from the MOECC water well database and information provided by the Proponent. AECOM has assumed that the information provided was factual and accurate. Judgement has been used by AECOM in the interpretation of the secondary source information, however subsurface physical and chemical characteristics may vary between or beyond MOECC water well locations given the variability in geological conditions.



Belle River Wind Project

MOECC Water Well Locations

May 2015	1:65,000	Datum: NAD83, Zone 17 Source: OBM
P#: 60333000	V#: 002	

AECOM

Figure 1

Table 1. Summary of MOECC Water Well Record Information

Well ID	UTM Zone	Easting (NAD83)	Northing (NAD83)	Elevation (mASL)	Well Type	Primary Water Use	Water Kind	Well Depth (m)	Top of Screen (m)	Static Level (m)	Pumping Rate (lpm)	Pumping rate (L/day)
2101783	17	356692.9	4680222	182.16	Bedrock	Livestock	Not stated	40.23		2.74	13.64	19,639
2101787	17	355217.9	4677852	184.89	Bedrock	Livestock	SULPHUR	43.89		4.88	9.09	13,093
2101788	17	355152.9	4677222	186.38	Bedrock	Livestock	SULPHUR	38.71		5.18	13.64	19,639
2101797	17	353232.9	4678732	187.08	Overburden	Livestock	SULPHUR	39.32		3.35	13.64	19,639
2101893	17	355233	4681992	181.49	Bedrock	Livestock	SALTY	43.28	28.96	1.83	22.73	32,732
2102617	17	358563	4680672	176.49	Bedrock	Livestock	SULPHUR	30.78		2.44	22.73	32,732
2102618	17	360763	4679072	181.37	Overburden	Livestock	FRESH	19.51		1.22	27.28	39,278
2102619	17	358563	4679172	179.82	Bedrock	Livestock	SULPHUR	29.87		3.66	22.73	32,732
2102620	17	360788	4678947	180.37	Bedrock	Livestock	FRESH	52.73		2.74	18.18	26,185
2102621	17	358862.9	4677622	184.25	Bedrock	Public	SULPHUR	39.62		3.05	36.37	52,371
2102622	17	358837.9	4677647	183.68	Bedrock	Public	SULPHUR	34.75		2.13	54.55	78,556
2102623	17	360713	4676747	185.29	Overburden	Industrial	FRESH	31.70		2.74	36.37	52,371
2102624	17	358622.9	4676947	185.20	Bedrock	Livestock	FRESH	41.45		1.22	18.18	26,185
2102625	17	360713	4676747	185.29	Bedrock	Livestock	MINERIAL	31.09		2.13	18.18	26,185
2102626	17	358662.9	4677022	185.10	Overburden	Livestock	FRESH	33.53		1.52	68.19	98,196
2102627	17	358512.9	4677347	183.43	Overburden	Livestock	FRESH	33.53	32.00	1.52	36.37	52,371
2102637	17	360788	4676422	185.69	Bedrock	Livestock	SULPHUR	42.67		4.88	22.73	32,732
2102640	17	364936.2	4680544	180.06	Bedrock	Livestock	SULPHUR	28.35		7.62		
2102642	17	364887.9	4677797	183.20	Bedrock	Livestock	SULPHUR	33.22		4.57	22.73	32,732
