APPENDIX V. SHADOW FLICKER ASSESSMENT

Shadow Flicker Analysis

for the

Wedgeport Wind Farm Project

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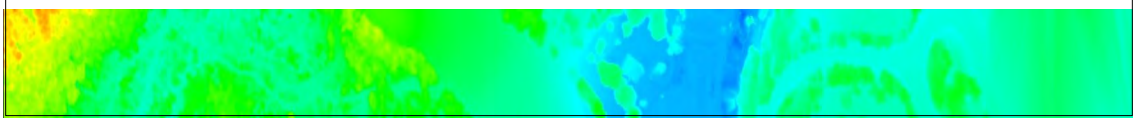

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1.0 Introduction

Wedgeport Wind Farm Limited Partnership by its general partner Wedgeport Wind Farm GP Inc. (Wedgeport Wind) is currently in the planning stages for developing the Wedgeport Wind Farm Project. The project will consist of up to 13 wind turbines which are planned to be built west of Wedgeport, Nova Scotia. While the final turbine model has not yet been determined, Wedgeport Wind has selected the Siemens Gamesa SG 6.6-170 turbine as this model represents the general range of turbine options being considered.

The rotating blades of a wind turbine create moving shadows know as shadow flicker that are noticeable in close proximity to the turbine. The potential impact depends on the time of year, the physical characteristics of the wind turbine, the orientation of the blades relative to the sun, the presence of wind and of course, the presence of sunlight.

The following report summarizes the results of shadow flicker modeling which will be incorporated into the Nova Scotia Environmental Assessment Registration Document.

2.0 Methodology

The shadow flicker analysis was completed using WindPro 3.5.584 which provides a comprehensive suite of wind farm design and modeling software.

The locations of the 13 proposed turbines are summarized in Table 1. In addition to the proposed turbines, there are 3 existing turbines that are located along Black Pond Road which is at the northern end of the proposed development. The locations of the existing turbines are summarized in Table 2. The model specific parameters of the proposed turbines are shown in Table 3. Table 4 and Table 5 show the specifications of the existing GE and Vestas Turbines.

2.1 Shadow Flicker Analysis

A shadow flicker analysis was completed using WindPro 3.5.584 which provides a comprehensive suite of wind farm design and modeling software. The shadow flicker analysis was based on developing a theoretical and realistic scenario that provides an understanding of the extent of shadow flicker as a result of the existing and proposed turbines.

2.2 Digital Surface Model

A digital surface model (DSM) that was derived from aerial Lidar data was used to model the forests and out buildings within the project area. A DSM is a digital representation of the upper surface of forests, buildings,

and vegetated areas referenced to a vertical datum, which in this case is the Canadian Geodetic Vertical Datum of 2013 (CGVD2013). CGVD2013 is the reference standard for vertical heights across Canada. The DSM has a spatial resolution of 1 m and is publicly available from the province of Nova Scotia. A similar digital elevation model (DEM) derived from the same aerial Lidar data was also utilized to determine the base elevations at each of the receptor, existing turbine and proposed turbine sites. The aerial Lidar data were obtained in 2019, and therefore the DSM is valid for that point in time. The DSM was compared to recent satellite imagery to determine if any forested areas had been harvested or blown down in close proximity to the receptors. There were no noticeable changes between 2019 and 2022 and therefore there was no need to update the DSM. The trees within the forest would have also increased in height however, with a maximum of 3 growing seasons since the Lidar data were acquired, this difference was considered to be negligible.

A 20 m buffer was generated around each of the receptors, existing and proposed turbines. The ground elevation was then 'stamped into the DSM so that the heights of turbines and receptor windows could be modeled. The stamping around receptors also provided a conservative modeling approach as trees located within 20 m of buildings were excluded from the shadow analysis Figure 2.

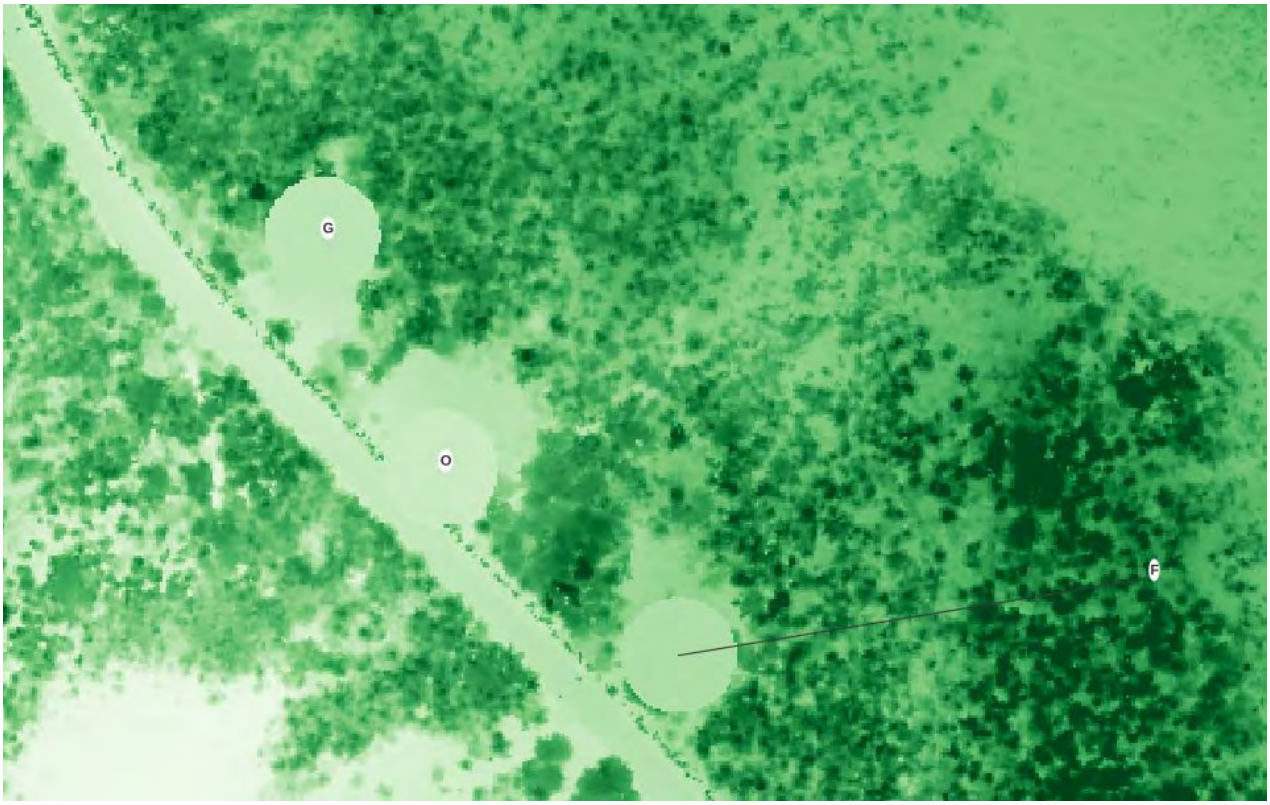

Figure 1: Digital Surface Model Modified with 20 m Base Elevation Buffer Around Receptors

