Appendix J

Noise and Vibration Impact Study

Noise and Vibration Impact Study

Argentia Renewables Project

Pattern Energy

18 March 2024

→ The Power of Commitment

Project name		SEM Pattern EA Support					
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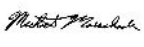
S4	FINAL	A. DeFaria	M. Masschaele		S. Bendenia		Mar.18/24

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Appendices

1. Introduction

The Argentia Renewables Project (the “Project”) as proposed by Pattern Energy Group LP (Pattern Energy) involves the development, construction, operation, maintenance, eventual decommissioning, and rehabilitation of both an onshore wind farm and a commercial-scale green hydrogen and ammonia production facility. The green hydrogen and ammonia production facility will require an anticipated 300 megawatts (MW) of energy and will be situated on brownfield private land owned by the Port of Argentia that is zoned for industrial use. The green hydrogen and ammonia production facility is to be powered by Pattern Energy’s proposed wind farm along with additional supply of low-carbon grid electricity from the Newfoundland and Labrador (NL) hydro grid when required. The location of the hydrogen and ammonia production facility (the hydrogen / ammonia plant) is on the Argentia Peninsula of Placentia Bay at 47°18'26.03"N 53°59'4.96"W (Figure 1). The locations of the wind turbine generators (WTGs) are on adjacent private lands locally referred to as the “Argentia Backlands” north of the communities of Dunville and Ferndale, as well as north of the community of Freshwater.

The hydrogen / ammonia plant will be designed to produce up to approximately 100,000 metric tonnes (t) of green hydrogen (equivalent to approximately 1.17 mega tonnes (Mt) of ammonia) annually via electrolysis. The hydrogen / ammonia plant will have an installed electrolyser capacity of 300 MW. The hydrogen produced by the Project will be converted into ammonia and exported to international markets by ship from an existing marine terminal in the Port of Argentia. The Project also includes civil works, ancillary infrastructure, and facilities associated with the wind farm, the hydrogen / ammonia plant, and the hydrogen / ammonia storage and export facilities.

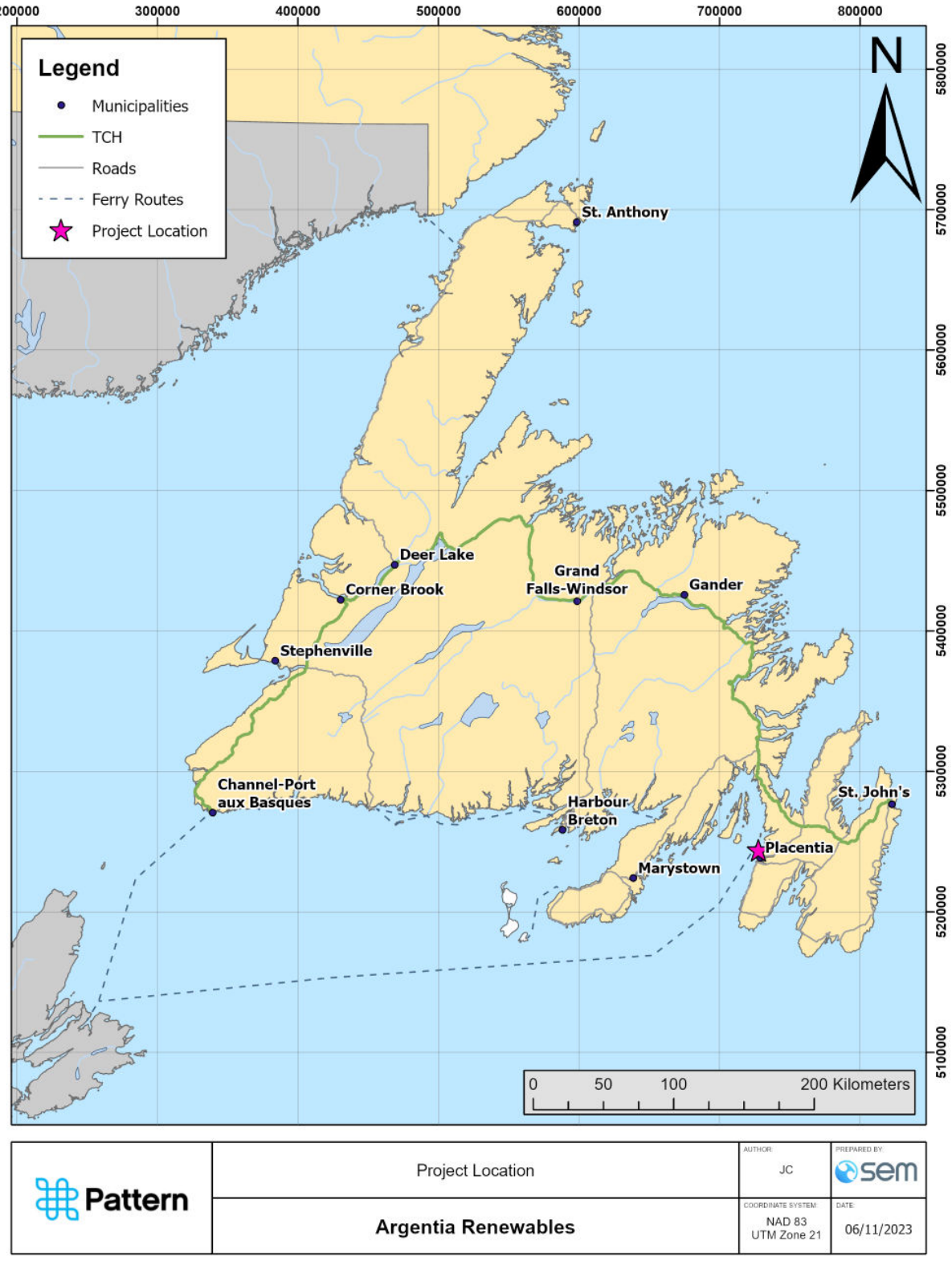


Figure 1 Project Location

1.1 Purpose of this Report

GHD Limited (GHD) was retained by Pattern Energy to prepare a Noise and Vibration Impact Study (Study) for the Argentia Renewables Project (Project) located on the Argentia Peninsula of Placentia Bay, Newfoundland and Labrador (Site). This Study has been prepared in support of the Environmental Assessment of the Project.

1.2 Scope and Limitations

This report: has been prepared by GHD for Pattern Energy and may only be used and relied on by Pattern Energy for the purpose agreed between GHD and Pattern Energy as set out in Section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Pattern Energy arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Project Description

The Project includes the construction, operation/maintenance, and decommissioning of (1) an onshore wind farm, (2) a green hydrogen and ammonia production, storage, and loading facilities, and (3) associated infrastructure related to storage and linear features. The site is located at Argentia, NL on the brownfield peninsula formerly used for military purposes and extends into the “Backlands” of Placentia.

The hydrogen-ammonia facility will be constructed on the Argentia peninsula along with six (6) turbines. Four (4) turbines will be located just south of Highway 102 near Cooper Drive, and the remaining thirty-six (36) turbines will be located throughout the Backlands (Figure 2). Linear infrastructure associated with the Project will include a network of roads, transmission lines between components, and water supply pipelines. In addition, a new transmission line will parallel an existing line and link to the Long Harbour terminal station (for a proposed 10 MW of firm power and 125 MW of non-firm power).

The Project will potentially interact with the environment at various spatial scales, so three levels of “study area” were assessed: a Project Area, a Local Assessment Area, and Regional Assessment Area. Each is defined in Section 4, along with a rationale for the delineation of the boundaries of each.

3. Existing Conditions & Baseline Noise Study Results

To establish noise limits in accordance with the Health Canada criteria (described in Section 4.2.2), baseline noise levels are required to be collected. Ambient noise levels were measured in the vicinity of the Site in 2023 from July 20th to 26th, December 1st to 9th, and December 14th to 17th. These measurements were taken to determine an approximate baseline where the Project could cause new or incremental impacts to the natural environment. The results from this sampling program were obtained as a time averaged sound level (L_{eq}); a single number value that expresses the time varying sound level for the specified period (in this case, one hour) as though it were a constant

sound level with the same total sound energy as the time varying level. This data was then filtered via the historical climate data obtained from nearby climate stations; noise levels during periods of inclement weather were discarded due to their atypical nature. The remaining data was then averaged over the appropriate period to obtain the equivalent continuous A-weighted noise levels (L_{Aeq}) averaged over day and nighttime periods. The sound pressure levels measured during the baseline sound quality survey are presented in Table 1, including daytime sound level (L_d), nighttime sound level (L_n), and the day-night average sound level (L_{dn}) values.

The baseline sound quality monitoring survey was conducted in accordance with ISO 1996-2:2007 ("Acoustics – Description, measurement and assessment of environmental noise – Part 2L Determination of environmental noise levels"), as recommended by Health Canada (Health Canada 2017). Ambient sound levels were measured using Type 1 Sound Pressure Level Meters. Measurements were taken continuously over a period of between 2 to 6 days at each location. Calibration checks were undertaken throughout the monitoring survey.

Upon completion of the sound monitoring, the baseline measurements were analysed in relation to meteorological conditions during the time of monitoring, potential nearby sources of sound (both natural and anthropogenic) and the audio recordings. Further calculations were performed on the raw data to obtain the daytime sound pressure level (L_d), the nighttime sound pressure level (L_n), and the day-night average sound pressure level (L_{dn}) (Health Canada 2017).

The following table summarizes these measurements in terms of average noise levels during the day (07:00 to 23:00), and night (23:00 to 07:00):

Table 1 Noise Monitoring Collected Data Summary

Monitoring Location ID	Description	Measured Noise Levels (dBA)		
		Day L_d (7am-11pm)	Night L_n (11pm-7am)	L_{dn}
M1[1]	Freshwater, NL	37	36	43
M2[1]	Ferndale, NL	42	35	43
M3[2]	Dunville, NL	52	34	50
M4[1]	Fox Harbour, NL	61	51	61
Note 1: Monitoring Data was between December 1st to December 17th as part of the second round of monitoring Note 2: Monitoring data was between 20 July 2023 to 26 July 2023 as part of the first round of noise monitoring				

Noise levels were found to be highest for locations close to major roadways or nearer to Dunville, such as M3 and M4. Rural areas experienced less noise, including M2, and the small community within Freshwater, M1. The major contributor to sound levels during the daytime were related to vehicle traffic. The major contributor to sound levels during nighttime were related to the natural environment, including wind and wave noise and wildlife calls, as well as occasional noise emissions from vehicle traffic.

A summary of the noise monitoring results is presented in Appendix A and the monitoring locations are shown on Figure A.1.

4. Noise and Vibration Assessment Methodology

The Study presented herein provides an evaluation of the potential noise impacts from the Project generated during Construction and Operations on the sensitive receptors located nearest to the project operations, based on continuous 24-hour operations and daytime only construction.

The noise assessment of the Project is split into two components:

– Construction of Turbine and Plant Facilities and Hydro Line and Road Construction
– Operation of the Turbines, associated production facilities and infrastructure

4.1 3D Acoustical Model

Datakustik's CadnaA Acoustical Modelling Software (CadnaA) is the industry standard for environmental noise modelling in Canada. CadnaA version 2023 was used to model the potential impacts of the significant noise sources for Construction and Operations. CadnaA calculates sound level emissions based on the ISO 9613-2 standard "Acoustics – Attenuation of Sound During Propagation Outdoors", which accounts for attenuation effects due to geometric divergence, atmospheric attenuation, barriers/berms, ground absorption, and directivity. Topography for the site and surrounding environment was obtained from GHD's GIS department, and input in the 3-D acoustical model (5 metre (m) resolution for elevations).

Cadna A modelling assumptions used in this Study included:

– Noise Sources: All sources were modelled using full octave band data from the reference materials.
– Reflection Order: A maximum reflection order of 1.0 was used to evaluate indirect noise impact from reflecting surfaces.
– Ground Absorption: The model included a ground absorption factor of G = 1 for soft ground, G = 0.5 was used for areas of gravel, G=0 for water.
– Tonality: A +5 dB adjustment was applied for tonal sources, if applicable.
– Building Surfaces: Buildings are modelled as reflective surfaces.
– Noise sources whose dimensions are small in comparison to the distance to the sensitive Points of Reception (PORs) (generators, air intakes and exhausts) are modelled as point sources in CadnaA. Noise sources with a larger area such as bay doors are modelled as vertical area sources. Noise sources extending in only one direction with small dimensions in the other two directions such as conveyor lines or trucking routes are modelled as line sources. Each of these noise source types appears in the legend provided with Figure 5 identifying the source type.
– Temperature: 10°C.
– Relative humidity: 70%.
– Wind speed: Downwind condition, wind speed of 3 m/s.
– Maximum search radius: 20,000 m.
– Noise propagation model: CadnaA version 2023 (DataKustik).
– Standard: ISO 9613.
– Terrain parameters: Digital ground terrain for the Site was incorporated.
– Foliage: The forest areas (coniferous trees) surrounding the Project were conservatively not included in the modelling.
– Plant activities are consistent throughout the day and night.
– Construction activities are limited to daytime operations only.

It should be noted that the selected meteorological parameters (temperature and relative humidity) produce the worst case (most conservative) noise prediction results using CadnaA. Noise level predictions to account for varying temperature and relative humidity throughout the year were not conducted but would produce slightly different results.