2102643	17	363387.9	4673312	184.98	Overburden	Livestock	FRESH	29.26		3.05	22.73	32,732
2102644	17	365438	4681162	176.08	Bedrock	Commerical	Not stated	31.09		7.62	22.73	32,732
2102645	17	365053	4677947	182.63	Bedrock	Livestock	SULPHUR	32.00		2.74	36.37	52,371
2102646	17	366512.9	4677522	181.68	Bedrock	Livestock	SULPHUR	36.58		2.74	31.82	45,825
2102647	17	364912.9	4676247	183.46	Overburden	Livestock	SULPHUR	32.92		2.74		
2102649	17	366787.9	4681072	175.44	Bedrock	Domestic	FRESH	42.37		5.49	45.46	65,464
2102661	17	360663	4674922	186.04	Bedrock	Commerical	SULPHUR	47.85		2.74	113.65	163,659
2102662	17	360723	4674922	186.20	Overburden	Commerical	FRESH	35.97	34.75	2.44	77.28	111,288
2102663	17	361837.9	4676072	183.55	Bedrock	Domestic	SULPHUR	30.78		2.44	22.73	32,732
2102664	17	362792.9	4674847	184.48	Bedrock	Livestock	SULPHUR	34.44		4.27		
2102665	17	363292.9	4674772	184.98	Overburden	Livestock	FRESH	35.36		1.83		
2102666	17	364167.9	4674947	183.44	Bedrock	Livestock	FRESH	35.05		2.44	150.02	216,030
2102667	17	363812.9	4674747	183.77	Bedrock	Domestic	SULPHUR	34.44		3.66	150.02	216,030
2102668	17	363737.9	4674752	183.75	Bedrock	Domestic	SULPHUR	44.20		3.66	90.92	130,927
2102669	17	364732.9	4675922	180.41	Bedrock	Domestic	FRESH	33.22		3.05	18.18	26,185
2102670	17	365022.9	4675847	180.56	Bedrock	Livestock	SULPHUR	34.44		1.83	113.65	163,659
2102671	17	359413	4674822	186.50	Bedrock	Domestic	SULPHUR	38.40		0.61	77.28	111,288
2102672	17	362602.9	4674697	185.02	Bedrock	Livestock	SULPHUR	34.14		2.44	77.28	111,288
2102675	17	365012.9	4674532	183.84	Overburden	Livestock	FRESH	32.92		3.66	22.73	32,732
2102676	17	368428	4681132	180.78	Bedrock	Not Used	SALTY	65.23		6.71		
2102677	17	368413	4681097	179.91	Bedrock	Domestic	SALTY	43.28		6.71		
2102678	17	365043	4681347	178.29	Bedrock	Public	SULPHUR	29.57		2.74	27.28	39,278
2102679	17	365213	4681327	178.99	Bedrock	Livestock	SULPHUR	31.39		2.44	36.37	52,371
2102988	17	370727.9	4679542	182.12	Bedrock			41.45				
2102989	17	372013	4679547	180.92	Bedrock	Livestock	MINERIAL	39.62		4.88	22.73	32,732
2102998	17	372713	4679222	181.72	Bedrock	Livestock	SULPHUR	38.10		4.27	31.82	45,825
2103000	17	369272.9	4676597	183.39	Bedrock	Domestic	SULPHUR	36.58		6.10	40.91	58,917
2103186	17	358612.9	4678397	181.27	Bedrock	Domestic	SULPHUR	33.22			45.46	65,464
2103496	17	368084.2	4676863	184.64	Bedrock	Domestic	SULPHUR	35.66		4.88	136.38	196,391