2.3 Theoretical Case

In this scenario, existing shadowing objects such as forests, trees and out buildings were included in the analysis. This scenario provides an understanding of the maximum amount of shadow flicker expected to be experienced at the modeled receptors under the following conditions:

- The sun shines 100% of the time when it is above the horizon;
- The turbine rotor is always perpendicular to the sun;
- Shadow flicker starts as the sun moves above 3 degrees from the horizon;
- The shadows dissipate at a maximum distance from the blade as a result of atmospheric conditions and light diffusion, and;
- The rotor blades are always spinning.

The total length of the shadow influence in the atmosphere is calculated from the physical dimensions of the turbine blade. In this analysis, the maximum shadow distance for the SG 6.6-170 was calculated to be 2,041 m. There are no municipal, provincial or federal guidelines for shadow flicker, however most jurisdictions consider a maximum of 30 hours of shadow flicker per year and a maximum of 30 minutes per day as the threshold parameters used to define the acceptable level of flicker from wind projects. These levels originate from Europe and are designed to reduce annoyance at neighboring dwellings.

2.4 Realistic Case

The realistic case was modeled by incorporating site specific wind conditions and monthly sunshine probabilities into the analysis. As with the theoretical case, shadowing objects were included in the model to provide an accurate representation of the existing forests and out buildings within the study area.

Statistical climate data in the form of average sunshine probabilities per month were obtained from the closest, representative coastal weather station (that records sunshine data). The long term hub height wind direction frequency data provided by the project developer were used to determine the direction the turbines are oriented through a typical year.

Table 1: Proposed Turbine Positions

ID	Model	Easting*	Northing*
1	SG 6.6-170	257,975	4,849,253
2	SG 6.6-170	258,066	4,848,241
3	SG 6.6-170	256,985	4,848,220
4	SG 6.6-170	257,028	4,847,752
5	SG 6.6-170	257,144	4,847,296
6	SG 6.6-170	257,167	4,846,770
7	SG 6.6-170	257,739	4,846,631
8	SG 6.6-170	257,306	4,846,293
9	SG 6.6-170	257,376	4,845,818
10	SG 6.6-170	257,996	4,845,508
11	SG 6.6-170	257,342	4,845,345
12	SG 6.6-170	257,384	4,844,362
13	SG 6.6-170	257,215	4,843,924

* UTM, NAD83, Zone 20

Table 2: Existing Turbine Positions

ID	Model	Easting*	Northing*
1	V100	256,033	4,848,952
2	V100	256,827	4,848,694
3	GE 1.6	257,521	4,848,505

* UTM, NAD83, Zone 20

Table 3: Proposed Turbine Specifications

Item	Specification
Manufacturer	Siemens Gamesa
Model	SG 6.6-170
Hub Height	110.5 m
Rotor Diameter	170 m
Operation Mode	Full Power
Rated Power Output	6,600 kW

Table 4: Existing Turbine Specifications - GE Wind

Item	Specification
Manufacturer	GE Wind
Model	1.6 1600
Hub Height	80
Rotor Diameter	82.5
Operation Mode	Level 0
Rated Power Output	1,600 kW

Table 5: Existing Turbine Specifications - Vestas

Item	Specification
Manufacturer	Vestas
Model	V100 2050
Hub Height	92
Rotor Diameter	100
Operation Mode	Level 0
Rated Power Output	2,050 kW

2.5 Climate Data

Monthly sunshine data were used to provide a realistic condition for calculating shadow flicker. The realistic scenario was modeled using site specific wind conditions and monthly sunshine probabilities obtained from the closest coastal observatory at Shearwater, NS. The monthly daily sunshine hours used in the analysis are shown in Table 6. The average long term wind direction frequency at hub height (110.5 m) data are summarized in Table 7. The frequency was calculated using all data with wind speeds above 3 m/s which is the cut in wind speed of the proposed SG 6.6-170 turbines.

Table 6: Monthly Average Sunshine Hours For Shearwater, Nova Scotia.

Month	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Average Daily Sunshine Hours	3.84	4.65	4.60	4.92	6.27	7.51	7.49	7.39	6.09	5.06	3.69	3.16

Table 7: Long Term Wind Directional Hub Height Frequency Above 3 m/s at the Project Location.

Direction (Deg)	0	30	60	90	120	150	180	210	240	270	300	330	Total
Average Hours per Year	629	448	405	439	431	594	562	786	954	922	1155	952	8245

2.6 Shadow Receptors

A total of 32 receptors were identified and modeled in this analysis. Receptors were identified using satellite and aerial imagery to locate buildings that can be considered as dwellings. Dwellings along Comeau's Hill Road which is located to the west of the proposed development were selected as receptors and an additional 3 representative dwellings located east of the proposed wind farm were also included in the analysis. Each building was assumed to have windows facing in all directions. This modeling approach is referred to as 'greenhouse mode' and ensures that the orientation of individual receptor windows are not a factor in estimating shadow flicker. Existing forests, individual trees and non dwelling buildings were included in the analysis through the use of a aerial Lidar derived Digital Surface Model (DSM). These factors ensure that the

modeling results are based on the best available data. Table 8 shows the locations of the 32 receptors used in the analysis.

Table 8: Shadow Flicker Receptor Physical Coordinates

ID	Easting (m)	Northing (m)	Elevation (m)
A	255,459	4,848,023	13
B	255,875	4,847,536	11
C	255,927	4,847,432	8
D	256,149	4,843,988	15
E	256,335	4,845,169	30
F	256,141	4,847,110	7
G	256,014	4,847,258	6
H	259,152	4,848,403	7
I	259,619	4,846,203	4
J	256,224	4,845,915	19
K	256,340	4,845,836	29
L	256,236	4,845,808	24
M	259,867	4,844,610	4
N	255,908	4,847,382	7
O	256,056	4,847,176	5
P	256,213	4,846,392	4
Q	256,210	4,846,171	10
R	256,281	4,845,500	30
S	256,354	4,845,137	30
T	256,289	4,845,453	30
U	256,383	4,844,632	24
V	256,362	4,844,589	23
W	256,321	4,844,521	21
X	256,302	4,844,454	19
Y	256,162	4,844,235	12
Z	256,174	4,844,190	12
AA	256,175	4,844,165	12
AB	256,166	4,844,133	12
AC	256,156	4,843,694	19
AD	256,184	4,843,680	19
AE	256,209	4,843,649	18
AF	256,253	4,843,596	16

3.0 Shadow Flicker Analysis Results and Discussion

There are no federal or provincial regulations that define criteria or maximum limits of shadow flicker from wind projects. A generally accepted guideline that originates from Europe is that shadow flicker exposure be limited to a maximum of 30 hours per year. In Nova Scotia, developers are required to demonstrate that no receptor will receive 30 minutes or more per day, and/or 30 hours or more per year of shadow flicker.

