Argentia Renewables Environmental Assessment Registration Document



Pattern | Argentia Renewables

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List of Abbreviations and Acronyms

Abbreviation	Description
°C	degrees Celsius
µcd	microcandela
µg	microgram
µm	micron
3-D	Three-Dimensional
AADT	Annual Average Daily Traffic
AAQM	Ambient Air Quality Monitoring
AAQS	Ambient Air Quality Standards
AC	Alternating Current
AC CDC	Atlantic Canada Conservation Data Centre
ACI	Aquatic Conservation Initiative (formerly Northeast Avalon Atlantic Coastal Action Program)
AES-L	Advanced Education, Skills, and Labour
AET	Actual Evapotranspiration
AIHTS	Agreement on International Humane Trapping Standards
AIS	Aquatic Invasive Species
AMA	Argentia Management Authority
APCR	Air Pollution Control Regulations, 2022
AQS	Air Quality Standards
Ar	argon
arcsec^2	square arcseconds
ARG	AL-PRO GmbH & Co. KG
ARU	Autonomous Recording Units
ASMFC	Atlantic States Marine Fisheries Commission
ASU	Air Separation Unit
ATV	All Terrain Vehicle
BBMA	Black Bear Management Area
BCR	Bird Conservation Region
BESS	Battery Energy Storage System
BFL	Boreal Felt Lichen
BLFL	Blue Felt Lichen
BOL	Beginning-Of-Life
BP	Before Present
BTU	British thermal unit
BV	Bureau Veritas
CA	California
CAAQS	Canadian Ambient Air Quality Standards
CAPEX	Capital Expenditure
CBC	Christmas Bird Count
CC	Average Carbon Content of Flare Gas
CCG	Canadian Coast Guard
CCG-MCTS	Canadian Coast Guard Marine Communications and Traffic Services

CCME	Canadian Council of Ministers of the Environment
CCRI	Community-Based Coastal Resource Inventory
CD	Census Division
CDWQG	Canadian Drinking Water Quality Guidelines
CE	Combustion Efficiency / Common Era
CEM	Continuous Emissions Measurement
CEPA	Canadian Environmental Protection Act, 1999
CEQG	Canadian Environmental Quality Guidelines
CH	Contractor Hires
CH_4	methane
CHE	Committee on Health and the Environment
CHP	Conservation Harvesting Plan
CHS	Canadian Hydrographic Services
cm	centimetres
CMA	Caribou Management Area / Census Metropolitan Area
CNWA	Canadian Navigable Waters Act
C^o	Celsius degrees (temperature differential)
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CP	Carcass Persistence
CPAWS	Canadian Parks and Wilderness Society
CPL	Canadian Projects Limited
CPPIB	Canada Pension Plan Investment Board
CSAS	Canadian Science Advisory Secretariat
CSD	Canadian Census subdivision
Cu	World Health Organization
CWCS	Canadian Wetland Classification System
CWS	Canadian Wildlife Service
dB	decibel
dBA	A-weighted decibels
dBC	C-weighted decibel
DBH	Diameter at Breast Height
DD	Data Deficient
DEI	Diversity, Equity, and Inclusion
DFO	Department of Fisheries and Oceans Canada
DH	Direct Hires
dioxin	polychlorinated dibenzo-p-dioxins
DWCP	Domestic Woodcutting Consultation Plan
dwt	Deadweight Tonnage
E	Endangered
EA	Environmental Assessment
EAR	Environmental Assessment Registration
EAR-G	Environmental Assessment Registration Guidelines