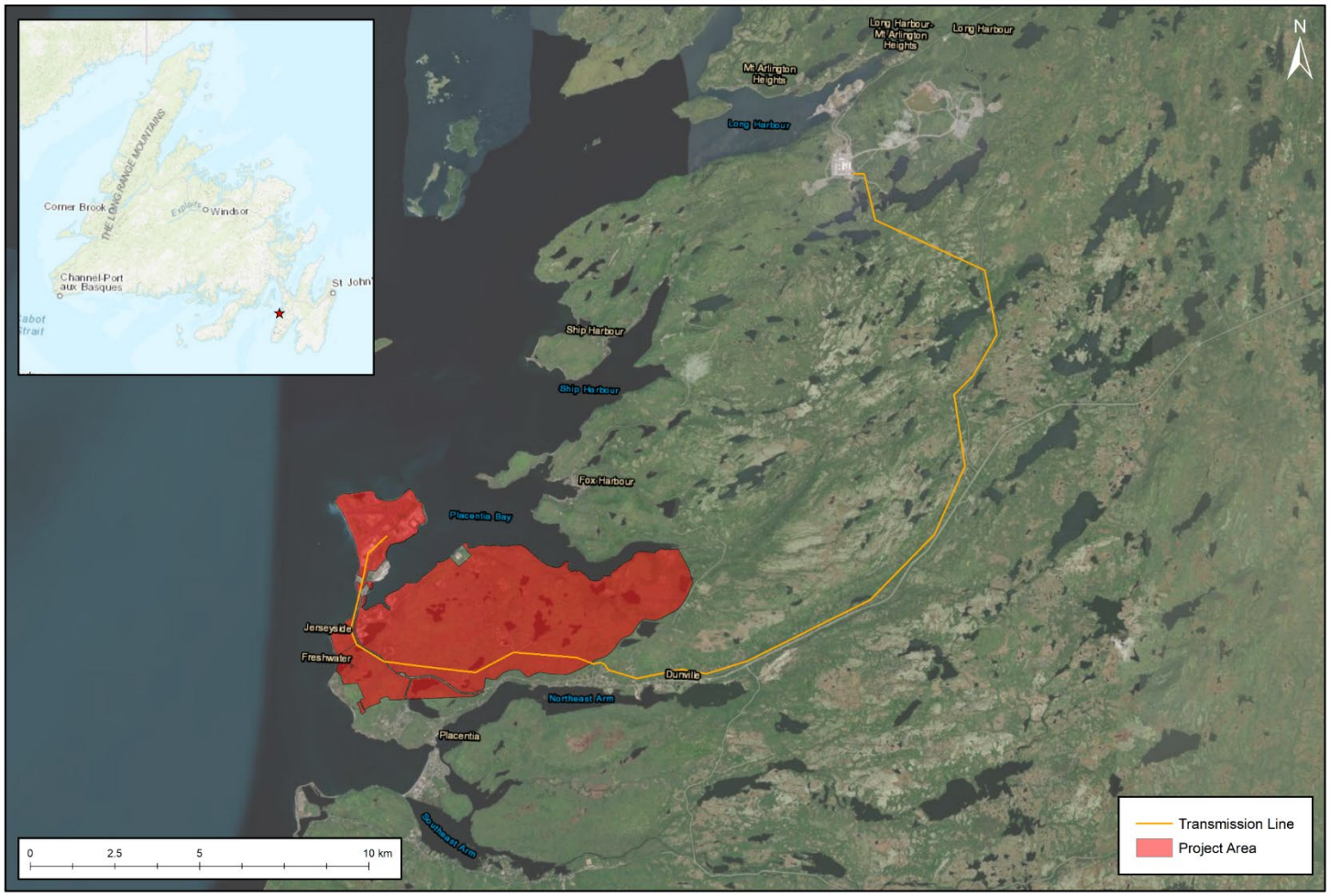
4.2 Spatial Boundaries

The spatial boundaries used for the assessment of effects of noise are defined below:

– The Project Area (PA) for the Argentia Renewables Project will be defined as “the area in which Project infrastructure components and activity (e.g., construction, operation, decommissioning) will occur, and within which direct environmental interactions with the Project will likely occur”. Specifically, the PA will encompass the collective spatial footprint of the wind turbines, the hydrogen-ammonia facility, ammonia storage infrastructure, electrical substation(s), turbine-interconnected transmission lines, a transmission line to the main electrical grid in Long Harbour, and all the associated roads for the aforementioned elements of the Project. A 100 m buffer was added to either side of the transmission line to Long Harbour. A diagram of the PA is provided in Figure 2.

– The Local Assessment Area (LAA) for the Project will be defined as “the area in which environmental interactions are detectable (and measurable) but which extend beyond the boundaries of the Project Area” (i.e., the interactions with the Project in the LAA are primarily indirect)”. A 10-kilometer (km) radius extending from the centre of the Project Area defined the boundary of the LAA. This distance was selected because to include all the local municipalities’ infrastructure and housing, and far enough into the marine environment to encompass any indirect interactions with the Project. 10 km would also comprise all the viewscapes of the Project from afar, any noise transmission outside of the Project Area, and encompasses the inshore environment which provides habitat for various species of birds, and possibly migratory bats. A diagram of the LAA is provided in Figure 3.

– The Regional Assessment Area (RAA) boundary includes the anticipated spatial extent of potential indirect and cumulative environmental effects which may reach beyond the limits of the LAA. The RAA therefore extends an additional 15 km beyond the radius of the LAA (i.e., out to 25 km). It includes the area within which most cumulative effects would occur, such as additive industrialization to other local industrial instalments, projects, or infrastructure. In particular, the extent of the Regional Assessment Area boundary considers changes to the environment that may indirectly affect the landscape or resources for local communities or migratory wildlife species. In addition, the rationale for 25 km also included the inclusion of the entire proposed transmission line from the Project Area to the Long Harbour Terminal Station. A diagram of the RAA is provided in Figure 4.



Pattern	Argentia Renewables	AUTHOR: CRB	PREPARED BY: sem
	Project Area	COORDINATE SYSTEM: NAD83 UTM Zone 22	DATE: 21/11/2023

Figure 2 ***Project Area (PA)***

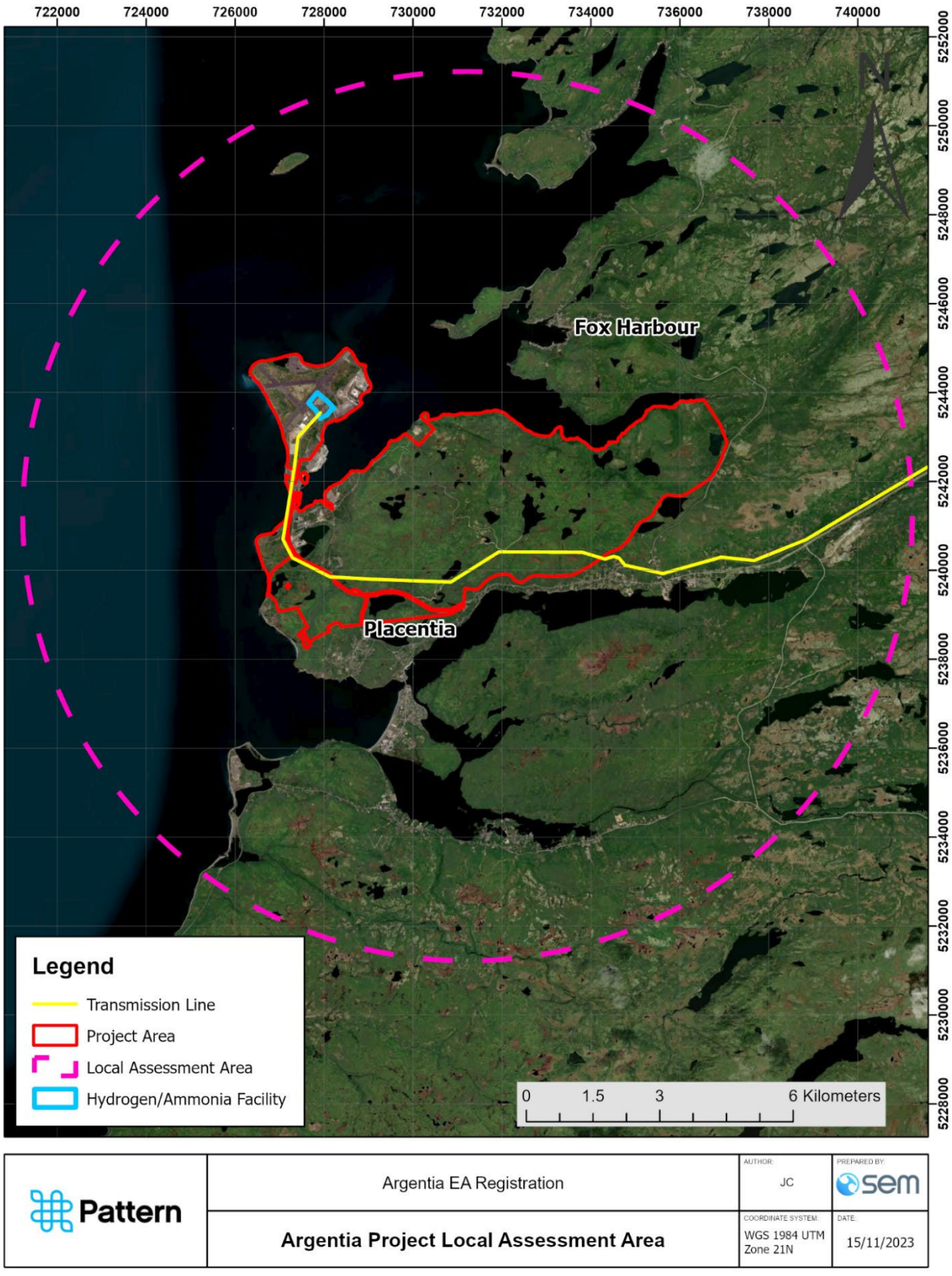


Figure 3 *Local Assessment Area (LAA)*

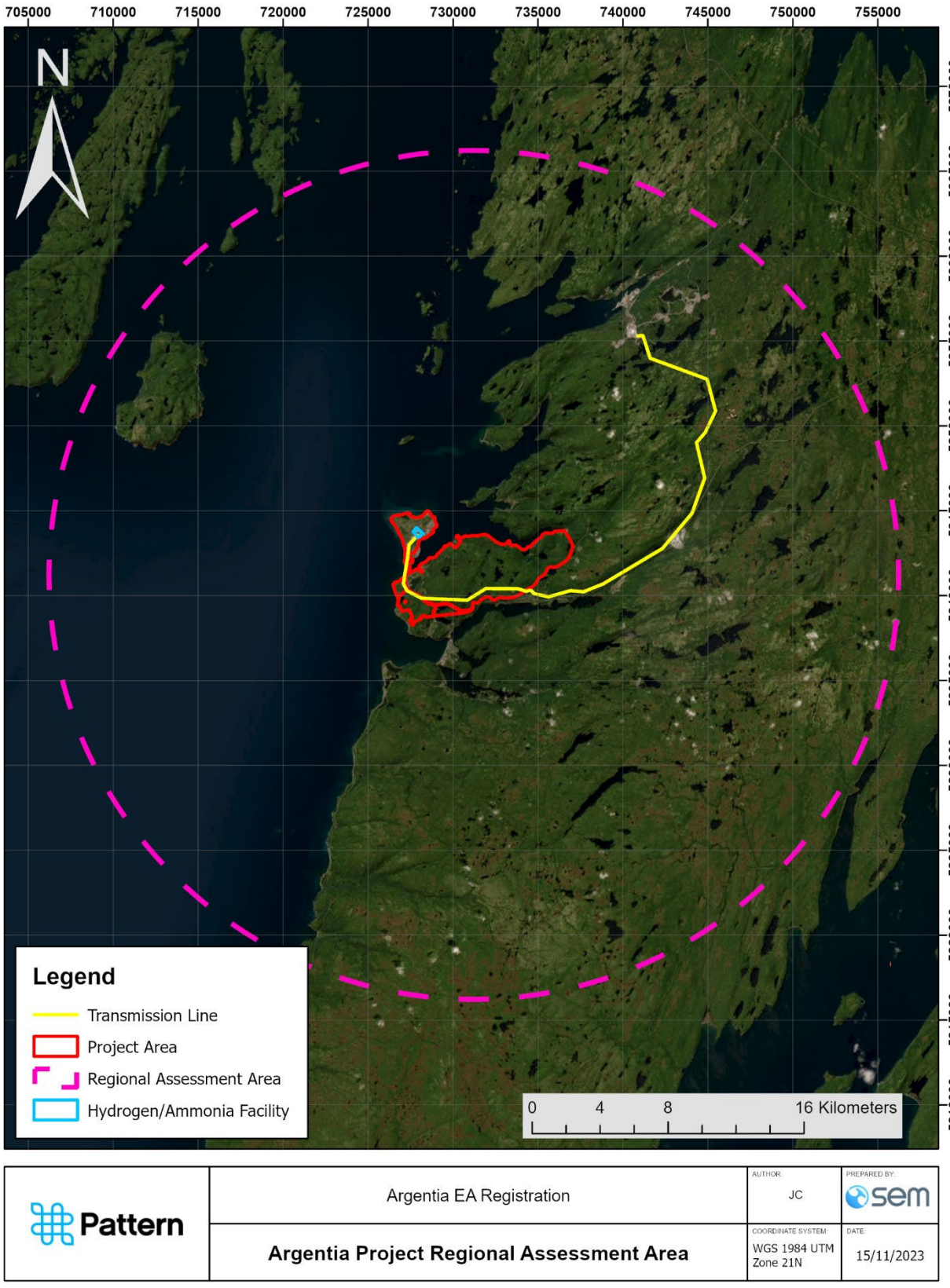


Figure 4 *Regional Assessment Area*

4.3 Temporal Boundaries

The temporal boundaries for the assessment of potential effects on the Acoustic Environment are not known at this time, however, based on the size of the project the following assumptions have been made for the project timeline:

– Construction: Overall, the construction phase of the Project will be from Q2 2024 through Q3 2028, pending EA approval and receipt of other required permits and approvals. Early civil works are planned to start Q2 2024 through Q1 2025. Construction of the Argentia wind farm and associated infrastructure is expected to start in Q1 2025 with completion of the construction in Q3 2028. The hydrogen / ammonia plant will be constructed in phases from Q4 2025 to Q3 2027. Grid power sources are planned for hydrogen production in 2026 until March 2027, when the electrolyzer is commissioned.

– Operation and maintenance: Wind farm commissioning is anticipated to start Q1 2028 at the Argentia wind farm. The 600 MW electrolyzer expected to be commissioned in Q3 2027. The operational life of the Project is 30 years.

– Decommissioning and rehabilitation: The decommissioning phase is anticipated to take two years, occurring between 2057 and 2059. Decommissioning is anticipated to begin Q3 2057 at the Argentia wind farm, with completion in Q1 2059.

4.4 Applicable Noise and Vibration Guidelines

4.4.1 Department of Environment and Climate Change – Government of Newfoundland and Labrador

The Government of Newfoundland and Labrador have published a guideline for the assessment of environmental impacts for onshore wind and green hydrogen production projects in *Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Product Projects* (Government of Newfoundland and Labrador, April 2023). The following guidance is identified in relation to the assessment of noise.

> ***2.3.1 Construction Activities***
>
> *Details of materials, methods, schedule, and locations of all construction activities (including permanent and temporary infrastructure related to physical features) should be described. Depending on the project components, this may include:*
>
> *…*
>
> - *sources and intensity of noise, vibration and light emissions;*
>
> *…*
>
> ***2.3.2 Operation and Maintenance Activities***
>
> *Details of the* ***operation and maintenance*** *of the undertaking should be described in this section of the registration document. Proponents should include detailed descriptions of the following, if applicable:*
>
> *…*
>
> - *sources, decibels, duration and geographic reach of noise (including long-term, low frequency), light emissions and shadow flicker, and vibrations during operation and maintenance of wind turbines and hydrogen production facilities;*

3.1.1 Atmospheric environment

*The proponent should describe the relevant components of the **atmospheric environment** in the project area, which may include the following:*

…

g) ambient light, vibration and noise level, including low frequency noise; and

4.4.2 Health Canada

In the absence of specific numerical criteria as set out in *Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Product Projects* from the Government of Newfoundland and Labrador, guidance can be sought from Health Canada's guideline titled *Guideline for Evaluating Human Health Impacts in Environmental Assessment: Noise* (January 2017) (the Guideline). It recommends that noise from projects in their operational phase are assessed using an evaluation of the increase in Percent Highly Annoyed (%HA). This type of evaluation is also applied to a project's construction phase where it lasts more that a year in duration. In addition to the %HA evaluation, Health Canada also states that nighttime noise levels experienced indoors at sensitive receptors shall be less than 45 dBA.