Figure 2 shows the results of the modeling and the spatial extent of the threshold 30 shadow hours per year. Receptor specific results are provided for in Table 9.

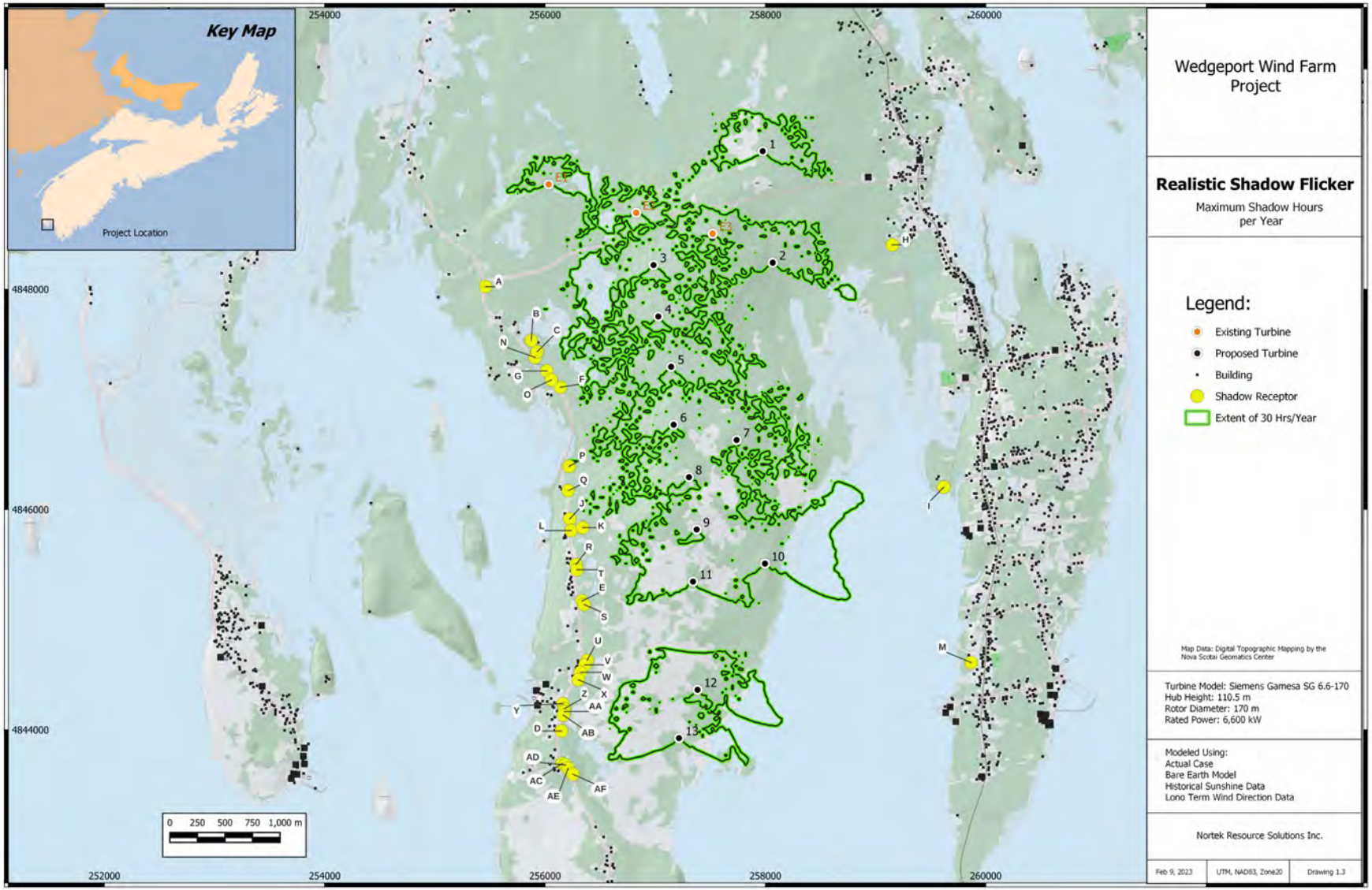

Figure 2: Shadow Flicker per Year Based on the realistic Scenario for the Proposed Wedgeport Wind Farm.

Table 9: Predicted Shadow Flicker for Local Receptors Based on Theoretical and Realistic Case Scenario's .

Receptor ID	Theoretical Case		Realistic Case
	Shadow Hours per Year	Max. Shadow Minutes per Day	Shadow Hours per Year
A	0.0	0.0	0.0
B	6.2	16	1.6
C	3.8	10	1.1
D	16.2	27	4.4
E	17.2	18	4.4
F	0.0	0	0.0
G	0.0	0	0.0
H	9.9	23	2.6
I	0.0	0	0.0
J	0.0	0	0.0
K	45.4	38	12.9
L	2.0	7	0.5
M	0.0	0	0.0
N	11.9	23	3.3
O	2.0	9	0.6
P	14.4	29	3.9
Q	0.0	0	0.0
R	0.0	0	0.0
S	0.9	5	0.3
T	1.1	5	0.3
U	9.4	22	2.5
V	3.4	10	0.9
W	5.7	15	1.5
X	29.9	27	8.1
Y	0.0	0	0.0
Z	4.0	21	1.1
AA	3.2	14	0.9
AB	7.6	26	2.1
AC	31.3	35	8.9
AD	25.5	37	7.3
AE	19.4	31	5.5
AF	38.9	40	11.3

The results of the theoretical case indicates that 3 of 32 receptors would experience greater than 30 hours of shadow flicker per year and 5 receptors would experience more than 30 minutes per day (Table 9). The realistic case scenario provides a more comprehensive analysis as the assumptions in the theoretical case are conservative in nature. By applying monthly sunshine probabilities and the long term wind direction frequencies into the model, precise annual results can be generated, however the maximum shadow flicker per day cannot be calculated. This is a result of using monthly sunshine probabilities which cannot be scaled to minute time steps. The realistic case scenario which includes the sunshine probabilities and wind frequency distribution, shows that all the receptors are expected to receive less than 30 hour per year of shadow flicker (Table 9).