EBSA	Ecologically and Biologically Significant Area
ECCC	Environment and Climate Change Canada
EEMP	Environmental Effects Monitoring Programs
EF	Emission Factor
EHS	Environment, Health, and Safety
ELC	Ecological Land Classification
EMF	Environmental Management Framework
EMS	Environmental Management System
EOL	End-Of-Life
EOR	Engineer of Record
EPA	Environmental Protection Act
EPP	Environmental Protection Plan
ERP	Emergency Response Plan
ERT	Emergency Response Team
FEL	Front-End Loading
FFAW	Fish, Food & Allied Workers
FMD	Forest Management Districts
FPSO	Floating Production, Storage and Offloading
FPT	Federal-Provincial-Territorial
FSC	Food, Social or Ceremonial
FT	Full-Time
FTE	Full-Time Equivalent
g	gram
GBS	Gravity Base Structure
GDP	Gross Domestic Product
GHD	GHD Limited
GHG	greenhouse gas
GIS	Geographic Information System
GJ	gigajoule
GPPA	Greenhouse Gas Pollution Pricing Act
GPS	Global Positioning System
GPX	GPS Exchange Format
GRP	Glass-Reinforced Plastic
GW	gigawatt
GWH	gigawatt-hour
GWP	Global Warming Potential
H_2	hydrogen
H_2O	water
H_2S	hydrogen sulfide
HADD	Harmful Alteration, Disruption or Destruction
HFC	hydrofluorocarbons
HIWEC	Henvey Inlet Wind Energy Centre
HMDC	Hibernia Management & Development Company
hp	horsepower
hr	hour

HRDEM	High Resolution Digital Elevation Model
HRIA	Historic Resources Impact Assessment
HROA	Historic Resources Overview Assessment
HSE	Health, Safety and Environment
Hz	hertz
IAAC	Impact Assessment Agency of Canada
ILE	Institution of Lighting Engineers
IMA	Integrated Management Area
IMMP	Impacts Mitigation and Monitoring Plan
IMN	Industrial Monitoring Network
IPCC	International Panel on Climate Change
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
kg	kilogram
kHz	kilohertz
km	kilometres
KOH	potassium hydroxide
kWh	kilowatt hour
L	litre
LAA	Local Assessment Area
L_{Aeq}	A-Weighted Noise Level
L_d	Daytime Sound Equivalent Level
L_{dn}	Day-Night Average Sound Level
L_{eq}	Equivalent Sound Level
LFN	Low Frequency Noise
LHNPP	Long Harbour Nickel Processing Plant
LiDAR	Laser Imaging, Detection, and Ranging
LLP	Limited Liability partnership
LN	Laurentian North
L_n	Nighttime Sound Equivalent Level
LNG	liquified natural gas
LOMA	Large Oceans Management Area
LP	Limited Partnership
LPG	Liquefied Petroleum Gas
LRU	Land and Resource Use
m	metre
m^2	square metre
m^3	cubic metre
mag	magnitude
MAL	Maximum Allowable Level
mASL	metres Above Sea Level
MBCA	Migratory Birds Convention Act
MBCR	Migratory Bird Convention Regulations
MBU	Marine Biogeographic Unit
mcd	millicandela

MET	Meteorological Evaluation Tower
MFN	Miawpukek First Nation
Mg	megagram
MGGA	Newfoundland and Labrador Management of Greenhouse Gas Act
mm	millimetres
MMA	Moose Management Area
MOU	Memorandum of Understanding
MPA	Marine Protected Area
MT	metric ton
MTPD	metric tonnes per day
MW	megawatt
N_2	nitrogen
N_2O	nitrous oxide
NABCI	North American Bird Conservation Initiative
NAFC	North Atlantic Fishery Centre
NAFO	Northwest Atlantic Fisheries Organization
NAICS	North American Industry Classification System
NAISS	Northwest Atlantic International Sightings Survey
NaOH	sodium hydroxide
NAPS	National Air Pollutant Surveillance Program
NAR	Not At Risk
NCC	Nature Conservancy Canada
ND	Not Detected
NE	Northeast
NFPA	National Fire Protection Association
NH_3	ammonia
Ni	nickel
NL	Newfoundland and Labrador
NL AAQS	Newfoundland and Labrador Ambient Air Quality Standards
NL DECC	Newfoundland and Labrador Department of Environment and Climate Change
NL DIET	Newfoundland and Labrador Department of Industry, Energy and Technology
NL DTI	Newfoundland and Labrador Department of Transportation and Infrastructure
NL EAD	Newfoundland and Labrador Environmental Assessment Division
NL ESA	Newfoundland and Labrador Endangered Species Act
NL FFA	Newfoundland and Labrador Department of Fisheries, Forestry, and Agriculture
NL WD	Newfoundland and Labrador Wildlife Division
NLH	Newfoundland and Labrador Hydro
NLNFB	Newfoundland and Labrador Nutritious Food Basket
NLOWE	Newfoundland and Labrador Organization for Women Entrepreneurs
nm	nautical mile
NO	nitric oxide
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOC	National Occupation Classification
NOx	nitric oxides