4.4.2.1 Calculation of Percent Highly Annoyed

%HA is calculated based on the 16-hour daytime equivalent sound level (Ld) and the 8-hour nighttime equivalent sound level (Ln), using an equation defined in the guideline. Health Canada suggests that mitigation be implemented when noise levels during long-term construction result in greater than 6.5% increase in %HA (delta %HA) at receptors.

The calculation of %HA is as follows:

$$\%HA = \frac{100}{1 + e^{(10.4 - 0.132 \times L_R dn)}}$$

where $L_R dn$ is the day-night rating level, which is calculated by:

$$L_R dn = 10 \log_{10}\left(\frac{\left(15 \times 10^{(0.1 \times L_R d)}\right) + \left(9 \times 10^{(0.1 \times (L_R n + 10))}\right)}{24}\right)$$

where $L_R d$ is the day rating level, and $L_R n$ is the night rating level. As discussed in Section 3, baseline noise levels in the vicinity of the Site were collected at four locations surrounding the PA to provide an accurate comparison between project noise and ambient noise levels.

The method for determining compliance with the %HA limits described in the Health Canada Guideline states that baseline %HA is to be compared to the operational %HA plus the baseline %HA, this essentially models the pre and post project annoyance levels. The difference of these values is known as the resultant delta %HA and must not exceed 6.5%. If 6.5% is exceeded, then noise mitigation should be considered to reduce the delta %HA to compliant levels.

4.4.2.2 Indoor Nighttime Noise Limits

The compliance with the nighttime limit of 45 dbA at indoor sensitive locations is to be assessed by comparing the predicted sound pressure levels indoors with the 45 dBA limit provided in the Health Canada Guideline. A reduction to the sound pressure level at the plane-of-window of 15 dBA (partially open window) is applied to provide a conservative value for worst-case indoor noise as per the Health Canada Guideline.

4.4.2.3 Low Frequency Noise

Wind turbines have the potential to emit high low-frequency noise (LFN) which could be summarized as noise in the frequency range of 16 Hz to 200 Hz. LFN is not accurately captured in A-weighted sound levels and sufficiently high LFN can cause annoyance issues even though the human ear is less sensitive to those frequencies.

To determine if a noise source is a likely to generate high LFN, the difference between the C-weighted sound levels and the A-weighted sound levels of the source are calculated and compared to a limit of 20 dB. If 20 dB is exceeded, then the source is generally considered to be an LFN source. Additionally, Health Canada suggests that if the total sound pressure level of the 16 Hz, 31.5 Hz, and 63 Hz bands exceed 70 dB then mitigation measures should be explored to reduce these levels to within compliance.

4.4.3 Vibration Criteria

Ground-borne vibration is the measure of ground oscillations, usually due to industrial activities such as construction, earthworks, pile driving, or even highway traffic. The most common approach to vibration measurement is by measuring velocity measurements at ground level, where higher velocities correspond to higher levels of vibration. One way to measure and report vibration is to record the maximum vibration level at any given time, also known as the peak particle velocity (PPV). Human exposure is more sensitive to vibrations that occur over a certain period of time more so than a more sudden exposure to vibrations for a short amount of time (Caltrans, 2020). Therefore, a more common measure of vibration for human exposure is the root-mean-square (RMS) of the vibrations. The RMS approach calculates an average vibration value for a given time period (usually one second). Since the RMS value is an average of the instantaneous vibration velocity measurements, it is always a lower value than the PPV value. The PPV and RMS can be related by a crest factor. The crest factor can be as low as 1.4 but can be as high as 8 depending on the nature of the vibration source (US FTA 2018).

There are no regulations or guideline exposure limits for vibration in Newfoundland and Labrador. Guidelines related to public nuisance from vibration have been developed by the American National Standards Institute (ANSI) and the Acoustical Society of America (ASA) through ANSI/ASA S.39-1983. These guidelines have been adopted by regulatory agencies such as the United States Federal Transit Administration (US FTA) and are often used in jurisdictions across Canada for assessing vibration. The ANSI guidance gives threshold values for different types of land use. For land uses associated with residential areas or in areas where sleeping occurs, the recommended ANSI threshold is 0.1 mm/s RMS, while daytime thresholds are recommended to be 0.14 mm/s RMS.

5. Noise Source Summary

5.1 Operational Noise Sources

5.1.1 Wind Turbines

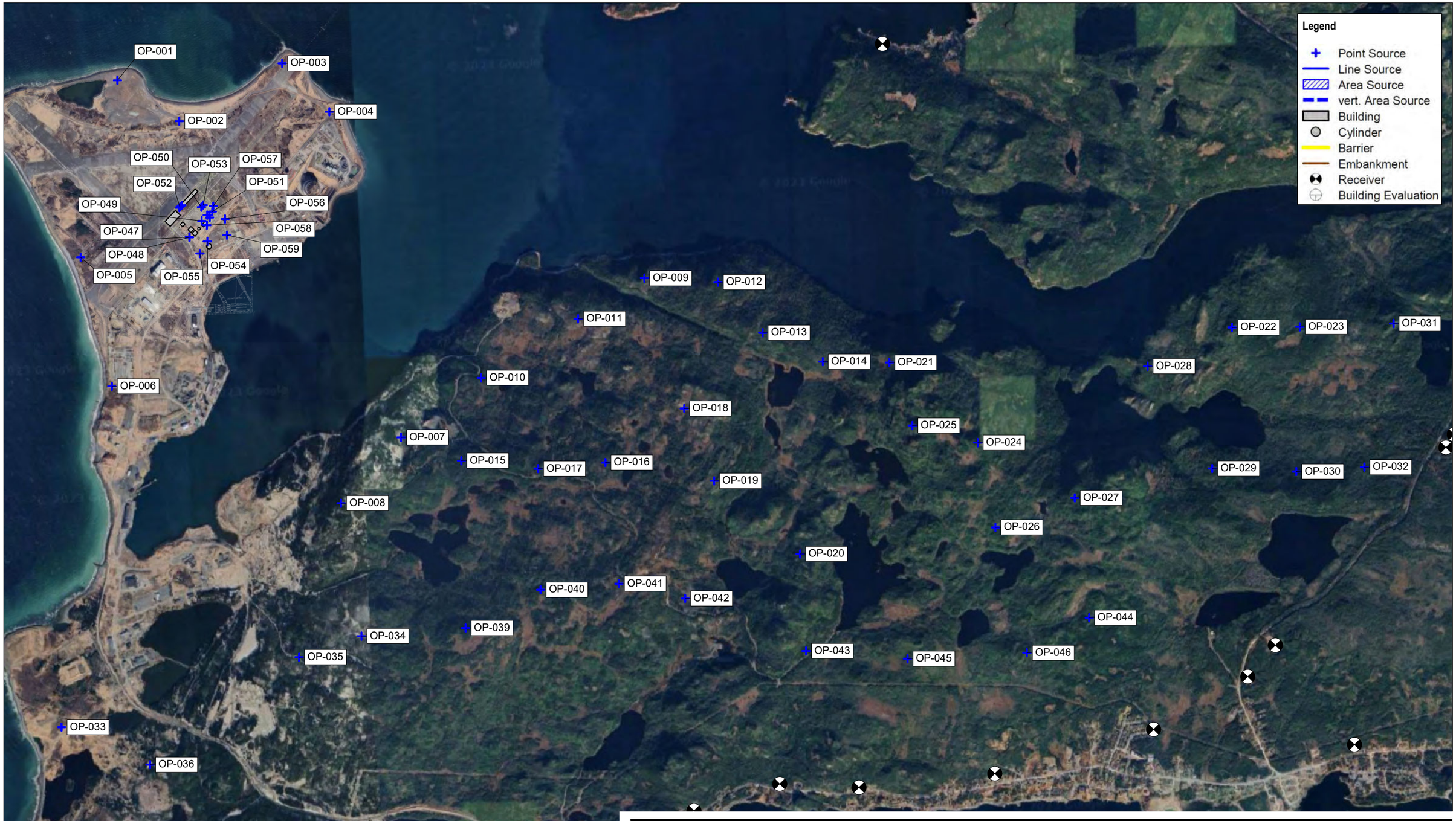
This Study focused on the noise emissions from the cumulative operation of both the wind turbines, and hydrogen and ammonia production facility. Noise emissions from wind turbines typically increase with increasing wind speed and thus, the maximum wind speed was used to be conservative. Turbine specifications have been specified in Table 2, and spectral sound data has been sourced from the previously prepared wind farm acoustic report *Navarre Green Power Hub – Wind Turbine Noise Assessment* (Marshall Day Acoustics, May 2023), where the same model wind turbine was assessed, provided below in Table 3. Noise emissions from wind turbines are dependent on a range of factors, including the turbine size, rotor diameter, blade design, power output and rotational speed. No special audible characteristics for the turbines considering low frequency, impulsiveness or tonality are identified, and have not been applied to noise level predictions in the assessment. The locations of the turbines used in the noise modelling was determined based on the site plans shown in Appendix B and is provided below in Figure 5 along with the plant source locations.

Table 2 Wind Turbine Specifications

Description	Characteristic
Model	Vestas V172-7.2
Rated power	7,200 kW
Hub height	166 m
Rotor diameter	172 m
Rotor swept area	23,235 m^2
Number of blades	3
Cut-in wind speed	3 m/s
Cut-out wind speed	25 m/s
Sound power level at hub height[1]	110.1 dBA
Note 1: Assuming wind speeds are over 9 m/s without serrated trailing edge rotor blades	

Table 3 A-Weighted Octave Band Sound Power Levels, dBA – Vestas V172-7.2

Parameter	Sound Power Octave band centre frequency, Hz									Total dBA
	31.5	63	125	250	500	1000	2000	4000	8000	
Sound power level at hub height	81	91	99	104	105	104	100	93	83	110



Paper Size ANSI B

0 200 400 600 800 1000 m

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 83 UTM Zone 21

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ACOUSTIC ASSESSMENT REPORT
PATTERN ENERGY
ARGENTIA RENEWABLES

NOISE SOURCE LOCATION PLAN
TURBINES HUBS

Project No. **12618385**
Revision No. **-**
Date **14.03.2024**

FIGURE 5

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Imagery source: Google Satellite

5.1.2 Hydrogen and Ammonia Production Facilities

Significant noise generation is expected to occur from operations emanating from the hydrogen and ammonia production facilities. These operations will involve the operation of various types of equipment including cooling towers, compressors, air coolers, transformers, flares, chillers and diesel generators. It is expected that some equipment will be located indoors whilst others located outdoors, however the exact configuration of the facility is not yet determined at this stage. To remain conservative, all equipment associated with the facility are assumed to be operating outside. In order to predict the future worst-case noise impacts from the Project activities, representative octave band noise data was used, measured from processing equipment similar to what is noted to be required for the Project.The list of operational equipment and their spectral sound power level source data is provided below in Table 4, and the locations of these operational noise sources is provided in Figure 6.

Paper Size ANSI B

0 200 400 600 800 1000 m

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 83 UTM Zone 21

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GHD

ACOUSTIC ASSESSMENT REPORT
PATTERN ENERGY
ARGENTIA RENEWABLES

NOISE SOURCE LOCATION PLAN
HYDROGEN AND AMMONIA PRODUCTION FACILITY

Project No. **12618385**
Revision No. **-**
Date **14.03.2024**

FIGURE 6

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Imagery source: Google Satellite

Table 4 Source Sound Power Levels Used in Acoustic Model – Hydrogen and Ammonia Production Facility Equipment

Source	A-weighted sound power level (dBA) by Octave Band (Hz)									Total Sound Power Level	
	31.5	63	125	250	500	1000	2000	4000	8000	dB	dBA
Cooling Water Tower	39	52	60	77	72	77	79	79	75	89	85
Cooling Water Tower Vent	35	45	56	72	64	69	70	68	61	83	77
N2 Compressor	65	79	92	101	110	123	129	122	114	130	131
Electrolyser Compressors 1	38	52	65	74	83	96	102	95	89	103	104
Electrolyser Compressors 2	49	63	76	85	94	107	113	106	98	114	115
Ammonia Air Coolers	81	97	107	111	114	113	111	108	98	129	119
Transformers[1]	70	89	101	103	109	106	102	97	88	121	112
Boil Off Gas Compressors	46	60	73	82	92	104	110	103	95	111	112
Tank Flare	81	91	108	111	114	117	116	115	109	128	122
NH3 Flare	81	91	108	111	114	117	116	115	109	128	122
Piping Valves 1	41	53	60	69	78	93	96	99	97	103	103
Piping Valves 2	41	53	60	69	78	93	96	99	97	103	103
Piping Valves 3	41	53	60	69	78	93	96	99	97	103	103
Turbine Glycol Chiller	74	86	91	92	95	92	90	90	85	117	100
Turbine Combustion Intake	51	67	79	86	91	93	92	89	82	102	98
Diesel Generator 1	0	81	86	86	89	83	80	74	67	109	93
Diesel Generator 2	0	81	86	86	89	83	80	74	67	109	93

Note 1: *Tonality was detected in the transformer sound spectrum, and thus, in accordance with the Health Canada Guidance, a +5 dBA tonal penalty has been applied*

5.2 Construction Noise Sources

Noise emissions during decommissioning and rehabilitation were considered to be less than noise emissions during construction and operation, and so were assessed qualitatively.

The construction of the Project is anticipated to occur over a period of 51 months. For construction activities lasting longer than one year, Health Canada recommends a quantitative assessment of noise emissions (Health Canada 2017).

The Project construction phase noise emissions were established using the following information sources:

– Equipment lists and design data provided as part of the Project Description
– Measurement data of similar equipment
– Publications that provide reference sound power levels and sound pressure levels for construction equipment (DEFRA, 2005; DEFRA, 2006)

Earthmoving and construction activities are planned for the ammonia production facility, the main source of noise emissions during construction of the ammonia production facility and port is related to pile driving that may be required. The sound power levels assumed for pile driving activities are shown in Table 5 and include a 12 dB penalty on the blasting source as it qualifies as a highly impulsive noise source as indicated in the Health Canada Guideline. A list of equipment and quantities that are planned to be used for the construction of the wind farm is provided in Table 5 along with estimates of the sound power levels that could be emitted from the operation of the construction equipment.