4.0 Conclusion

The shadow flicker analysis based on the realistic case indicate that the modeled receptors are expected to receive less than 30 hours per year of shadow flicker. The realistic values range from 0 to 12.9 hours per year which are well below the 30 hour per year threshold value.

These modeled results indicate that the proposed wind project meets the current guidelines as defined by the Nova Scotia Department of Environment and Climate Change.

5.0 References

Nova Scotia Policy Division, Environmental Assessment Branch, Guide to Preparing an EA Registration Document for Wind Power Projects in Nova Scotia, May 2007, revised October 2021.

Nova Scotia Topographic Database, https://gis8.nsgc.gov.ns.ca/DataLocatorASP/main.html

Nova Scotia Elevation Explorer, https://nsgi.novascotia.ca/datalocator/elevation/

APPENDIX W. ELECTROMAGNETIC INTERFERENCE REPORT

EMI Report

for the

Wedgeport Wind Project

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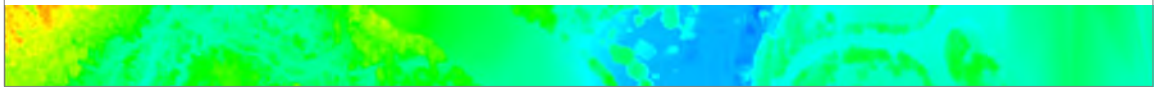

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1.0 Introduction

The proposed Wedgeport Wind Project is located approximately 5 km south east of Wedgeport, Nova Scotia in Yarmouth County. The proposed project will consist of 13 turbines with a proposed hub height of 110.5 m and a rotor diameter of 170 m.

This EMI Study is designed to apply the guidelines identified by the joint *Radio Advisory Board of Canada and Canadian Wind Energy Association Technical Information and Coordination Process Between Wind Turbines and Radiocommunication and Radar Systems*[1] (herein after referred to as the RABC). The technical guidelines have been developed to apply a consistent approach to determining if wind energy developments may impact existing radio, telecommunication and radar systems. Radio communication system locations were obtained from Industry Canada Spectrum Direct website[2].

2.0 Point-to-Point Systems above 890 MHz

The existing RABC guidelines describe consultation zones for Point-to-Point Systems above 890 MHz which include a 1 km consultation zone around existing transmitters and receivers as well as a variable "cylinder" between links that are based on the distance between links and the licensed radio frequencies.

A variable consultation zone along the line of sight between the transmitter and receiver recommended by RABC is calculated using the following formula:

$$L_C = R + 52\sqrt{D/F}$$

Where:

D = *Path length in kilometers*

F = *Frequency in gigahertz*

L_C = *Diameter of the cylinder in meters*

R = *Wind turbine rotor diameter in meters*

Data obtained from the Industry Canada Technical and Administrative Frequency Lists accessed through the Spectrum Management System web site[3] are summarized in Figure 1.

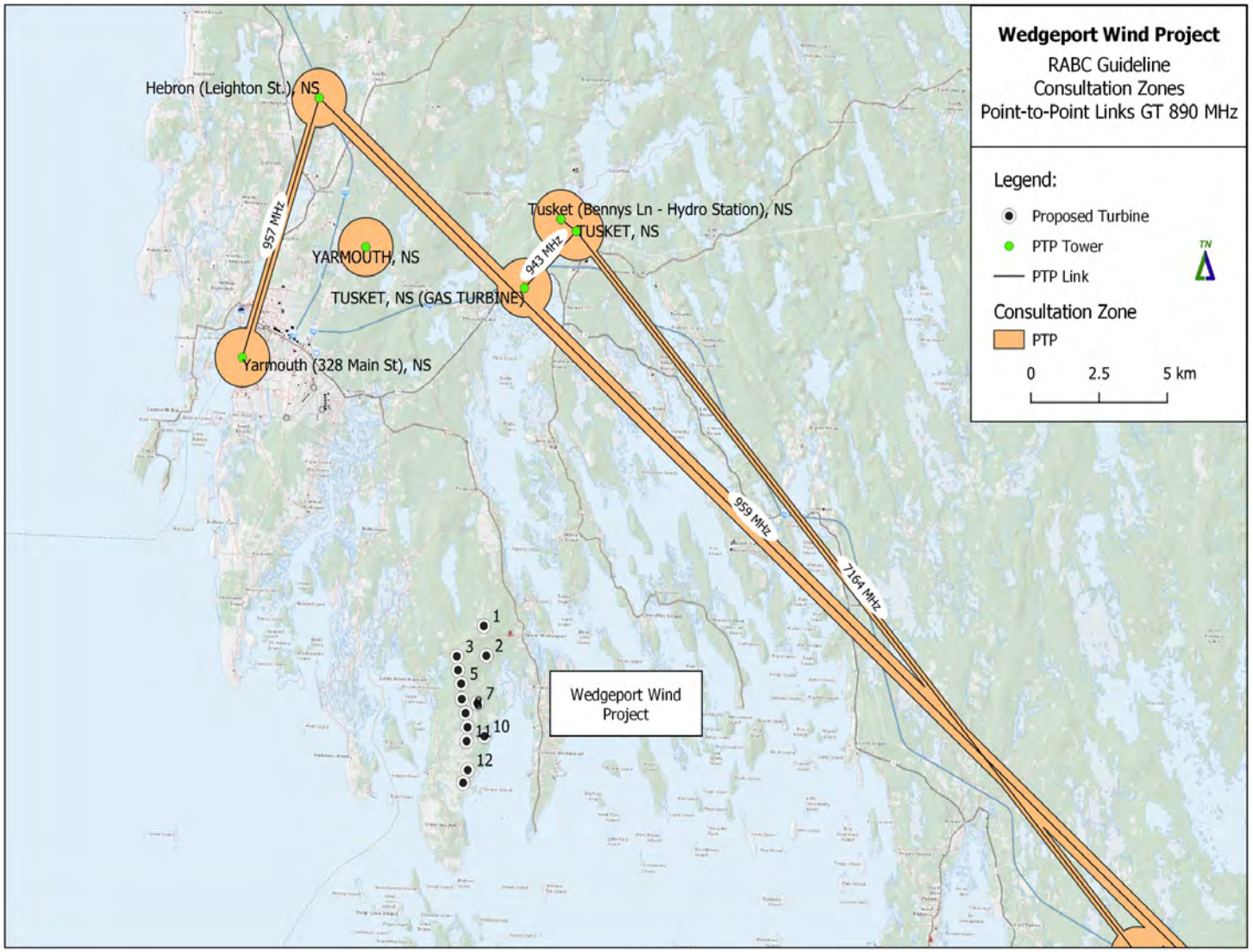

Figure 1: RABC Guideline Consultation Zones for Point-to-Point Radio Links Above 860 MHz.