NPRI	National Pollutant Release Inventory
NRCan	Natural Resources Canada
NS	Nova Scotia
NTS	National Topography System
O_2	oxygen
O_3	ozone
OAWA	Office to Advance Women Apprentices
OH^-	hydroxide ion
OH&S	Occupational Health and Safety
ON	Ontario
OSW	Office for the Status of Women
PA	Potential Area
PAANL	Protected Areas Association of Newfoundland and Labrador
PAH	polycyclic aromatic hydrocarbon
PAO	Provincial Archaeology Office
PASS	Passive Air Sampling System
Pattern	Pattern Energy Group LP
Pb	lead
PBGB	Placentia Bay/Grand Banks
PBS	Pilot Boarding Station
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxins
PCDF	polychlorinated dibenzo furans
PCIC	Prairie Climate Impacts Consortium
PCM	Post Construction Monitoring
PCMP	Post Construction Monitoring Plan
PDAC	Prospectors & Developers Association of Canada
PEC	Progressive Engineering & Consulting Incorporated
PEGNL	Professional Engineers and Geoscientists of Newfoundland and Labrador
PEM	Proton Exchange Membrane
PEMS	Predictive Emission Monitoring Systems
PET	Potential Evapotranspiration
PETP	polyethylene terephthalate
PIL	Project Interconnect Line
PFC	perfluorocarbons
PM	particulate matter
PM_{10}	particulate matter less than 10 microns
$PM_{2.5}$	particulate matter less than 2.5 microns
POA	Port of Argentia
ppb	parts per billion
PPE	Personnel Protective Equipment
PPP	Public Participation Plan
PPWSA	Protected Public Water Supply Area
PSA	Public Service Announcement
PSPC	Public Service and Procurement Canada

PT	Part-Time
PWGSC	Public Works and Government Services Canada
QFN	Qalipu Mi'kmaq First Nation
RAA	Regional Assessment Area
RCMP	Royal Canadian Mounted Police
RCP	Rehabilitation and Closure Plan
RDL	Reportable Detection Limit
ROV	Remote-Operated Vehicle
ROW	Right-of-Way
RPAS	Remotely Piloted Aircraft System
RV	Recreation Vehicle
SAR	Species at Risk
SARA	Species at Risk Act
SCADA	Supervisory Control and Data Acquisition
SCC	Species of Conservation Concern
SE	Southeast
SEEF	Searcher Efficiency
SEM	Sikumiut Environmental Management Ltd.
SF_6	Sulfur Hexafluoride
SFA	Salmon Fishing Areas
SiBA	Significant Benthic Area
SM	Song Meter
SMB-PB	St. Mary's Bay-Placentia Bay
SNC	AtkinsRéalis (formally SNC-Lavalin Group)
SO_2	Sulfur Dioxide
SOEC	Solid Oxide Electrolyzer Cell
SRF	Site Record Forms
SSAC	Species Status Advisory Committee
T	Threatened
t	metric tonnes
TAT	Tree to Above Tree Height (<60 m altitude)
TBD	To Be Determined
TC	Transport Canada
TCH	Trans-Canada Highway
TDG	Transportation of Dangerous Goods
TDS	total dissolved solids
TEK	Traditional Ecological Knowledge
TIS	Transportation Impact Study
TMP	Traffic Management Plan
TOC	Top Of Concrete
TPY	Trips Per Year
TSP	total suspended particulate
TX	Texas
US	United States (of America)
USD	United States Dollar