Sound emissions will also result from blasting during construction. Blast energy that liberates into the atmosphere can generate air overpressure and noise. Blasting is expected to be limited to daytime hours and will follow best management practices (BMPs) outlined in guidance documents such as the Blasters Handbook (ISEE, 2016) and the Environmental Code of Practice for Metal Mines (ECCC, 2009). These guidance documents provide detailed information on designing and carrying out blasting to reduce sound emissions, and these will be consulted during blasting design.

The equipment sources related to Project construction of the wind turbines were modelled as area sources covering the wind farm locations. The vehicle traffic to/from the wind farms and transmission line construction sources were modelled as line sources.

5.2.1 Construction Scenario 1 – Turbine and Plant Construction

This Study focused on noise generating pieces of construction equipment that are likely to be used during construction activities. The final list of plant and equipment needed for the Project would be determined during the construction planning phase. Anticipated construction equipment, quantities and their usage factors are provided below in Table 5.

Table 5 Anticipated Construction Equipment Details CS01

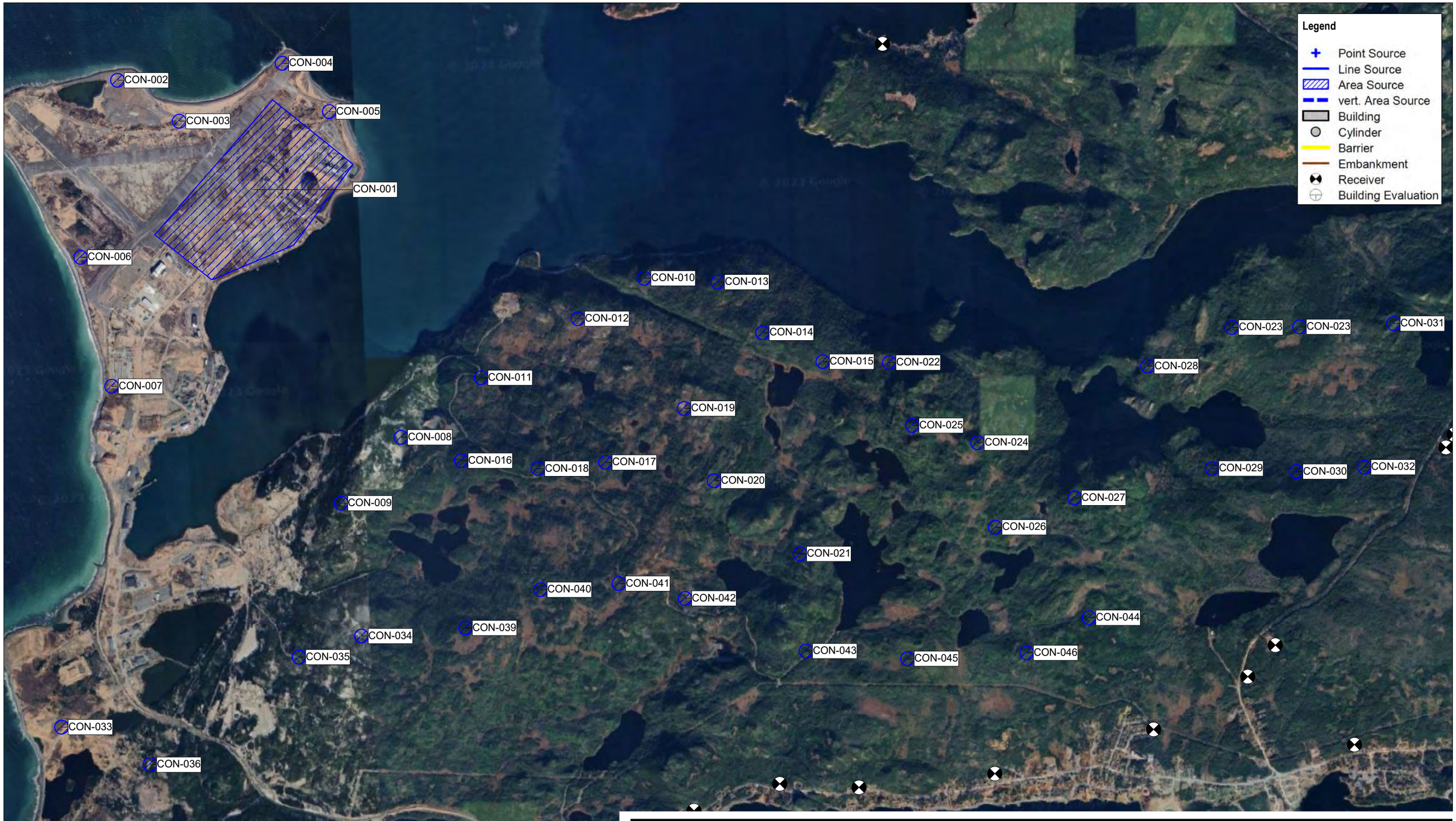
Equipment	Quantity	Usage Factor	Sound Power Level (SWL) $L_{Aeq(1hr)}$, dBA	Noise Level Source
Backhoe	4	40%	112	FTA, 2018[1]
Blasting[3]	1	1%	138	FHWA, 2006[2]
Bulldozers	2	40%	117	FTA, 2018
Compactor	4	20%	114	FTA, 2018
Compressor	4	40%	112	FTA, 2018
Concrete Truck	10	40%	117	FHWA, 2006
Concrete Pump Truck	2	20%	114	FTA, 2018
Concrete Saws	2	20%	122	FHWA, 2006

Equipment	Quantity	Usage Factor	Sound Power Level (SWL) $L_{Aeq(1hr)}$, dBA	Noise Level Source
Concrete Vibrators	2	20%	108	FTA, 2018
Crane	4	16%	115	FTA, 2018
Flat Bed Truck	4	40%	116	FHWA, 2006
Fork Truck	2	40%	99	FTA, 2018
Generator	8	50%	114	FTA, 2018
Grinders / Cutters	4	20%	112	FTA, 2018
Hydraulic rock breakers	2	40%	122	FHWA, 2006
Jack hammers	4	20%	117	FHWA, 2006
Pickup truck	4	40%	87	FHWA, 2006
Manlift	2	20%	117	FHWA, 2006
Welder	4	40%	105	FHWA, 2006
Vibratory Hammers	2	20%	127	FHWA, 2006
Impact Pile Driver[3]	2	1%	145	FTA, 2018

Note 1: *Transit Noise and Vibration Impact Assessment Manual* (Federal Transit Administration, September 2018)

Note 2: *Construction Noise Handbook* (Federal Highway Administration, 2006)

Note 3: A 12 dB penalty is included to account for the highly impulsive characteristics of the activity in accordance with Health Canada



Paper Size ANSI B

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Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 83 UTM Zone 21

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ACOUSTIC ASSESSMENT REPORT
PATTERN ENERGY
ARGENTIA RENEWABLES

NOISE SOURCE LOCATION PLAN
CONSTRUCTION SCENARIO CS01

Project No. **12618385**
Revision No. **-**
Date **14.03.2024**

FIGURE 7

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Imagery source: Google Satellite

5.2.2 Construction Scenario 2 – Transmission Lines, Collector System and Road Construction

For the construction of new transmission lines, collector system, and roads, a separate equipment list was used to determine the sound levels. As with Scenario 1, the final list of plant and equipment needed for the Project would be determined during the construction planning phase. Anticipated construction equipment, quantities and their usage factors are provided below in Table 6 and displayed in Figure 8.

Table 6 Anticipated Construction Equipment Details CS02

Equipment	Quantity	Usage Factor	Sound Power Level (SWL) $L_{Aeq(1hr)}$, dBA	Noise level source
Compressor	1	20%	112	FTA, 2018[1]
Crane	2	16%	115	FTA, 2018
Flat Bed Truck	2	40%	116	FTA, 2018
Pickup Truck	2	40%	87	FHWA, 2006[2]
Tamper	2	20%	94	DEFRA, 2006[3]
Mobile Drill	1	10%	117	FHWA, 2006
Compactor	1	20%	114	FTA, 2018
Concrete Truck	1	40%	117	FHWA, 2006
Concrete Pump Truck	1	20%	114	FTA, 2018
Concrete Vibrators	1	20%	108	FTA, 2018
Generator	1	50%	114	FTA, 2018
Excavator	2	50%	117	FHWA, 2006
Welder	4	40%	105	FHWA, 2006

Note 1: *Transit Noise and Vibration Impact Assessment Manual* (Federal Transit Administration, September 2018)
Note 2: *Construction Noise Handbook* (Federal Highway Administration, 2006)
Note 3: *Noise Database for Prediction of Noise on Construction and Open Sites* (Department for Environment, Food, and Rural Affairs, 2006)

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Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 83 UTM Zone 21

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ACOUSTIC ASSESSMENT REPORT
PATTERN ENERGY
ARGENTIA RENEWABLES

NOISE SOURCE LOCATION PLAN CONSTRUCTION SCENARIO CS02

Project No. **12618385**
Revision No. **-**
Date **14.03.2024**

FIGURE 8

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Imagery source: Google Satellite

6. Vibration Source Summary

Project operations, including operating and maintaining the wind turbines, transmission lines, ammonia generation facility, and port facilities, are not expected to generate substantial vibration emissions, and so vibration effects from these activities are not considered further in the Study due to a minimum setback to sensitive areas of 550 m.

7. Point-of-Reception Summary

A “point-of-reception” is any point on the premises of a person where sound origination from other than those premises is received. A point-of-reception may be located in areas where people normally live, work, or take part in recreation; this does not apply to the work force of a company.

The objective of this Study is to determine the predictable worst case 1-hour equivalent sound level (1-hour LEQ) at the worst-case points of reception. The worst-case points of reception are defined as the sensitive receptors with the greatest potential exposure to the Facility noise sources due to proximity and direct line of sight exposure.

The worst-case sensitive points-of-reception (PORs) for this Study are:

– POR-01 - Identified cabin residence facade (4.5m Above Ground [AG])
– POR-02 - Identified cabin residence facade (4.5m AG)
– POR-03 - Identified cabin residence facade (4.5m AG)
– POR-04 - Ferndale Road residence facade (4.5m AG)
– POR-05 - NL-100 residence facade (4.5m AG)
– POR-06 - NL-100 residence facade (4.5m AG)
– POR-07 - NL-100 residence facade (4.5m AG)
– POR-08 - NL-100 residence facade (4.5m AG)
– POR-09 - Villa Marie Drive residence facade (4.5m AG)
– POR-10 - Fort Harbour Road residence facade (4.5m AG)
– POR-11 - NL-100 residence facade (4.5m AG)
– POR-12 - NL-100 residence facade (4.5m AG)
– POR-13 - Ferndale Road residence facade (4.5m AG)
– POR-14 - Green Road residence facade (4.5m AG)
– POR-15 - Graveyard Road residence facade (4.5m AG)
– POR-16 - Freshwater Crescent residence facade (4.5m AG)
– POR-17 - Old Settlement Hill residence facade (4.5m AG)
– POR-18 - High Road residence facade (4.5m AG)
– POR-19 - Orcan Drive residence facade (4.5m AG)

All POR locations within the RAA were considered; however, the noise impact at only the worst-case and most exposed PORs are presented herein. The locations of the worst-case PORs are identified in Figures 9 through 11.

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Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 83 UTM Zone 21

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ACOUSTIC ASSESSMENT REPORT
PATTERN ENERGY
ARGENTIA RENEWABLES

POINT OF RECEPTION LOCATION PLAN
SOUTHWESTERN RECEPTORS

Project No. **12618385**
Revision No. **-**
Date **14.03.2024**

FIGURE 9

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Imagery source: Google Satellite

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Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 83 UTM Zone 21

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ACOUSTIC ASSESSMENT REPORT
PATTERN ENERGY
ARGENTIA RENEWABLES

POINT OF RECEPTION LOCATION PLAN
SOUTHEASTERN RECEPTORS

Project No. **12618385**
Revision No. **-**
Date **14.03.2024**

FIGURE 10

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Imagery source: Google Satellite

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Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 83 UTM Zone 21

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ACOUSTIC ASSESSMENT REPORT
PATTERN ENERGY
ARGENTIA RENEWABLES

POINT OF RECEPTION LOCATION PLAN
NORTHEASTERN RECEPTORS

Project No. **12618385**
Revision No. **-**
Date **14.03.2024**

FIGURE 11

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Imagery source: Google Satellite

8. Noise Impact Assessment Results

8.1 Operational Noise

8.1.1 %HA Assessment

The predicted project-related daytime and nighttime sound levels for the operational phase of the project are shown below in Table 7. The predicted daytime (L_d), night (L_n) and day-night average sound levels (L_{dn}) at the receptors result in a difference in %HA levels that are lower than the limit of 6.5%. Therefore, noise mitigation measures are not required for operational noise with respect to the %HA criteria. A contour plot can be found in Figure 12 which displays the %HA levels in relation to the sensitive receptors.

Table 7 Modelling Results, Operational Phase – Day-Night Rating Sound Levels L_{dn} and % Highly Annoyed %HA at Points of Reception

Receptor	Monitoring Location	Baseline		Project Predicted Ldn (dBA)	Total (Baseline plus Project)		Delta %HA (Between Total and Baseline)	Compliance with Limits?
		Ldn (dBA)	%HA		Ldn (dBA)*	%HA		
POR1	M3	50	2.2	48	52	2.9	0.7	Yes
POR2	M3	50	2.2	51	53	3.4	1.2	Yes
POR3	M3	50	2.2	50	53	3.3	1.0	Yes
POR4	M1	43	0.8	36	43	0.9	0.1	Yes
POR5	M2	43	0.9	33	43	0.9	0.0	Yes
POR06	M2	43	0.9	38	44	1.0	0.1	Yes
POR07	M2	43	0.9	30	43	0.9	0.0	Yes
POR08	M2	43	0.9	31	43	0.9	0.0	Yes
POR09	M3	50	2.2	50	53	3.3	1.1	Yes
POR10	M3	50	2.2	48	52	2.9	0.6	Yes
POR11	M3	50	2.2	25	50	2.3	0.0	Yes
POR12	M3	50	2.2	20	50	2.2	0.0	Yes
POR13	M1	43	0.8	37	44	0.9	0.1	Yes
POR14	M4	61	8.7	42	61	8.8	0.1	Yes
POR15	M4	61	8.7	30	61	8.7	0.0	Yes
POR16	M1	43	0.8	41	45	1.1	0.3	Yes
POR17	M1	43	0.8	49	50	2.1	1.2	Yes
POR18	M1	43	0.8	44	46	1.3	0.5	Yes
POR19	M1	43	0.8	38	44	1.0	0.2	Yes

Legend

- > 2 %
- > 3 %
- > 4 %
- > 5 %
- > 6 %
- > 7 %
- > 8 %

Grid Height: 4.5 m above grade
Parameter: Change in percent highly annoyed

Paper Size ANSI B

0 200 400 600 800 1000 m

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 83 UTM Zone 21

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ACOUSTIC ASSESSMENT REPORT
PATTERN ENERGY
ARGENTIA RENEWABLES

NOISE CONTOUR PLOT:
PERCENT HIGHLY ANNOYED (%HA)

Project No. **12618385**
Revision No. **-**
Date **14.03.2024**

FIGURE 12

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Imagery source: Google Satellite

8.1.2 Indoor Nighttime Noise Assessment

The predicted project-related indoor nighttime sound levels for the operational phase of the project are shown below in Table 8. As per the Health Canada Guideline, 15 dBA was conservatively subtracted from the outdoor project noise at the plane of window of the sensitive receptors to obtain the predicted indoor noise levels. The predicted indoor nighttime levels at all receptors are within 45 dBA, and thus, noise mitigation measures are not required for operational noise with respect to the nighttime noise criteria.