There are no point-to-point radio links above 890 MHz consultation zones within the proposed wind project.

3.0 Broadcast Transmitters

3.1 AM Transmitters

A 15 km consultation zone is recommended by RABC for AM radio transmitters utilizing multiple tower antenna systems. For single tower systems, a 5 km consultation zone is required. A review of existing AM Radio licenses was completed and there are no AM radio transmitters located within 15 km of the the proposed wind project.

There are no AM Radio Transmitters located within 15 km of the proposed Wedgeport Wind Project.

3.2 FM Transmitters

For proximity reasons, the RABC suggests a 2 km consultation zone around existing FM transmitters. A FM transmitter is located 12.7 km (CJLS, Yarmouth) from the closest, proposed turbine. A second transmitter (CJLS, Tusket Falls) is located 13.9 km from the closet proposed wind turbine. These transmitters are well outside of the RABC recommended consultation zones .

The proposed wind project is not within the 2 km consultation zone recommended by RABC for FM transmitters.

3.3 TV Transmitters

The closest TV Transmitter is located approximately 18.9 km north of the proposed wind project and is located at South Ohio, NS. The next closest television transmitter is located 95.6 km northeast of the wind project at East Caledonia. Table 1 summarizes the closest TV transmitters to the proposed wind project.

Table 1: TV Transmitters Located in Close Proximity to the Proposed Wedgeport Wind Project.

Channel	Call Sign	Latitude	Longitude
6 (VHF)	CJCH-TV-6	44.3411° N	65.1006° W
40 (UHF)	CJCH-DT-7	43.9161° N	66.0897° W

There are no Television Transmitters located within the 2 km consultation zone recommended by RABC.

4.0 Over-the-Air Television Reception

As of August 31, 2011, the CRTC had required that all TV transmitters that serve markets with a population greater than 300,000 (Mandatory Markets) be converted to digital technology. In most cases, transmitters in larger urban areas have been upgraded to digital and re-transmitters that serve smaller population bases continued to operate with analog equipment.

The RABC recommends television receiver consultation zones based on the whether the broadcast is delivered using analog or digital signals with consultation zones of 15 km and 10 km respectively. As mentioned in the previous section, the closest TV transmitters are located 18.9 and 95.6 km from the proposed wind farm.

The proposed wind farm is outside of the recommended Over-the-Air Reception consultation zones.

5.0 Cellular Networks, Land Mobile Radio Networks and Point-to-Point Systems below 890MHz

There are two Communication Towers located within the 1 km consultation zone as recommended by the RABC. One is located on Black Pond Road, North east of the Fire Hall amd the other is located on Comeau's Hill.

5.1 *Cellular Networks*

The communication tower located at 290 Black Pond Road has cellular services operated by two companies which are detailed in Table 2.

Table 2: Cellular Networks Located within 1 km of the Wedgeport Wind Project.

Tower Location	Licensee	Distance to Closest Turbine (km)
290 Black Pond Road	Bell Mobility Inc.	0.74
	Bragg Communications Inc.	

There is one Cellular/mobile data Network tower site located within 1 km of the proposed wind project. The tower operators have been contacted to discuss possible interference issues and potential mitigative measures. Both of the operators have expressed no concern over the proposed wind farm.

5.2 *Land Mobile Radio Networks*

Licensed mobile radio links within 4.0 km of the proposed wind project were mapped and 1 km consultation zones were generated (Table 3). Two radio tower sites are within the recommended consultation zone (Table 3). The project proponents have contacted the license holders to discuss potential issues and concerns. One has indicated they are not opposed to the wind farm and the second has not responded to inquiries by the project developer. The project developer will continue to reach out to the remaining licensee.

Table 3: Land Mobile Networks Located within 1 km of the Wedgeport Wind Project.

Tower Location	Licensee	Distance to Closest Turbine (km)
290 Black Pond Road	Orion Wireless Partnership	0.74
Little River, NS	Municipality of the District of Argyle	1.02

There are 2 Land Mobile Radio Network tower site located within or close to 1 km of the proposed wind project. The tower operators have been contacted in regard to concerns about possible interference issues and potential mitigative measures. To date, the Municipality of the District Of Argyle has responded that they are not opposed to the proposed wind farm. The developer is awaiting a response from Orion Wireless Partnership.

5.3 Point-to-Point Systems Below 890 MHz

Existing low frequency Point-to-Point radio systems were mapped to determine if the locations of existing tower systems are within the 1.0 km consultation zone. After completing the analysis, it was concluded that there are no Point-to-Point Systems below 890 MHz located within the recommended consultation zone.