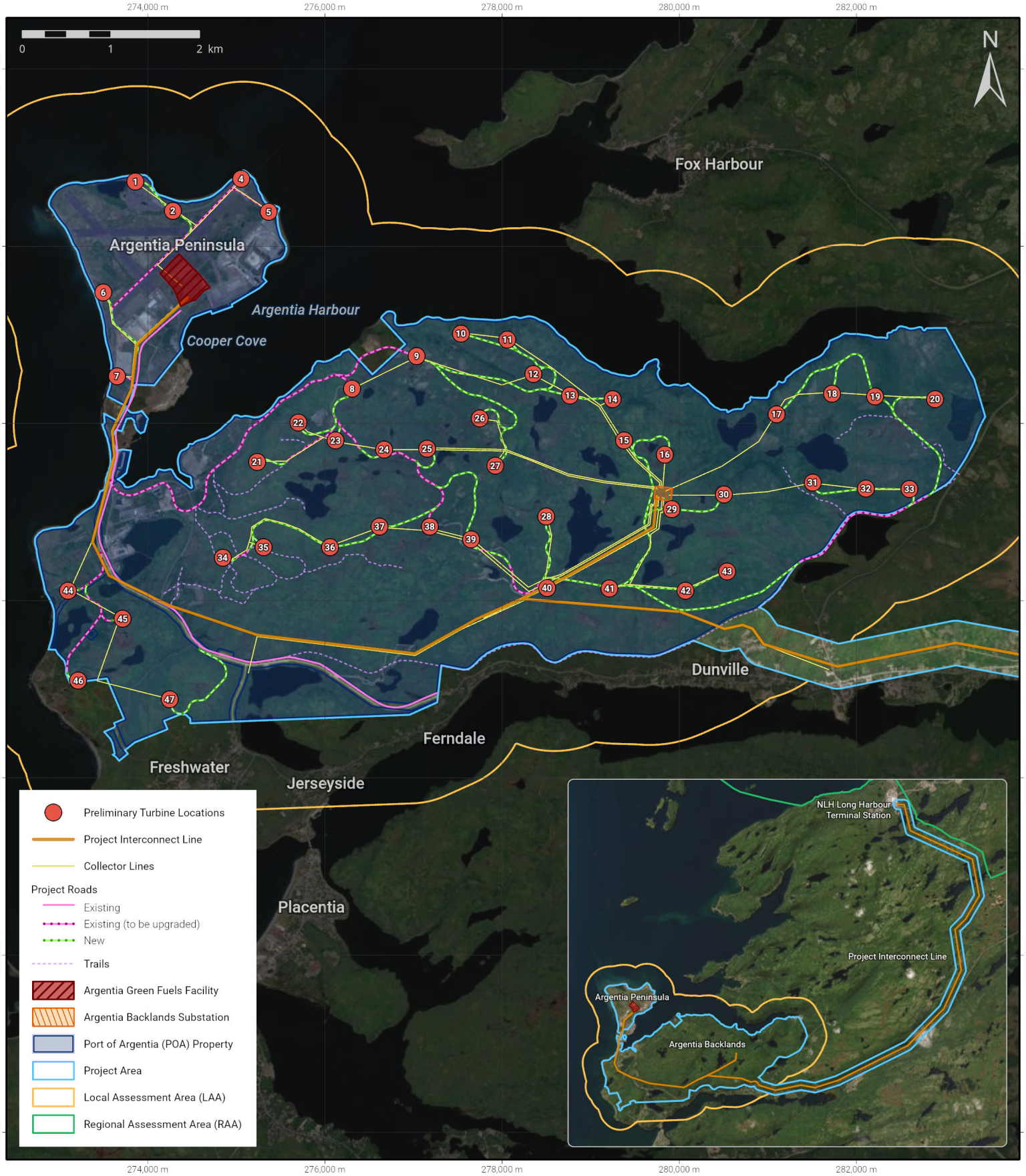
UTM	Universal Transverse Mercator
V	vanadium
Vale	Vale Newfoundland and Labrador
VBNC	Voisey's Bay Nickel Company
VC	Valued Component
VKT	Vehicle Kilometre Travelled
VOC	volatile organic compound
VT	Vessel Tonnage
WAT	Well Above Tree Height (60-140 m altitude)
WCAREG	Eastern Canada Vessel Traffic Services Zone
WDF	Waste Designation Forms
WDNR	Wisconsin Department of Natural Resources
WEP	Workforce and Employment Plan
WHMIS	Workplace Hazardous Materials Information System
WHO	World Health Organization
WISE	Women in Science and Engineering Newfoundland and Labrador
WMP	Waste Management Plan
WNS	White-Nose Syndrome
WRDC	Women in Resource Development Corporation
WRF	Weather Research Forecasting
WSC	Water Survey of Canada
WWII	World War II
X	Extinct
XT	Extirpated
Zn	zinc