Table 8 Modelling Results, Operational Phase – Indoor Nighttime Sound Levels at Points of Reception

Receptor	Project Predicted Nighttime Leq (dBA)	Predicted Indoor Noise Levels	Health Canada Indoor Noise Limits	Compliance with Limits?
POR1	42	27	45	Yes
POR2	44	29	45	Yes
POR3	44	29	45	Yes
POR4	29	14	45	Yes
POR5	26	11	45	Yes
POR06	31	16	45	Yes
POR07	23	8	45	Yes
POR08	24	9	45	Yes
POR09	44	29	45	Yes
POR10	41	26	45	Yes
POR11	19	4	45	Yes
POR12	14	0	45	Yes
POR13	30	15	45	Yes
POR14	35	20	45	Yes
POR15	24	9	45	Yes
POR16	35	20	45	Yes
POR17	42	27	45	Yes
POR18	37	22	45	Yes
POR19	32	17	45	Yes

8.1.3 Low-Frequency Noise Assessment

Wind turbines have been assessed for the potential to emit high LFN. The difference between the C-weighted sound levels and the A-weighted sound levels of the wind turbines were calculated and found to be 12 dB. This difference is much lower than the 20 dB limit, and thus, the wind turbines are likely not LFN sources. Additionally, the total sound pressure level of the 16 Hz, 31.5 Hz, and 63 Hz bands at the worst-case sensitive receptor were 63 dB which is well below the limit of 70 dB. Therefore, LFN is not anticipated to be an issue at the surrounding receptors; no mitigation measures are required to achieve compliance.

8.2 Construction Noise

The predicted project-relative daytime and nighttime sound levels for the construction phase of the project are provided below in Table 9 for construction scenario CS01 (Turbine and Plant Construction), and Table 10 for construction scenario CS02 (Transmission Lines, Collector System, and Road Construction).

Table 9 Modelling Results, Construction Phase CS01 (Turbine and Plant Construction) – Day -Night Rating Sound Levels Ldn and % Highly Annoyed %HA at Points of Reception

Receptor	Monitoring location	Baseline		Project Predicted Ldn (dBA)	Total (Baseline plus Project)		Delta %HA (Between Total and Baseline)	Compliance with Limits?
		Ldn (dBA)	%HA		Ldn (dBA)*	%HA		
POR1	M3	50	2.2	52	54	3.7	1.5	Yes
POR2	M3	50	2.2	60	61	8.3	6.0	Yes
POR3	M3	50	2.2	59	59	7.0	4.7	Yes
POR4	M1	43	0.8	29	43	0.9	0.0	Yes
POR5	M2	43	0.9	29	43	0.9	0.0	Yes
POR6	M2	43	0.9	36	44	1.0	0.1	Yes
POR7	M2	43	0.9	30	43	0.9	0.0	Yes
POR8	M2	43	0.9	32	43	0.9	0.0	Yes
POR9	M3	50	2.2	49	53	3.1	0.8	Yes
POR10	M3	50	2.2	51	54	3.6	1.3	Yes
POR11	M3	50	2.2	22	50	2.2	0.0	Yes
POR12	M3	50	2.2	21	50	2.2	0.0	Yes
POR13	M1	43	0.8	33	43	0.9	0.0	Yes
POR14	M4	61	8.7	38	61	8.8	0.0	Yes
POR15	M4	61	8.7	30	61	8.7	0.0	Yes
POR16	M1	43	0.8	38	44	1.0	0.2	Yes
POR17	M1	43	0.8	59	59	6.7	5.9	Yes
POR18	M1	43	0.8	44	46	1.3	0.5	Yes
POR19	M1	43	0.8	31	43	0.9	0.0	Yes

Table 10 *Modelling Results, Construction Phase CS02 (Transmission Lines, Collector System, and Roads) - Day-Night Rating Sound Levels Ldn And % Highly Annoyed %HA At Points of Reception*

Receptor	Monitoring location	Baseline		Project Predicted Ldn (dBA)	Total (Baseline plus Project)		Delta %HA (Between Total and Baseline)	Compliance with Limits?
		Ldn (dBA)	%HA		Ldn (dBA)*	%HA		
POR1	M3	50	2.2	50	53	3.2	1.0	Yes
POR2	M3	50	2.2	57	57	5.7	3.4	Yes
POR3	M3	50	2.2	56	57	5.3	3.1	Yes
POR4	M1	43	0.8	20	43	0.8	0.0	Yes
POR5	M2	43	0.9	23	43	0.9	0.0	Yes
POR6	M2	43	0.9	27	43	0.9	0.0	Yes
POR7	M2	43	0.9	20	43	0.9	0.0	Yes
POR8	M2	43	0.9	24	43	0.9	0.0	Yes
POR9	M3	50	2.2	70	70	23.2	20.9	No
POR10	M3	50	2.2	44	51	2.5	0.3	Yes
POR11	M3	50	2.2	16	50	2.2	0.0	Yes
POR12	M3	50	2.2	14	50	2.2	0.0	Yes
POR13	M1	43	0.8	20	43	0.8	0.0	Yes
POR14	M4	61	8.7	23	61	8.7	0.0	Yes
POR15	M4	61	8.7	22	61	8.7	0.0	Yes
POR16	M1	43	0.8	31	43	0.9	0.0	Yes
POR17	M1	43	0.8	38	44	1.0	0.1	Yes
POR18	M1	43	0.8	32	43	0.9	0.0	Yes
POR19	M1	43	0.8	23	43	0.8	0.0	Yes

As shown in Table 10, the %HA level at POR-9 (27 Power Street, Dunville) is greater than the limit of 6.5% due to the close proximity to the construction. Thus, mitigation in the form of temporary barrier/hoarding is recommended in order to attenuate the sound to acceptable levels (this recommendation is included in Section 9.1, Table 11 under Path Controls). The expected %HA after the inclusion of noise mitigation in the form of noise barriers/hoarding is 5.6% which is below the limit of 6.5 %HA.

9. General Noise Mitigation Measures and Best Practices

9.1 On-Site Best Practices for Construction Noise

General recommendations to assist in minimizing noise impacts during the construction phase of the project are provided below Table 11.

Table 11 Construction Noise and Vibration Mitigation Measures

Action Required	Details
Management Measures	
Implement community consultation measures	Notification detailing work activities, dates and hours, impacts and mitigation measures, any operational noise benefits from the works (where applicable) and contact telephone number.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: – All relevant project specific and standard noise and vibration mitigation measures – Relevant licence and approval conditions – Permissible hours of work – Any limitations on high noise generating activities – Location of nearest sensitive receivers – Construction employee parking areas – Designated loading/ unloading areas and procedures – Construction traffic routes – Site opening/closing times (including deliveries) – Environmental incident procedures.
Behavioural practices	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.
Monitoring	A noise monitoring program may be carried out for the duration of the works in accordance with a prepared Construction Noise and Vibration Management Plan, and any approval and licence conditions.
Attended vibration measurement	Attended vibration measurements are required at the commencement of vibration generating activities to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage.
Building condition surveys	Undertake building dilapidation surveys on all buildings located within the buffer zone prior to commencement of activities with the potential to cause property damage
Blasting Noise and Vibration Mitigation	Blasting activities (if required) will be included under a contract service agreement with the explosives supplier and who will have a valid blasters certificate issued by Newfoundland and Labrador Environment and Climate Change (NLDECC). An Explosives and Blasting Management Plan will be developed by the blasting contractor to provide direction for the safe storage, handling and use of explosives and explosive components at the Project site, to address the safety of the public and Project personnel, and protection of both the environment and Project components. Blasting patterns and procedures will be used to reduce shock or instantaneous peak noise levels, in accordance with a Blast Management Plan that will be developed for the Project. Blasts should be designed by the blasting contractor to meet the required noise and vibration limits. Blast sound and vibration levels can be controlled by adjusting various parameters such as hole spacing, explosive charge weight, and the time delay between rows.

Action Required	Details
Source Controls	
Construction hours and scheduling	Where reasonable and feasible, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods. Further to this, it is recommended that the use of mulchers, jack hammers, concrete saws, rock breakers, compaction or other equipment used in very close proximity to the receivers should be limited where feasible and reasonable to the standard construction hours.
Equipment selection	Use quieter and less vibration emitting construction methods where reasonable and feasible.
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receptors is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers. Only have necessary equipment on site
Plan worksites and activities to minimise noise and vibration	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noisy activities should be scheduled for normal working hours. If the work cannot be undertaken during the day, it should be completed before 11:00 pm.
Non-tonal reversing alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Reduced equipment power	Use only the necessary size and power
Minimise disturbance arising from delivery of goods to construction sites	Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers. Select site access points and roads as far as possible away from sensitive receivers. Dedicated loading/unloading areas to be shielded if close to sensitive receivers. Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible. Avoid or minimise these out of hours movements where possible.
Path Controls	
Shield stationary noise sources such as pumps, compressors, fans etc.	Stationary noise sources should be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained.
Shield sensitive receivers from noisy activities	Use structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) and consideration of site topography when situating plant. In particular, 27 Power Street, Dunville, NL requires temporary hoarding to adhere to the Health Canada Noise Guideline.

9.2 On-Site Best Practices for Operational Noise

General recommendations to assist in minimizing noise impacts during the operational phase of the project are provided below Table 11.

Table 12 Operational Noise and Vibration Mitigation Measures

Action Required	Details
Management Measures	
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: – All relevant project specific and standard noise and vibration mitigation measures – Relevant licence and approval conditions – Permissible hours of work – Any limitations on high noise generating activities – Location of nearest sensitive receivers – Employee parking areas – Designated loading/ unloading areas and procedures – Operational traffic routes – Site opening/closing times (including deliveries) – Environmental incident procedures
Behavioural practices	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.
Source Controls	
Equipment selection	Use quieter and less vibration emitting equipment where reasonable and feasible.
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receptors is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers. Only have necessary equipment on site
Plan worksites and activities to minimise noise and vibration	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noisy activities should be scheduled for normal working hours. If the work cannot be undertaken during the day, it should be completed before 11:00 pm.
Non-tonal reversing alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Reduced equipment power	Use only the necessary size and power

Action Required	Details
Minimise disturbance arising from delivery of goods to facility	Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers. Select site access points and roads as far as possible away from sensitive receivers. Dedicated loading/unloading areas to be shielded if close to sensitive receivers. Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible. Avoid or minimise these out of hours movements where possible.
Path Controls	
Shield stationary noise sources such as pumps, compressors, fans etc.	Stationary noise sources should be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained.

10. Conclusions

In general, facility operations and construction often produce elevated noise levels that have the potential to impact the surrounding environment. Thus, noise levels produced by equipment at the proposed Argentia Renewables Project have been assessed at the identified worst-case receptors and property lines to determine the future impact on residents of the nearest communities. This is not intended to preclude residents at farther distances but rather is presented to document those sensitive receptors (i.e., human receptors – seasonal and permanent dwellings) that are closest and represent a worst-case scenario.

10.1 Noise Compliance at Receptors

The predicted noise levels produced by worst-case activities during the Construction and Operation of the Project, including noise emissions from the Argentia Renewables Project are within the applicable guideline limits for all identified receptors provided that temporary construction noise mitigation in the form or barriers/hoarding is constructed during the erection of power lines near 27 Power Street, Dunville. Based on these predictions, noise levels at nearby sensitive receptors are expected to be within the Health Canada %HA noise level limits.

10.2 Vibration Compliance at Receptors

Vibration levels experienced at sensitive receptors located closest to construction and facility operations are not anticipated to exceed applicable limits. This is because the equipment with the highest potential to emit high vibration levels is in operation at locations that are as close as 550 metres from sensitive receptors. This offers significant setback and, as a result, the zone of influence created by the equipment usage will not overlap with sensitive receptors.

10.3 Follow-Up and Monitoring

Follow-up and monitoring are intended to verify the accuracy of predictions made during the Study, to assess the implementation and effectiveness of mitigation, and to manage adaptively, if required. Compliance monitoring, where required by permitting or regulations, will be conducted to confirm that mitigation measures are properly implemented. Should an unexpected deterioration of the environment be observed as part of follow-up and/or monitoring, intervention mechanisms may include the application of noise mitigation measures to address it.

Based on the results of the Noise and Vibration Impact Study, follow-up and monitoring are not planned at this time.