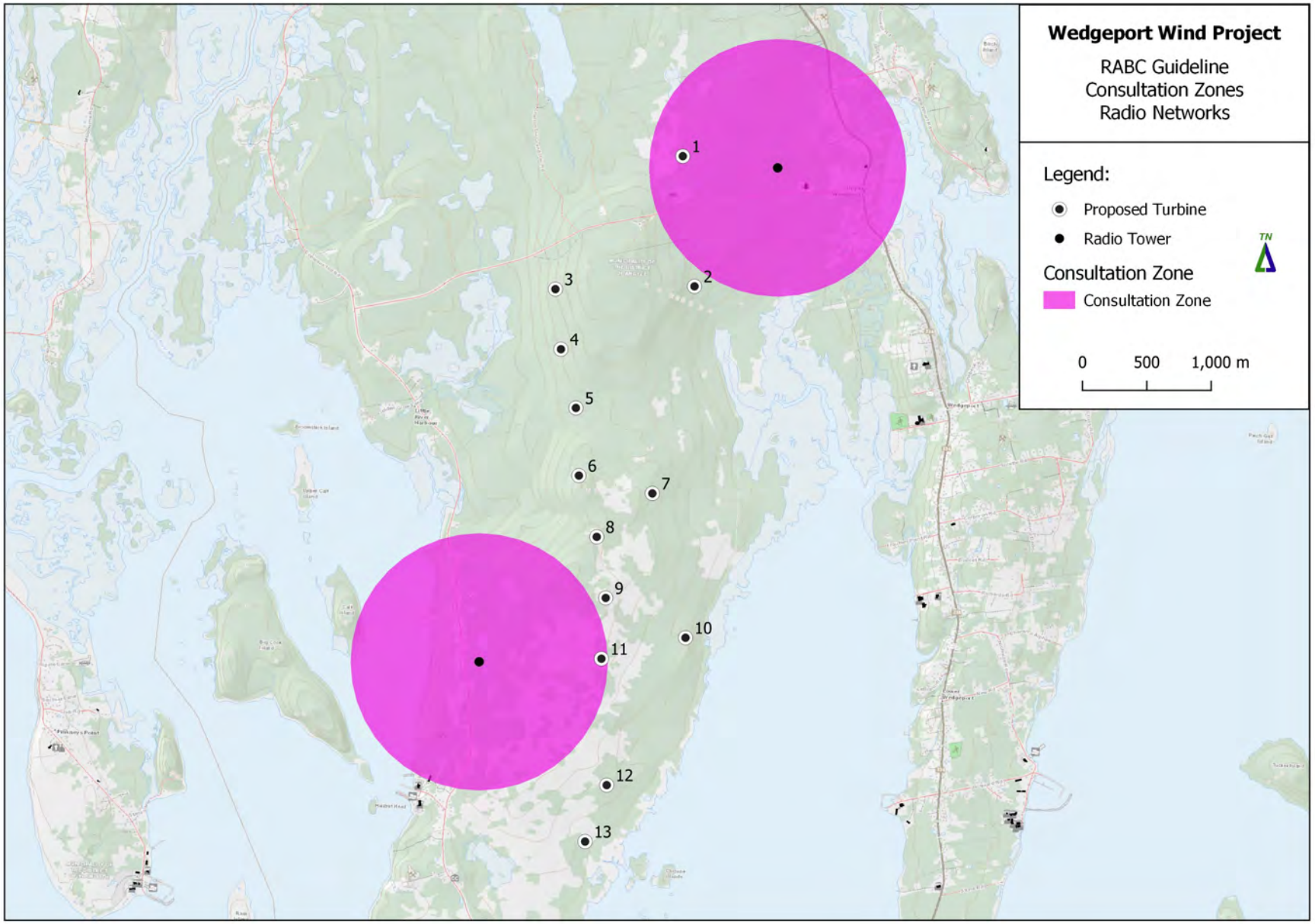

Figure 2: *Cellular, Land Mobile Radio and Point-to-Point Networks (Below 890 MHz).*

6.0 Satellite Systems

6.1 Satellite Ground Stations

There are no satellite ground stations located within the RABC recommended 500 m consultation zone.

6.2 DTH Receivers

A preliminary review of Direct to Home Satellite receivers has been completed. The analysis is based on the physical turbine dimensions which are:

Hub Height = 110.5 m
Rotor Diameter = 170 m

The RABC recommends the following formula for determining the size of the cone:

$$L_{c(m)} = R + 104\sqrt{D/F}$$

where: L_c = Diameter of the cylinder (m)
D = Distance from the ground satellite receiver (km)
F = Frequency in GHz (11.7)
R = Rotor Diameter (170 m)

$L_{c\,(1\ km)}$ = 200.4 m
$L_{c\,(10\ km)}$) = 266.1 m

A cone based on 11.7 GHz was calculated and the satellite data from Table 4 were used for the analysis. The analysis involved identifying both horizontal and vertical zones where dwellings may be impacted by the wind project. The intersect of these two zones resulted in the final consultation zone highlighted in Figure 3.

There are no buildings that are located withing the DTH consultation zones.

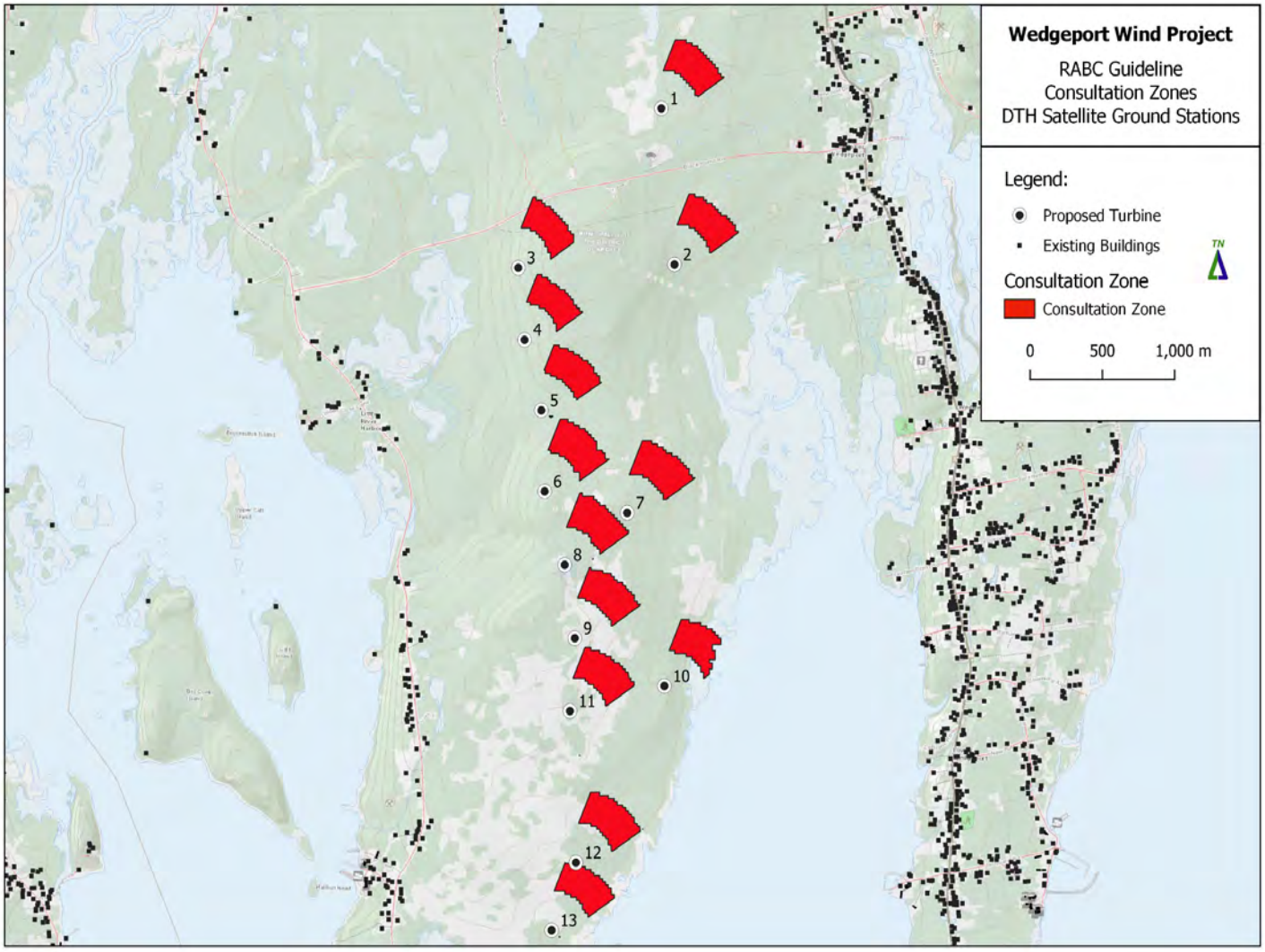

Figure 3: RABC Guidleine Consultation Zones for Satellite Receivers Based on Line of Sight Cones

Table 4: Direct-To-Home Geostationary Satellite Parameters.