Table 1. Summary of MOECC Water Well Record Information

Well ID	UTM Zone	Easting (NAD83)	Northing (NAD83)	Elevation (mASL)	Well Type	Primary Water Use	Water Kind	Well Depth (m)	Top of Screen (m)	Static Level (m)	Pumping Rate (lpm)	Pumping rate (L/day)
2103694	17	356612.9	4677222	185.39	Bedrock	Domestic	FRESH	30.18		1.52	22.73	32,732
2103712	17	364312.9	4674872	184.69	Bedrock	Domestic	SULPHUR	35.05		3.05	27.28	39,278
2103713	17	364312.9	4674822	184.70	Bedrock	Not Used	SULPHUR	38.10		3.05	27.28	39,278
2103796	17	358501.9	4677948	180.66	Bedrock	Livestock	FRESH	32.92	27.43		31.82	45,825
2103938	17	359432	4674042	185.31	Bedrock	Domestic	FRESH	35.66	33.53	1.22	54.55	78,556
2104167	17	364272.9	4674942	184.48	Bedrock	Livestock	SULPHUR	34.14		3.66	227.30	327,318
2104168	17	360752.9	4673602	187.82	Bedrock	Domestic	SULPHUR	38.10		1.83	136.38	196,391
2104169	17	362412.9	4673502	184.26	Bedrock	Domestic	FRESH	32.61	29.57	0.91	113.65	163,659
2104233	17	363972.9	4674582	183.37	Bedrock	Domestic	FRESH	33.53		2.74	45.46	65,464
2104252	17	360772.9	4673462	187.15	Bedrock	Domestic	Not stated	39.01	37.49	0.91	136.38	196,391
2104290	17	366332.9	4676442	183.23	Bedrock	Domestic	SULPHUR	34.14		2.13	272.77	392,782
2104320	17	362062.9	4673472	184.70	Bedrock		FRESH	37.19				
2104321	17	362062.9	4673522	184.92	Bedrock	Livestock	SULPHUR	39.62		0.91	136.38	196,391
2104342	17	358063	4679772	180.03	Bedrock		SULPHUR	25.91			13.64	19,639
2104489	17	361412.9	4674842	184.83	Bedrock	Domestic	FRESH	34.44	32.31	0.00	136.38	196,391
2104539	17	360713	4674922	186.17	Bedrock		FRESH	41.15		1.83	4.55	6,546
2104540	17	360713	4674902	186.07	Overburden	Domestic	FRESH	36.58	32.31	1.83	45.46	65,464
2104624	17	366672.9	4676662	179.65	Bedrock	Domestic	FRESH	33.83		15.24		
2104722	17	360872.9	4672922	186.52	Overburden	Domestic	FRESH	29.57	26.52	1.83	681.91	981,955
2104914	17	360758	4674867	185.94	Bedrock	Domestic		36.58				
2104915	17	360773	4674952	186.45	Bedrock	Domestic		41.15				
2105385	17	359455.9	4677179	183.51	Bedrock	Not Used	SULPHUR	35.97		2.13	68.19	98,196
2105386	17	359455.9	4677179	183.51	Bedrock	Irrigation	SULPHUR	61.57		4.57	227.30	327,318
2105393	17	359455.9	4677179	183.51	Bedrock		SULPHUR	61.57		-4.57	227.30	327,318
2105394	17	359455.9	4677179	183.51	Bedrock	Not Used	SULPHUR	35.97		2.13	68.19	98,196
2105403	17	360148	4673317	185.08	Overburden	Domestic	Not stated	25.91		3.05		
2105422	17	360110.9	4672756	185.60	Overburden	Domestic	FRESH	27.43	25.60	2.44	68.19	98,196
2105551	17	353435.5	4681758	180.46	Bedrock			47.24				
2105670	17	359651.3	4678386	180.55								
2105671	17	359651.3	4678386	180.55								
2105749	17	366939.2	4681300	178.96								
2105765	17	368643	4680929	179.50		Not Used						
2105896	17	353200	4678520	186.54	Overburden			3.20	2.50			
2105962	17	359796	4681438	178.11	Bedrock			60.96				
7043299	17	359752	4683692	176.26	Overburden			5.11	1.18			
7045673	17	358202	4677535	180.31	Bedrock			32.92	1.52			
7045674	17	360481	4677353	183.53	Overburden			6.10	4.57			
7047166	17	358670	4677460	184.96		Not Used		38.40	38.10			
7047170	17	360497	4677418	183.19		Not Used		30.18	29.88			
7050194	17	367587	4677459	182.58			SULPHUR	35.66		2.74	45.46	65,464
7113742	17	372097	4677448	184.52		Monitoring and Test Hole		6.10	3.10			
7113743	17	372117	4677446	184.50		Monitoring and Test Hole		6.10				
7113744	17	372130	4677416	184.52		Monitoring and Test Hole		6.10	3.10			
7116762	17	372117	4677446	184.50								
7117005	17	372130	4677416	184.52								
7117006	17	372097	4677448	184.52								
7124223	17	361166	4678512	182.95		Monitoring	FRESH	7.60	6.00			
7132556	17	358888	4681512	176.77		Monitoring and Test Hole		5.50	2.50			

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Well ID	UTM Zone	Easting (NAD83)	Northing (NAD83)	Elevation (mASL)	Well Type	Primary Water Use	Water Kind	Well Depth (m)	Top of Screen (m)	Static Level (m)	Pumping Rate (lpm)	Pumping rate (L/day)
7132557	17	358855	4681602	176.49		Monitoring and Test Hole		5.50	2.50			
7132558	17	358866	4681590	176.55		Monitoring and Test Hole		6.40	3.40			
7148917	17	358873	4683667	175.35		Monitoring and Test Hole	FRESH	6.10	2.80			
7148917	17	358849	4683667	175.34		Monitoring and Test Hole	FRESH	6.10	2.80			
7148917	17	358826	4683692	175.26		Monitoring and Test Hole	FRESH	6.10	2.80			
7153054	17	372297	4677384	184.67		Monitoring		5.18	2.13			
7155318	17	372297	4677384			Monitoring			3.05			
7155328	17	371812	4677666			Monitoring		7.62	4.65			
7179215	17	361163	4678520									

Source: Ontario Ministry of Environment and Climate Change (MOECC) Water Well Records

within 3 km of the Operations and Maintenance Building