11. References

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Appendices

Appendix A

Baseline Noise Monitoring Results and Location Plan

Paper Size ANSI B

0 100 200 300 400 500 m

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 83 UTM Zone 21

N

GHD

ACOUSTIC ASSESSMENT REPORT
PATTERN ENERGY
ARGENTIA RENEWABLES

BASELINE NOISE MONITORING LOCATIONS

Project No. **12618385**
Revision No. **-**
Date **14.03.2024**

FIGURE A.1

\\ghdnet\ghd\CA\Montreal\Projects\661\12618385\Tech\Noise\02_Modelling\PatternGreen_CadnaA_Base.cna
Imagery source: Google Satellite

Table A.1

Environmental Sound Level Measurements, LEQ - Ambient Background Baseline Measurements - M1
Pattern Green Renewables Project
Latitude: 47°15'28.01"N, Longitude: 53°58'21.35"W
Freshwater, Newfoundland and Labrador

Date	Time		Leq [(2), (3)]	Wind Spd (km/h) [(1)]	Temperature (°C)	Precipitation (mm)	Weather
2023-12-01	2:14:18 PM		36.7	23	2.5	0	
2023-12-01	3:00:00 PM		37.9	26	3.2	0	
2023-12-01	4:00:00 PM		41.5	30	3.9	0	
2023-12-01	5:00:00 PM		43.3	38	4.4	0	
2023-12-01	6:00:00 PM		41.5	34	4.8	0	
2023-12-01	7:00:00 PM		42.2	38	5	0	
2023-12-01	8:00:00 PM		41.2	40	5.5	0	Discarded - Wind Speed > 38 km/h
2023-12-01	9:00:00 PM		40.8	34	5.7	0	
2023-12-01	10:00:00 PM		48.6	40	6.2	0	Discarded - Wind Speed > 38 km/h
2023-12-01	11:00:00 PM		41.1	34	6.1	0	
2023-12-01	12:00:00 AM		39.8	32	6.3	0	
2023-12-01	1:00:00 AM		36.1	28	6.1	0	
2023-12-01	2:00:00 AM		35.1	25	5.7	0	
2023-12-01	3:00:00 AM		34.4	21	5.6	0	
2023-12-02	4:00:00 AM		33.6	16	5.4	0	
2023-12-02	5:00:00 AM		32.1	13	5.4	0	
2023-12-02	6:00:00 AM		32.7	16	5.2	0	
2023-12-02	7:00:00 AM		32.3	18	4.8	0	
2023-12-02	8:00:00 AM		32.8	15	4.6	0	
2023-12-02	9:00:00 AM		32.9	9	4.8	0	
2023-12-02	10:00:00 AM		31.9	9	4.9	0	
2023-12-02	11:00:00 AM		33.6	7	4.9	0	
2023-12-02	12:00:00 PM		33.4	8	4.7	0	
2023-12-02	1:00:00 PM		33.5	5	4.9	0	
2023-12-02	2:00:00 PM		35.1	3	5.1	0	
2023-12-02	3:00:00 PM		34.4	4	5.1	0	
2023-12-02	4:00:00 PM		34	8	4.7	0	
2023-12-02	5:00:00 PM		31.8	12	4.4	0	
2023-12-02	6:00:00 PM		32.3	12	4.1	0	
2023-12-02	7:00:00 PM		32.3	10	3.9	0	
2023-12-02	8:00:00 PM		29	11	3.5	0	

Table A.1

Environmental Sound Level Measurements, LEQ - Ambient Background Baseline Measurements - M1
Pattern Green Renewables Project
Latitude: 47°15'28.01"N, Longitude: 53°58'21.35"W
Freshwater, Newfoundland and Labrador

Date	Time		Leq [2], [3]	Wind Spd (km/h) [1]	Temperature (°C)	Precipitation (mm)	Weather
2023-12-02	9:00:00 PM		28.8	14	3.3	0	
2023-12-02	10:00:00 PM		28.4	8	2.5	0	
2023-12-02	11:00:00 PM		28.1	13	2.6	0	
2023-12-03	12:00:00 AM		27.2	19	2.6	0	

	Sound Level (dBA)	# Inclement Weather Hours	Total Hours Recorded	Inclement Weather Hours
Daytime 16h Leq (Ld) (07:00 - 23:00)	**37**	**2**	35	2.0
Nighttime 8h Leq (Ln) (23:00 - 07:00)	**36**	**0**		

	Sound Level (dBA)
Ldn	**43**

	Value (%)
%HA	**0.83**

Notes:

(1) Weather data provided by Environment Canada's Argentia Climate Station.
(2) Measurements recorded during inclement weather (winds speeds greater than 38 km/h and/or rain) were disregarded.
(3) Bolded data represents the lowest measured Leq during the respective monitoring time period.

Legend	
Day Time Hours	
Evening Time Hours	
Night Time Hours	

Table A.2

Environmental Sound Level Measurements, LEQ - Ambient Background Baseline Measurements - M2
Pattern Green Renewables Project
Latitude: 47°15'44.90"N, Longitude: 53°56'58.71"W
Ferndale, Newfoundland and Labrador

Date	Time		Leq [2], [3]	Wind Spd (km/h) [1]	Temperature (°C)	Precipitation (mm)	Weather
2023-12-04	3:21:24 PM		44.2	25	0.5	0.1	Discarded - Precipitation > 0 mm
2023-12-04	4:00:00 PM		43.3	28	0.8	1.5	Discarded - Precipitation > 0 mm
2023-12-04	5:00:00 PM		40.5	28	0.9	0	
2023-12-04	6:00:00 PM		39.6	33	1.1	0	
2023-12-04	7:00:00 PM		41.2	29	0.8	0	
2023-12-04	8:00:00 PM		41.3	24	0.7	0.2	Discarded - Precipitation > 0 mm
2023-12-04	9:00:00 PM		39.8	25	1	0.4	Discarded - Precipitation > 0 mm
2023-12-04	10:00:00 PM		41.5	22	1	0	
2023-12-04	11:00:00 PM		34.9	19	1	0	
2023-12-04	12:00:00 AM		38.8	27	0.9	0.8	Discarded - Precipitation > 0 mm
2023-12-04	1:00:00 AM		42	25	0.9	0.5	Discarded - Precipitation > 0 mm
2023-12-04	2:00:00 AM		36.9	31	0.6	0	
2023-12-04	3:00:00 AM		40.5	30	0.6	0	
2023-12-04	4:00:00 AM		38.5	29	0.6	0	
2023-12-04	5:00:00 AM		38.5	29	0.4	0	
2023-12-05	6:00:00 AM		41.5	24	0.4	0	
2023-12-05	7:00:00 AM		37.5	21	0.5	0	
2023-12-05	8:00:00 AM		39.5	20	0.6	0	
2023-12-05	9:00:00 AM		39	7	0.6	0	
2023-12-05	10:00:00 AM		40.4	14	1.2	0	
2023-12-05	11:00:00 AM		41.6	13	0.9	0	
2023-12-05	12:00:00 PM		45.1	12	1	0	
2023-12-05	1:00:00 PM		45.9	18	0.7	0	
2023-12-05	2:00:00 PM		39.9	21	0.4	0	
2023-12-05	3:00:00 PM		40.2	22	0.8	0	
2023-12-05	4:00:00 PM		45.9	16	0.5	0	
2023-12-05	5:00:00 PM		38.9	17	0.6	0	
2023-12-05	6:00:00 PM		39	16	0.5	0	
2023-12-05	7:00:00 PM		41.8	16	0.2	0	
2023-12-05	8:00:00 PM		45	12	0.4	0	
2023-12-05	9:00:00 PM		39.4	9	-0.2	0	
2023-12-05	10:00:00 PM		35.5	2	-1.6	0	
2023-12-05	11:00:00 PM		36.1	4	-1.2	0	
2023-12-05	12:00:00 AM		29.2	5	-2	0	
2023-12-05	1:00:00 AM		28.3	6	-2.1	0	
2023-12-05	2:00:00 AM		23.3	11	-2.1	0	

Table A.2

Environmental Sound Level Measurements, LEQ - Ambient Background Baseline Measurements - M2
Pattern Green Renewables Project
Latitude: 47°15'44.90"N, Longitude: 53°56'58.71"W
Ferndale, Newfoundland and Labrador

Date	Time		Leq [2], [3]	Wind Spd (km/h) [1]	Temperature (°C)	Precipitation (mm)	Weather
2023-12-05	3:00:00 AM		23.2	12	-1.4	0	
2023-12-05	4:00:00 AM		22.3	13	-1.6	1	Discarded - Precipitation > 0 mm
2023-12-05	5:00:00 AM		28.2	34	1.2	1.3	Discarded - Precipitation > 0 mm
2023-12-06	6:00:00 AM		27.7	35	-0.1	0	
2023-12-06	7:00:00 AM		31.5	42	-0.5	0	Discarded - Wind Speed > 38 km/h
2023-12-06	8:00:00 AM		32.3	37	-0.8	0	
2023-12-06	9:00:00 AM		38.4	31	-1	0	
2023-12-06	10:00:00 AM		35.2	30	-1.3	0	
2023-12-06	11:00:00 AM		38.2	27	-1.5	0	
2023-12-06	12:00:00 PM		39.4	22	-1.7	0	
2023-12-06	1:00:00 PM		40.9	22	-1.3	0	
2023-12-06	2:00:00 PM		41.5	27	-1.1	0	
2023-12-06	3:00:00 PM		42.2	21	-1.3	0	
2023-12-06	4:00:00 PM		41.5	22	-0.8	0	
2023-12-06	5:00:00 PM		45.1	26	0	0	
2023-12-06	6:00:00 PM		40	30	0.2	0	
2023-12-06	7:00:00 PM		38.1	24	0.1	0	
2023-12-06	8:00:00 PM		42.1	19	0.1	0	
2023-12-06	9:00:00 PM		42.2	18	0	0	
2023-12-06	10:00:00 PM		41.5	20	0.3	0	
2023-12-06	11:00:00 PM		36.7	22	0.5	0	
2023-12-06	12:00:00 AM		30.9	22	0.2	0	
2023-12-06	1:00:00 AM		28.7	18	-1.4	0	
2023-12-06	2:00:00 AM		27	24	-2	0	
2023-12-06	3:00:00 AM		25.4	20	-2.8	0	
2023-12-06	4:00:00 AM		32.2	22	-2.6	0	
2023-12-06	5:00:00 AM		28.7	23	-2.5	0	
2023-12-07	6:00:00 AM		29.5	25	-2.6	0	
2023-12-07	7:00:00 AM		32.9	30	-2.7	0	
2023-12-07	8:00:00 AM		34	33	-2.9	0	
2023-12-07	9:00:00 AM		32.9	33	-3.5	0	
2023-12-07	10:00:00 AM		35.7	32	-3.1	0	
2023-12-07	11:00:00 AM		37.4	32	-3.1	0	
2023-12-07	12:00:00 PM		38.7	32	-2.7	0	
2023-12-07	1:00:00 PM		39.7	28	-2.7	0	
2023-12-07	2:00:00 PM		41.1	28	-2.7	0	

Table A.2

Environmental Sound Level Measurements, LEQ - Ambient Background Baseline Measurements - M2
Pattern Green Renewables Project
Latitude: 47°15'44.90"N, Longitude: 53°56'58.71"W
Ferndale, Newfoundland and Labrador

Date	Time		Leq [2], [3]	Wind Spd (km/h) [1]	Temperature (°C)	Precipitation (mm)	Weather
2023-12-07	3:00:00 PM		44.3	28	-2.7	0	
2023-12-07	4:00:00 PM		42.7	31	-1.9	0	
2023-12-07	5:00:00 PM		38.8	36	-1.1	0	
2023-12-07	6:00:00 PM		42.4	38	-1.1	0	
2023-12-07	7:00:00 PM		39.9	37	-1.3	0	
2023-12-07	8:00:00 PM		39.3	36	-1.2	0	
2023-12-07	9:00:00 PM		40.6	34	-1.6	0	
2023-12-07	10:00:00 PM		49.9	33	-1.3	0	
2023-12-07	11:00:00 PM		37.5	40	-1.2	0	Discarded - Wind Speed > 38 km/h
2023-12-07	12:00:00 AM		32.1	49	-1.6	0	Discarded - Wind Speed > 38 km/h
2023-12-07	1:00:00 AM		30.5	41	-1.9	0	Discarded - Wind Speed > 38 km/h
2023-12-07	2:00:00 AM		31.4	48	-1.5	0	Discarded - Wind Speed > 38 km/h
2023-12-07	3:00:00 AM		30.5	50	-1.2	0	Discarded - Wind Speed > 38 km/h
2023-12-07	4:00:00 AM		40.2	54	-0.4	0	Discarded - Wind Speed > 38 km/h
2023-12-07	5:00:00 AM		34.7	53	0.2	0	Discarded - Wind Speed > 38 km/h
2023-12-08	6:00:00 AM		35.6	55	0.3	0	Discarded - Wind Speed > 38 km/h
2023-12-08	7:00:00 AM		41.7	56	0.5	0	Discarded - Wind Speed > 38 km/h
2023-12-08	8:00:00 AM		49.2	56	0.5	0	Discarded - Wind Speed > 38 km/h
2023-12-08	9:00:00 AM		51.1	54	0.8	0	Discarded - Wind Speed > 38 km/h
2023-12-08	10:00:00 AM		50	52	1.2	0	Discarded - Wind Speed > 38 km/h
2023-12-08	11:00:00 AM		48.3	54	1.3	0	Discarded - Wind Speed > 38 km/h
2023-12-08	12:00:00 PM		44.5	50	1.2	0	Discarded - Wind Speed > 38 km/h
2023-12-08	1:00:00 PM		42	44	1.3	0	Discarded - Wind Speed > 38 km/h
2023-12-08	2:00:00 PM		42.3	42	1.6	0	Discarded - Wind Speed > 38 km/h
2023-12-08	3:00:00 PM		42.1	39	1.6	0	Discarded - Wind Speed > 38 km/h
2023-12-08	4:00:00 PM		41.2	37	1.7	0	
2023-12-08	5:00:00 PM		43.2	36	1.9	0	
2023-12-08	6:00:00 PM		42.2	37	2	0	
2023-12-08	7:00:00 PM		44.1	34	2	0	
2023-12-08	8:00:00 PM		39.1	35	2	0	
2023-12-08	9:00:00 PM		40.6	35	2.3	0	
2023-12-08	10:00:00 PM		39.2	35	2.6	0	
2023-12-08	11:00:00 PM		36.2	32	2.8	0	
2023-12-08	12:00:00 AM		32.3	33	3.1	0	
2023-12-08	1:00:00 AM		30.7	34	3.2	0	
2023-12-08	2:00:00 AM		29.7	35	3.7	0	

Table A.2

Environmental Sound Level Measurements, LEQ - Ambient Background Baseline Measurements - M2
Pattern Green Renewables Project
Latitude: 47°15'44.90"N, Longitude: 53°56'58.71"W
Ferndale, Newfoundland and Labrador

Date	Time		Leq [2], [3]	Wind Spd (km/h) [1]	Temperature (°C)	Precipitation (mm)	Weather
2023-12-08	3:00:00 AM		26.1	37	3.5	0	
2023-12-08	4:00:00 AM		28.9	42	3.6	0	Discarded - Wind Speed > 38 km/h
2023-12-08	5:00:00 AM		34	41	3.8	0	Discarded - Wind Speed > 38 km/h
2023-12-09	6:00:00 AM		26.6	38	4	0	
2023-12-09	7:00:00 AM		33.9	40	3.7	0	Discarded - Wind Speed > 38 km/h
2023-12-09	8:00:00 AM		42.4	42	4	0	Discarded - Wind Speed > 38 km/h
2023-12-09	9:00:00 AM		50.1	38	4.2	0	
2023-12-09	10:00:00 AM		43.4	35	4.5	0	
2023-12-09	11:00:00 AM		37.3	33	4.8	0	
2023-12-09	12:00:00 PM		39.8	34	5	0	
2023-12-09	1:00:00 PM		42.1	37	4.8	0	
2023-12-09	2:00:00 PM		44.4	39	4.5	0	Discarded - Wind Speed > 38 km/h

	Sound Level (dBA)	# Inclement Weather Hours	Total Hours Recorded	Inclement Weather Hours
Daytime 16h Leq (Ld) (07:00 - 23:00)	**42**	**17**	120	31.0
Nighttime 8h Leq (Ln) (23:00 - 07:00)	**35**	**14**		

	Sound Level (dBA)
Ldn	**43**

	Value (%)
%HA	**0.89**

Notes:

(1) Weather data provided by Environment Canada's Argentia Climate Station.
(2) Measurements recorded during inclement weather (winds speeds greater than 38 km/h and/or rain) were disregarded.
(3) Bolded data represents the lowest measured Leq during the respective monitoring time period.