Service Provider	Satellite ID	Geostationary Satellite Orbit (Lat, Long)	Local Azimuth (True North)	Local Inclination
Bell Direct	Nimiq 4	0° N, 82° W	202.5°	37.0 °
	Nimiq 6	0° N, 91.1° W	214.1 °	33.6 °
Shaw Direct	Anik F1	0° N, 109.1° W	233.5 °	23.9 °
	Anik F2	0° N, 111.1° W	235.4 °	22.6 °

There are no buildings located within the RABC recommended DTH receiver consultation zones identified in this analysis, however there are a number located close to the consultation zone that should be notified.

7.0 Radar Systems

7.1 Air Defence Radar

DND has been contacted and completed an internal analysis to determine if the proposed wind project may impact existing radar installations. DND has not yet responded to the notification of the proposed wind project (Appendix 2).

DND has been contacted and advised of the proposed wind project. The results of their internal review has not yet been shared with the project proponent.

7.2 Vessel Traffic Radar

The Canadian Coast Guard (CCG) monitors vessel traffic through a series of radar installations. The RABC has recommended a 60 km consultation zone around existing stations. The Canadian Coast Guard has been contacted and they do not anticipate any interference issues (Appendix 2).

No issues in regard to interference with existing vessel traffic radar systems.

7.3 Air Traffic Control Radars

Air Traffic Control utilizes a number of radar systems to manage aircraft surveillance and navigation. Nav Canada was contacted in regard to the proposed wind farm and they have agreed to accept the existing wind farm layout. Changes will be made to the air traffic approaches to Yarmouth Airport.

Nav Canada has approved the proposed wind farm.

7.4 Weather Radars

Environment Canada operates a network of Doppler radar sites across the country that collectively is known as the Canadian Weather Radar Network. The radars are used for meteorological forecasting and detecting severe weather events as they occur. Weather radar picks up the Doppler signal from the tips of the rotating blades and the wake turbulence produced as the blades pass through the air.

There are two Doppler weather radar stations that are located in Nova Scotia and one in New Brunswick (Table 5). The closest weather radar site is located 239 km away from the proposed wind project and is located at Halifax, NS. This site is located outside of the 50 km consultation zone recommended by RABC and Environment Canada has been contacted to discuss any potential issues or concerns in regard to the proposed wind project (Appendix 2).

Table 5: Nearest Weather Radar Sites.

ID and Location	Latitude	Longitude	Distance to Wind Project (km)
CXGO Halifax, NS	45° 05' 54.47 N	63° 42' 15.56 W	239
CXNC Chipman, NB	46° 13' 19.89 N	65° 41' 57.23 W	286
CXMB Marion Bridge, NS	45° 56' 58.44 N	60° 12' 19.75 W	527

There are no Environment Canada Doppler radar site located within the RABC recommended consultation zone. Environment Canada has been contacted and has completed and an internal analysis of potential interference issues. Environment Canada does not expect problematic interference issues and therefore do not oppose the proposed wind project.

8.0 VHF Omnidirectional Range (VOR)

VHF Omnidirectional systems are ground based, short distance navigation aids which provide pilots with 360 degree directional information to or from a station. The frequency range is 108.1 to 117.956 MHz.

The Yarmouth (113.3 MHz) VOR site is located 1.0 km km from the proposed wind project and consists of VOR beacon with distance measuring equipment (Table 6). As the proposed wind project is within the 5 km consultation zone for this Navigation aid for aircraft, NAV Canada has been contacted and approved the exiting wind farm layout. The next closest VOR site is at Saint John, NB

which is located 175 km north of the site. The Halifax VOR site is located 250 km northeast of the site. The two latter stations are outside of the recommended consultation zones.

Table 6: Closest VOR Sites.

Site	Type	Latitude	Longitude	Distance to Wind Project (km)
Yarmouth	VOR-DME	43° 49' 30" N	66° 04' 57 W	1
Saint John	VOR-DME	45° 24' 26 N	65° 52' 15 W	175
Halifax	VOR-DME	44° 55' 23.30 N	63° 24' 07 W	250

There is one VOR sites that is located within the RABC recommended 15 km consultation zone. Nav Canada has been contacted and has completed and an internal analysis of potential interference issues. Nav Canada has approved the current wind farm layout and does not expect interference issues to be severe and therefore do not oppose the proposed wind project.

9.0 Summary

Table 7: Summary of Results from the EMI Review.

System	RABC Consultation Requirement	Result
Point-to-Point Systems above 890 MHz	1 km of transmitters/receivers A consultation cylinder based on link parameters	There are no radio link transmitters or receivers that are within 1 km of the proposed wind project. Additionally, there are no links that pass within the recommended consultation zone.
Broadcast Transmitters	AM Stations: Omnidirectional 5 km Directional: 15 km FM: 2 km TV: 2 km	No AM transmitters within the 5 or 15 km consultation zone. No FM Transmitters located within the 2 km consultation zone. No TV Transmitters within the 2 km consultation zone.
Over-the-Air Reception	Digital Transmitters: 10 km Analog Transmitters: 15 km	No TV transmitters located within the 10 and 15 km consultation zones.
Cellular Type Networks	1 km of Cell Towers	One cellular tower located within the 1 km consultation zone. Licensee's have been contacted and there are no objections to the proposed wind farm.
Land Mobile Radio Networks and Point-to-point Systems below 890 MHz	1 km	Two Land Mobile Radio towers and no Point-to-Point systems are located within the 1 km consultation zone. Land Mobile Radio Licensee's have been contacted and one of the two has confirmed they have no issues. The project developer is awaiting follow up with Orion Wireless Partnership.
Satellite Systems	0.5 km around satellite transmit/receive locations Consultation cone based on turbine and satellite locations	No ground satellite stations located within 500 m of the proposed wind farm. No dwellings or buildings located within the projected consultation cones.
Air Defence Radars, Vessel Traffic Radars, Air Traffic Control Radars and Weather Radars	DND Air Defence radar: 100 km Air Traffic Control Primary Surveillance Radar 80 km Air Traffic Control Secondary Surveillance Radar 10 km DND Precision Approach radar : 40 km Canadian Coast Guard Vessel Traffic radar: 60 km Airfield: 10 km Environment Canada Weather Radar:	DND Contacted – No Objections. NAV Canada Contacted – No Objections. Vessel Traffic Systems – Canadian Coast Guard contacted - No Issues. Weather Radar – Environment Canada contacted – No concerns.

	50km	
VOR	VOR Beacon: 15 km	There is one VOR site located within the 15 km consultation zone. NAV Canada contacted, no objection.

10.0 References

[1] Radio Advisory Board of Canada and Canadian Wind Energy Association (CanWEA), *Technical Information and Coordination Process Between Wind Turbines and Radiocommunication and Radar Systems*, December, 2010

[2] Spectrum Management System data base, Industry Canada, <https://sms-sgs.ic.gc.ca/eic/site/sms-sgs-prod.nsf/eng/home>, Accessed October, 2022.

APPENDIX X. NAV CANADA & DEPARTMENT OF NATIONAL DEFENSE LETTERS OF NON-OBJECTION

Serving a world in motion
Au service d'un monde en mouvement
navcanada.ca

November 4, 2022

Your file
Wedgeport Wind Farm Project (Little River Harbour) 14 Turbines
Our file
22-3698

Mr. Dan Eaton
Wedgeport Wind Farm Limited
2150 - 745 Thurlow Street
Vancouver, BC
V6E 0C5

RE: Wind Farm: Wind Turbine(s) - Wedgeport, NS
(See attached document(s))

Mr. Eaton,

NAV CANADA has evaluated the captioned proposal and has no objection to the project as submitted. Our assessment does not constitute an approval and/or permit from other agencies.

Due to the location and heights of the proposed wind turbines NAV CANADA will be publishing the following changes to the procedures for Yarmouth Airport (CYQI):

- **RNAV (GNSS) Z RWY 06** – LPV and LNAV minima
  - Wind Farm becomes 10 NM Obstacle
- **RNAV (GNSS) Z RWY 15** – LPV and LNAV minima
  - Wind Farm to be depicted on chart (becomes holding's CO)
  - Impact on MA Holding Altitude – to be raised from 1700 to 1800
- **RNAV (GNSS) Z RWY 24** – LPV and LNAV minima
  - Wind Farm becomes 10 NM Obstacle
- **RNAV (GNSS) Z RWY 33** – LPV and LNAV minima
  - Wind Farm becomes 10 NM Obstacle
  - Impact on Left Initial Segment (LEVUB – KIPOT) – min altitude to be raised from 1500 to 1700

Any construction equipment exceeding the height of this submission must be submitted at least 30 business days prior to usage.

The nature and magnitude of electronic interference to NAV CANADA ground-based navigation aids, including RADAR, due to wind turbines depends on the location, configuration, number, and size of turbines; all turbines must be considered together for analysis. The interference of wind turbines to certain navigation aids is cumulative and while initial turbines may be approved, continued development may not always be possible.

In the interest of aviation safety, it is incumbent on NAV CANADA to maintain up-to-date aeronautical publications and issue NOTAM as required. To assist us in that end, we ask that you notify us at least 90 business days prior to the erection of wind turbines. This notification requirement can be satisfactorily met by returning a completed, signed copy of the attached form and an Excel copy of the attached spreadsheet by email at landuse@navcanada.ca or fax at 613-248-4094. In the event that you should decide not to proceed with this project or if the structure is dismantled, please advise us accordingly so that we may formally close the file.

If you have any questions, contact the Land Use Department by email at landuse@navcanada.ca.

NAV CANADA's land use evaluation is based on information known as of the date of this letter and is valid for a period of 18 months, subject to any legislative changes impacting land use submissions. Our assessment is limited to the impact of the proposed physical structure on the air navigation system and installations; it neither constitutes nor replaces any approvals or permits required by Transport Canada, other Federal Government departments, Provincial or Municipal land use authorities or any other agency from which approval is required. Innovation, Science and Economic Development Canada addresses any spectrum management issues that may arise from your proposal and consults with NAV CANADA engineering as deemed necessary.

Regards,

Land Use Office
NAV CANADA

cc ATLR - Atlantic Region, Transport Canada
mbaksh@elementalenergy.ca
jeffb@mccallumenvironmental.com
robert@mccallumenvironmental.com
+windturbines@forces.gc.ca
jeffrey.bateman2@forces.gc.ca

National Defence / Défense nationale

1 Canadian Air Division HQ
PO BOX 17000 STN Forces
Winnipeg, MB R3J 3Y5

Date of Electronic Signature

Dan Eaton
Director of Project Development
Elemental Energy
2150-745 Thurlow St,
Vancouver, British Columbia V6E 0C5

LETTER OF NON-OBJECTION FOR ELEMENTAL ENERGY

Dear Mr. Eaton,

Thank you for your patience on this matter and for considering DND radar, airport facilities, and radio-communication systems in your project development process. We have completed the detailed analysis of your proposed site, referenced in NAVCAN Land Use file# 22-3698 near Wedgeport, NS. We recognize that this site is within defined consultation zones which have been recommended against by RABC/CanWEA guidelines. The results of the detailed analysis and subsequent technical and operational impact assessments have confirmed there is likely to be minimal or no interference with DND radar, flight operations, and radio-communication systems. Therefore, as a result of these findings we have no objections with your project as submitted. If however,the layout were to change/move, please re-submit that proposal for another assessment.

The concurrence for this site is valid for 24 months from date of this correspondence. If the project should be cancelled or delayed during this timeframe please advise the point of contact. It should be noted that each submission is assessed on a case by case basis and as such, concurrence on this submission in no way constitutes a concurrence for similar projects in the same area, nor does it indicate that similar concurrence might be offered in another region. The issuance of this Letter of Non-Objection shall not constitute a waiver or alienation of any existing or future legal rights of the DND/CAF nor shall it be construed to create any exemptions, indemnification, approvals, rights, acceptances in favour of Elemental Energy.

DND/CAF expressly reserves its rights to take legal action or seek remedy for any and all liability, loss, harm, degradation of services or equipment, litigation costs, damages, judgements or expenses that arise from the adverse effects, whether incidental, indirect or causal, of the referenced NAVCAN Land Use file# 22-3698 near Wedgeport, NS. upon the DND/CAF radars, equipment and its provision of Air Traffic Services.

Canada

At present DND is working with Transport Canada to make obstruction lighting compliance with Night Vision Goggles (NVG) mandatory. At present DND cannot stipulate that proponents of wind turbine farms utilize NVG compliant lighting. However, as you can imagine, the safety of our aircrews is a top priority, and as such, we ask that you consider lighting your turbines with NVG compliant lighting so that they are visible to pilots during NVG operations.

I trust that you will find this satisfactory. If you have any technical questions or concerns regarding any aspect of this investigation, please contact the undersigned.

Kind regards.

A.A. Lockerby
Lieutenant-Colonel
Senior Staff Officer Aerospace
Capabilities and Readiness