Legend	
Day Time Hours	
Evening Time Hours	
Night Time Hours	

Table A.3

Environmental Sound Level Measurements, LEQ - Ambient Background Baseline Measurements - M3
Pattern Green Renewables Project
Latitude: 47°15'44.90"N, Longitude: 53°56'58.71"W
Dunville, Newfoundland and Labrador

Date	Time		Leq [2], [3]	Wind Spd (km/h) [1]	Temperature (°C)	Precipitation (mm)	Weather
2023-07-20	2:00:00 PM		44.2	22	17.6	0	
2023-07-20	3:00:00 PM		43.3	30	19	0	
2023-07-20	4:00:00 PM		40.5	26	18.9	0	
2023-07-20	5:00:00 PM		39.6	6	19.5	0	
2023-07-20	6:00:00 PM		41.2	18	21.9	0	
2023-07-20	7:00:00 PM		41.3	12	22.5	0	
2023-07-20	8:00:00 PM		39.8	18	21.6	0	
2023-07-20	9:00:00 PM		41.5	24	21.5	0	
2023-07-20	10:00:00 PM		34.9	29	20.3	0	
2023-07-20	11:00:00 PM		38.8	26	19.1	0	
2023-07-20	12:00:00 AM		42	35	17.1	0	
2023-07-21	1:00:00 AM		36.9	45	16.5	0	Discarded - Wind Speed > 38 km/h
2023-07-21	2:00:00 AM		40.5	42	15.9	0	Discarded - Wind Speed > 38 km/h
2023-07-21	3:00:00 AM		38.5	43	15.2	0	Discarded - Wind Speed > 38 km/h
2023-07-21	4:00:00 AM		38.5	36	15.1	0	
2023-07-21	5:00:00 AM		41.5	34	15.5	0	
2023-07-21	6:00:00 AM		37.5	29	15.5	0	
2023-07-21	7:00:00 AM		39.5	26	15.5	0	
2023-07-21	8:00:00 AM		39	25	15.8	0	
2023-07-21	9:00:00 AM		40.4	25	15.9	0	
2023-07-21	10:00:00 AM		41.6	24	16.3	0	
2023-07-21	11:00:00 AM		45.1	22	17.3	0	
2023-07-21	12:00:00 PM		45.9	21	17.9	0	
2023-07-21	1:00:00 PM		39.9	14	17.6	0	
2023-07-21	2:00:00 PM		40.2	14	18.2	0	
2023-07-21	3:00:00 PM		45.9	13	16.9	0	
2023-07-21	4:00:00 PM		38.9	7	16.6	0	
2023-07-21	5:00:00 PM		39	9	16.3	0	
2023-07-21	6:00:00 PM		41.8	7	15.8	0	
2023-07-21	7:00:00 PM		45	14	16.2	0	
2023-07-21	8:00:00 PM		39.4	12	16.5	0	
2023-07-21	9:00:00 PM		35.5	5	16.8	0	
2023-07-21	10:00:00 PM		36.1	1	16.8	0	
2023-07-21	11:00:00 PM		29.2	2	16.7	0	

Table A.3

Environmental Sound Level Measurements, LEQ - Ambient Background Baseline Measurements - M3
Pattern Green Renewables Project
Latitude: 47°15'44.90"N, Longitude: 53°56'58.71"W
Dunville, Newfoundland and Labrador

Date	Time		Leq [2], [3]	Wind Spd (km/h) [1]	Temperature (°C)	Precipitation (mm)	Weather
2023-07-21	12:00:00 AM		28.3	5	17	0	
2023-07-22	1:00:00 AM		23.3	6	17.4	0	
2023-07-22	2:00:00 AM		23.2	8	17.3	0	
2023-07-22	3:00:00 AM		22.3	8	17.5	0	
2023-07-22	4:00:00 AM		28.2	2	17.5	0	
2023-07-22	5:00:00 AM		27.7	4	19.2	0	
2023-07-22	6:00:00 AM		31.5	7	20.2	0	
2023-07-22	7:00:00 AM		32.3	7	20.7	0	
2023-07-22	8:00:00 AM		38.4	7	20.3	0	
2023-07-22	9:00:00 AM		35.2	6	21.7	0	
2023-07-22	10:00:00 AM		38.2	8	21.3	0	
2023-07-22	11:00:00 AM		39.4	18	20.6	0	
2023-07-22	12:00:00 PM		40.9	14	22	0	
2023-07-22	1:00:00 PM		41.5	23	25.6	0	
2023-07-22	2:00:00 PM		42.2	17	20.9	0	
2023-07-22	3:00:00 PM		41.5	10	20.9	0	
2023-07-22	4:00:00 PM		45.1	14	21.8	0	
2023-07-22	5:00:00 PM		40	22	23.6	0	
2023-07-22	6:00:00 PM		38.1	16	22.7	0	
2023-07-22	7:00:00 PM		42.1	16	21	0	
2023-07-22	8:00:00 PM		42.2	21	19.6	0	
2023-07-22	9:00:00 PM		41.5	18	19.9	0	
2023-07-22	10:00:00 PM		36.7	22	20.1	0	
2023-07-22	11:00:00 PM		30.9	18	19.9	0	
2023-07-22	12:00:00 AM		28.7	20	20.2	0	
2023-07-23	1:00:00 AM		27	17	20.2	0	
2023-07-23	2:00:00 AM		25.4	13	19.9	0	
2023-07-23	3:00:00 AM		32.2	7	19.5	0	
2023-07-23	4:00:00 AM		28.7	11	20.3	0	
2023-07-23	5:00:00 AM		29.5	8	20.3	0	
2023-07-23	6:00:00 AM		32.9	4	20.6	0	
2023-07-23	7:00:00 AM		34	6	22.4	0	
2023-07-23	8:00:00 AM		32.9	7	20.2	0	
2023-07-23	9:00:00 AM		35.7	6	19.8	0	

Table A.3

Environmental Sound Level Measurements, LEQ - Ambient Background Baseline Measurements - M3
Pattern Green Renewables Project
Latitude: 47°15'44.90"N, Longitude: 53°56'58.71"W
Dunville, Newfoundland and Labrador

Date	Time		Leq [2], [3]	Wind Spd (km/h) [1]	Temperature (°C)	Precipitation (mm)	Weather
2023-07-23	10:00:00 AM		37.4	7	20.7	0	
2023-07-23	11:00:00 AM		38.7	5	21.3	0	
2023-07-23	12:00:00 PM		39.7	7	21.6	0.4	Discarded - Precipitation > 0 mm
2023-07-23	1:00:00 PM		41.1	10	21.6	0	
2023-07-23	2:00:00 PM		44.3	28	22.1	0	
2023-07-23	3:00:00 PM		42.7	13	20.2	0	
2023-07-23	4:00:00 PM		38.8	13	19.7	0	
2023-07-23	5:00:00 PM		42.4	11	19.8	0	
2023-07-23	6:00:00 PM		39.9	10	20.6	0	
2023-07-23	7:00:00 PM		39.3	19	21.9	0	
2023-07-23	8:00:00 PM		40.6	20	22.3	0	
2023-07-23	9:00:00 PM		49.9	24	21.8	1.1	Discarded - Precipitation > 0 mm
2023-07-23	10:00:00 PM		37.5	22	21.5	0	
2023-07-23	11:00:00 PM		32.1	23	21.5	0	
2023-07-23	12:00:00 AM		30.5	24	21.5	0.2	Discarded - Precipitation > 0 mm
2023-07-24	1:00:00 AM		31.4	23	21.8	1.9	Discarded - Precipitation > 0 mm
2023-07-24	2:00:00 AM		30.5	24	21.8	1.2	Discarded - Precipitation > 0 mm
2023-07-24	3:00:00 AM		40.2	29	22.1	0	
2023-07-24	4:00:00 AM		34.7	30	21.6	0.3	Discarded - Precipitation > 0 mm
2023-07-24	5:00:00 AM		35.6	48	21.7	3.1	Discarded - Precipitation > 0 mm
2023-07-24	6:00:00 AM		41.7	46	20.4	1.8	Discarded - Precipitation > 0 mm
2023-07-24	7:00:00 AM		49.2	46	18.6	0.9	Discarded - Precipitation > 0 mm
2023-07-24	8:00:00 AM		51.1	38	17.8	0	
2023-07-24	9:00:00 AM		50	33	17.5	0	
2023-07-24	10:00:00 AM		48.3	32	18	0	
2023-07-24	11:00:00 AM		44.5	35	17.8	0	
2023-07-24	12:00:00 PM		42	33	17.6	0	
2023-07-24	1:00:00 PM		42.3	31	17.4	0	
2023-07-24	2:00:00 PM		42.1	33	17.7	0	
2023-07-24	3:00:00 PM		41.2	32	17.8	0	
2023-07-24	4:00:00 PM		43.2	26	17.6	0	
2023-07-24	5:00:00 PM		42.2	30	17.4	0	
2023-07-24	6:00:00 PM		44.1	28	17.1	0	
2023-07-24	7:00:00 PM		39.1	30	16.5	0	

Table A.3

Environmental Sound Level Measurements, LEQ - Ambient Background Baseline Measurements - M3
Pattern Green Renewables Project
Latitude: 47°15'44.90"N, Longitude: 53°56'58.71"W
Dunville, Newfoundland and Labrador

Date	Time		Leq [2], [3]	Wind Spd (km/h) [1]	Temperature (°C)	Precipitation (mm)	Weather
2023-07-24	8:00:00 PM		40.6	30	16.2	0	
2023-07-24	9:00:00 PM		39.2	31	15.9	0	
2023-07-24	10:00:00 PM		36.2	29	15.7	0	
2023-07-24	11:00:00 PM		32.3	25	15.7	0	
2023-07-24	12:00:00 AM		30.7	28	16.1	0	
2023-07-25	1:00:00 AM		29.7	22	16.3	0	
2023-07-25	2:00:00 AM		26.1	21	16.2	0	
2023-07-25	3:00:00 AM		28.9	22	16.1	0	
2023-07-25	4:00:00 AM		34	21	16.1	0	
2023-07-25	5:00:00 AM		26.6	20	16.2	0	
2023-07-25	6:00:00 AM		33.9	22	16.3	0	
2023-07-25	7:00:00 AM		42.4	21	16.3	0	
2023-07-25	8:00:00 AM		50.1	20	16.4	0	
2023-07-25	9:00:00 AM		43.4	18	16.6	0	
2023-07-25	10:00:00 AM		37.3	6	18.7	0	
2023-07-25	11:00:00 AM		39.8	5	19.7	0	
2023-07-25	12:00:00 PM		42.1	3	19.8	0	
2023-07-25	1:00:00 PM		44.4	9	19.4	0	
2023-07-25	2:00:00 PM		63.1	6	19.7	0	
2023-07-25	3:00:00 PM		69.4	29	18.1	0	
2023-07-25	4:00:00 PM		44	27	19.4	0	
2023-07-25	5:00:00 PM		42.7	25	19.2	0	
2023-07-25	6:00:00 PM		44.3	25	18.6	0	
2023-07-25	7:00:00 PM		58.7	18	18	0	
2023-07-25	8:00:00 PM		40	16	17.6	0	
2023-07-25	9:00:00 PM		39.6	16	18.1	0	
2023-07-25	10:00:00 PM		38	16	17.9	0	
2023-07-25	11:00:00 PM		34.7	21	17	0	
2023-07-25	12:00:00 AM		34.3	19	16.9	0	
2023-07-26	1:00:00 AM		32.3	18	16.6	0	
2023-07-26	2:00:00 AM		27.3	25	16	0	
2023-07-26	3:00:00 AM		27.8	24	15.9	0	
2023-07-26	4:00:00 AM		33.6	15	15.6	0	
2023-07-26	5:00:00 AM		29.2	18	15.3	0	

Table A.3

Environmental Sound Level Measurements, LEQ - Ambient Background Baseline Measurements - M3
Pattern Green Renewables Project
Latitude: 47°15'44.90"N, Longitude: 53°56'58.71"W
Dunville, Newfoundland and Labrador

Date	Time		Leq [2], [3]	Wind Spd (km/h) [1]	Temperature (°C)	Precipitation (mm)	Weather
2023-07-26	6:00:00 AM		35.3	22	15.6	0	
2023-07-26	7:00:00 AM		40.6	22	15.2	0	
2023-07-26	8:00:00 AM		44.2	24	15.4	0	
2023-07-26	9:00:00 AM		37.3	22	15.9	0	
2023-07-26	10:00:00 AM		56.4	19	16.5	0	
2023-07-26	11:00:00 AM		56.1	17	16.5	0	

	Sound Level (dBA)	# Inclement Weather Hours	Total Hours Recorded	Inclement Weather Hours
Daytime 16h Leq (Ld) (07:00 - 23:00)	**52**	**3**	142	12.0
Nighttime 8h Leq (Ln) (23:00 - 07:00)	**34**	**9**		

	Sound Level (dBA)
Ldn	**50**

	Value (%)
%HA	**2.25**

Notes:

(1) Weather data provided by Environment Canada's Argentia Climate Station.
(2) Measurements recorded during inclement weather (winds speeds greater than 38 km/h and/or rain) were disregarded.
(3) Bolded data represents the lowest measured Leq during the respective monitoring time period.

Legend	
Day Time Hours	
Evening Time Hours	
Night Time Hours	

Table A.4

Environmental Sound Level Measurements, LEQ - Ambient Background Baseline Measurements - M4
Pattern Green Renewables Project
Latitude: 47°19'18.05"N, Longitude: 53°54'51.42"W
Fox Harbour, Newfoundland and Labrador

Date	Time		Leq [2], [3]	Wind Spd (km/h) [1]	Temperature (°C)	Precipitation (mm)	Weather
2023-12-14	11:00:00 AM		58.5	30	-2.8	0	
2023-12-14	12:00:00 PM		61.9	30	-3	0	
2023-12-14	1:00:00 PM		68	29	-1.9	0	
2023-12-14	2:00:00 PM		62.5	40	-1.6	0	Discarded - Wind Speed > 38 km/h
2023-12-14	3:00:00 PM		64.8	40	-1.8	0	Discarded - Wind Speed > 38 km/h
2023-12-14	4:00:00 PM		64.4	35	-2.1	0	
2023-12-14	5:00:00 PM		67.1	37	-2.3	0	
2023-12-14	6:00:00 PM		63.5	37	-2.5	0	
2023-12-14	7:01:00 PM		64.1	37	-3	0	
2023-12-14	8:00:00 PM		64.3	33	-3.3	0	
2023-12-14	9:00:00 PM		59	33	-3.6	0	
2023-12-14	10:00:00 PM		57	29	-3.9	0	
2023-12-14	11:00:00 PM		54.2	26	-4	0	
2023-12-14	12:00:00 AM		51.3	23	-4.3	0	
2023-12-15	1:00:00 AM		54.4	23	-4.5	0	
2023-12-15	2:00:00 AM		52.9	24	-3.9	0	
2023-12-15	3:00:00 AM		48.5	32	-3.4	0	
2023-12-15	4:00:00 AM		45.9	33	-2.9	0	
2023-12-15	5:00:00 AM		52.6	28	-3.1	0	
2023-12-15	6:00:00 AM		49.5	29	-2.6	0	
2023-12-15	7:00:00 AM		52.3	27	-2.2	0	
2023-12-15	8:00:00 AM		52.8	25	-1.3	0	
2023-12-15	9:00:00 AM		55.2	38	-0.3	0	
2023-12-15	10:00:00 AM		61.4	44	0.4	0	Discarded - Wind Speed > 38 km/h
2023-12-15	11:00:00 AM		61.6	49	0.9	0	Discarded - Wind Speed > 38 km/h
2023-12-15	12:00:00 PM		60.4	57	1.2	0	Discarded - Wind Speed > 38 km/h
2023-12-15	1:00:00 PM		60	59	1.7	0	Discarded - Wind Speed > 38 km/h
2023-12-15	2:00:00 PM		60	62	2.1	0	Discarded - Wind Speed > 38 km/h
2023-12-15	3:00:00 PM		59	64	2.4	0	Discarded - Wind Speed > 38 km/h
2023-12-15	4:00:00 PM		57.9	74	2.9	0	Discarded - Wind Speed > 38 km/h
2023-12-15	5:00:00 PM		58.7	65	3.2	0	Discarded - Wind Speed > 38 km/h

Table A.4

Environmental Sound Level Measurements, LEQ - Ambient Background Baseline Measurements - M4
Pattern Green Renewables Project
Latitude: 47°19'18.05"N, Longitude: 53°54'51.42"W
Fox Harbour, Newfoundland and Labrador

Date	Time		Leq [2], [3]	Wind Spd (km/h) [1]	Temperature (°C)	Precipitation (mm)	Weather
2023-12-15	6:00:00 PM		62.5	62	3.5	0	Discarded - Wind Speed > 38 km/h
2023-12-15	7:01:00 PM		64	58	3.5	0	Discarded - Wind Speed > 38 km/h
2023-12-15	8:00:00 PM		63.1	53	2.9	0	Discarded - Wind Speed > 38 km/h
2023-12-15	9:00:00 PM		57.9	50	3.6	0	Discarded - Wind Speed > 38 km/h
2023-12-15	10:00:00 PM		59.6	52	4	0	Discarded - Wind Speed > 38 km/h
2023-12-15	11:00:00 PM		61.6	39	3.2	0	Discarded - Wind Speed > 38 km/h
2023-12-15	12:00:00 AM		53.1	35	3.3	0	
2023-12-16	1:00:00 AM		52.3	35	2.8	0	
2023-12-16	2:00:00 AM		53	39	2.8	0	Discarded - Wind Speed > 38 km/h
2023-12-16	3:00:00 AM		51.9	33	2.7	0	
2023-12-16	4:00:00 AM		56.2	34	2.9	0	
2023-12-16	5:00:00 AM		49.8	36	3	0	
2023-12-16	6:00:00 AM		42.5	35	3.2	0	
2023-12-16	7:00:00 AM		46.9	36	3.5	0	
2023-12-16	8:00:00 AM		38.4	41	3.5	0	Discarded - Wind Speed > 38 km/h
2023-12-16	9:00:00 AM		49.8	38	3.6	0	
2023-12-16	10:00:00 AM		43.5	43	3.8	0	Discarded - Wind Speed > 38 km/h
2023-12-16	11:00:00 AM		45.4	35	3.6	0	
2023-12-16	12:00:00 PM		46.8	40	3.7	0	Discarded - Wind Speed > 38 km/h
2023-12-16	1:00:00 PM		46.1	41	3.2	0	Discarded - Wind Speed > 38 km/h
2023-12-16	2:00:00 PM		47.8	29	1.9	0	
2023-12-16	3:00:00 PM		51.1	39	1.1	0	Discarded - Wind Speed > 38 km/h
2023-12-16	4:00:00 PM		50.5	36	0.4	0	
2023-12-16	5:00:00 PM		50.6	46	-0.2	0	Discarded - Wind Speed > 38 km/h
2023-12-16	6:00:00 PM		52.3	43	-0.7	0	Discarded - Wind Speed > 38 km/h
2023-12-16	7:01:00 PM		50.6	42	-2.3	0	Discarded - Wind Speed > 38 km/h
2023-12-16	8:00:00 PM		49.9	40	-2.9	0	Discarded - Wind Speed > 38 km/h
2023-12-16	9:00:00 PM		49.4	43	-3.2	0	Discarded - Wind Speed > 38 km/h
2023-12-16	10:00:00 PM		47	42	-3.5	0	Discarded - Wind Speed > 38 km/h
2023-12-16	11:00:00 PM		49.6	44	-4	0	Discarded - Wind Speed > 38 km/h
2023-12-16	12:00:00 AM		49.9	45	-4.5	0	Discarded - Wind Speed > 38 km/h

Table A.4

Environmental Sound Level Measurements, LEQ - Ambient Background Baseline Measurements - M4
Pattern Green Renewables Project
Latitude: 47°19'18.05"N, Longitude: 53°54'51.42"W
Fox Harbour, Newfoundland and Labrador

Date	Time		Leq [2], [3]	Wind Spd (km/h) [1]	Temperature (°C)	Precipitation (mm)	Weather
2023-12-17	1:00:00 AM		47.1	43	-4.6	0	Discarded - Wind Speed > 38 km/h
2023-12-17	2:00:00 AM		43.9	34	-5.1	0	
2023-12-17	3:00:00 AM		44	32	-5.2	0	
2023-12-17	4:00:00 AM		40.2	30	-5.2	0	
2023-12-17	5:00:00 AM		38.4	26	-5	0	
2023-12-17	6:00:00 AM		38.9	23	-4.9	0	
2023-12-17	7:00:00 AM		46.3	22	-4.9	0	
2023-12-17	8:00:00 AM		46.7	11	-4.2	0	
2023-12-17	9:00:00 AM		48	16	-2.5	0	
2023-12-17	10:00:00 AM		45.7	23	-1.8	0	
2023-12-17	11:00:00 AM		53.7	25	-0.9	0	
2023-12-17	12:00:00 PM		65.7	30	-0.2	0	

	Sound Level (dBA)	# Inclement Weather Hours	Total Hours Recorded	Inclement Weather Hours
Daytime 16h Leq (Ld) (07:00 - 23:00)	**61**	**26**	74	31.0
Nighttime 8h Leq (Ln) (23:00 - 07:00)	**51**	**5**		

	Sound Level (dBA)
Ldn	**61**

	Value (%)
%HA	**8.74**

Notes:

(1) Weather data provided by Environment Canada's Argentia Climate Station.
(2) Measurements recorded during inclement weather (winds speeds greater than 38 km/h and/or rain) were disregarded.
(3) Bolded data represents the lowest measured Leq during the respective monitoring time period.

Legend

Day Time Hours	
Evening Time Hours	
Night Time Hours	

Appendix B

Project Site Plans

DRAFT ISSUE

E 230200 E 230400 E 230600

N 5241600 N 5241400 N 5241200 N 5241000

FUTURE SWITCH ROOM (100m X 20m)

SWITCH ROOM OPTION 1 (100m X 20m)

FUTURE ELECTROLYSER

ELECTROLYSER (90m X 56m)

SWITCH GEAR (15m X 25m)

BACKUP POWER (2-15m X 5m DIESEL GEN.)

DIESEL TANK (7m X 5m)

PIPE RACK

LAYDOWN (50m x 10m)

NH3 SYNYHESIS, REFRIG COMPRESSION (50m X 50m)

LAY DOWN (15m x 56m)

POWER GENERATION UNIT (15m x 50m)

NH3 FLARE (10m X 10m)

OFFICE BUILDING AND PARKING AREA (100m X 50m)

GUARD HOUSE (5m X 5m)

MAINTENANCE AREA (40m X 40m)

CONTROL ROOM (25m X 25m)

NITROGEN COMPRESSOR (40m X 20m)

ASU (40m X 20m)

SECURITY GATE HOUSE (10m X 10m)

LAYDOWN AREA (40m x 75m)

WASTE WATER PLANT (30m X 30m)

FIREWATER / BUFFER TANK (20m Ø)

WATER TREATMENT (30m X 30m)

COOLING WATER FIN-FAN AIR COOLERS (20m X 50m)

SWITCH GEAR OPTION 2 (15m X 25m)

SWITCH ROOM OPTION 2 (100m X 25m)

LAYDOWN AREA (80m x 30m)

BOIL OFF UNITS (25m X 25m)

AMMONIA TANK (15kT - 38.2m Ø)

AMMONIA TANK (15kT - 38.2m Ø) (EXPANSION)

AMMONIA TANK (15kT - 38.2m Ø) (EXPANSION)

TANK FLARE (10m X 10m)

STORMWATER POND (100m X 43m)

PIPE CORRIDOR TO JETTY

OFFTAKE OPTION 3

REV	DATE	REVISION DESCRIPTION	DRN	CHK	APP
00	13.10.23	ISSUED FOR REVIEW	TS	BH	CN

CONSULTANT

AtkinsRéalis

CLIENT

Pattern

PATTERN ENERGY.
119 Spadina Avenue,
Suite 403 Toronto,
Canada, ON M5V 2L1.

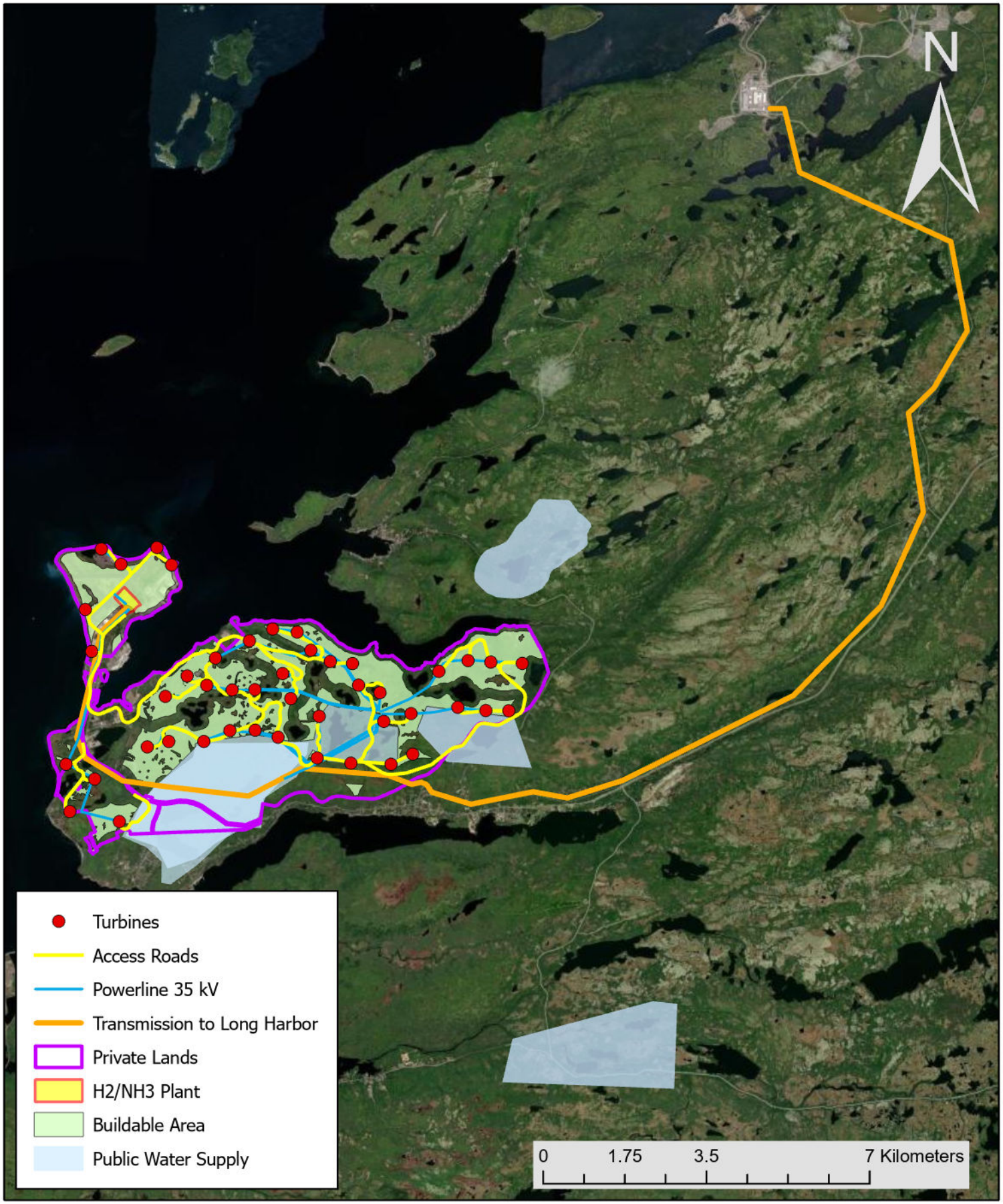
PREPARED	JS	13.10.2023
DRAWN	TS	13.10.2023
CHECKED	BH	13.10.2023
APPROVED	CN	13.10.2023
SCALE 1:1000	FORMAT	B1

PROJECT: Argentia Renewables - Feasibility Study

DRAWING TITLE: CONCEPT PLOT PLAN

DRAWING NUMBER: SNC-XX-XX-DDRW-Z-0002

REV: 00



	Argentia Renewable Project	AUTHOR: DP	PREPARED BY: Pattern
		COORDINATE SYSTEM: NAD83(CSRS)v7 UTM Zone 22N	DATE: 12/19/2023


GHD