Executive Summary

Argentia Renewables Wind LP (Argentia Renewables), an affiliate of Pattern Energy Group LP (Pattern), in partnership with the Port of Argentia (POA), is proposing to develop, construct, operate, and, at the end of the project life, decommission and rehabilitate a renewable energy infrastructure project (the Project) in eastern Newfoundland and Labrador (NL). The Project will consist of a 300-megawatt (MW) onshore wind generation facility powering a new green hydrogen and ammonia production, storage and export facility at the POA. The purpose of the Project is to produce hydrogen through the electrolysis of water using wind-generated electricity; subsequently the hydrogen will be combined with nitrogen from the air to produce ammonia for sale internationally. The ammonia will be produced at the Argentia Green Fuels Facility on the Argentia Peninsula in Placentia Bay, where it will also be exported from the existing marine terminal in Argentia Harbour.

As an important step in the Project's planning and approval process, this document has been prepared in accordance with the NL **Environmental Protection Act** (Part X) and the **Environmental Assessment Regulations**. This Environmental Assessment (EA) Registration Document has been prepared by Argentia Renewables with assistance from Sikumiut Environmental Management Limited (SEM). The format of this submission is consistent with the "Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects" as well as the "Environmental Assessment Act: A Guide to the Process". The Project does not include any activities requiring federal assessment as listed in the **Physical Activities Regulations** under the **Impact Assessment Act, 2019**.

A defining feature of the Project is that all energy generation and green fuels synthesis and export infrastructure will be situated on private, mixed-use lands owned by the POA and within the municipal boundaries of the Town of Placentia. The POA Property spans 3,500 hectares (ha) (9,000 acres) and encompasses both the brownfield industrial area of the Argentia Peninsula and the rural locally named "Backlands". The Argentia Wind Facility will be principally located on the Argentia Backlands, with several wind turbines and Project electrical infrastructure also proposed on the brownfield portion of the Argentia Peninsula, adjacent to the port. The Project, as proposed, will avoid the use of Crown Lands for wind energy generation. A portion of the Project Interconnect Line, which is the transmission line that will connect to the Newfoundland and Labrador Hydro (NLH) electrical grid at the Long Harbour Terminal Station, is the only part of the Project that involves Crown Land. The Project will rely on existing services and facilities available from the Port of Argentia, including dock space, laydown areas, port services and road infrastructure. An overview of the Project Area is provided below, which also appears in Section 1.2.



Pattern | Argentia Renewables	FIGURE NUMBER: 0 - ES	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/26
	FIGURE TITLE: Proposed Infrastructure	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change.	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	sem

SEM MAP ID: 238-005-GIS-043-Rev0

The Project will generate approximately 300 MW of wind energy, powering a hydrogen electrolyzer system with an installed capacity of an estimated 160 MW. The hydrogen will be directed to the Argentia Green Fuels Facility along with nitrogen separated from the air, whereby hydrogen will be converted into ammonia for more efficient storage and transportation. The facility footprint will be approximately 16 ha and will produce an estimated 400 metric tonnes (t) of green ammonia daily (135,000-150,000 t annually), requiring 1,185 cubic metres (m^3) of freshwater per day. Liquified ammonia will be stored in an above-ground tank with sufficient capacity to align with a once per 30-day shipping schedule. Maritime traffic during Operation will therefore be limited to one vessel per month. The current wind turbine design for the Project is expected to have a nominal power with an anticipated range of 6.8-7.2 MW, a hub height of 100-119 m and a rotor diameter of up to 170 m.

The Project scope will encompass all standard components required to operate a renewable energy project of this kind, including civil works and associated infrastructure. Electrical collection infrastructure will transport energy from the wind turbines to the Argentia Green Fuels Facility and comprise approximately 47 kilometres (km) of new overhead and underground low-voltage (34.5 kilovolt [kV]) power lines. A 35 km long high-voltage (230 kV) transmission line (the Project Interconnect Line) will connect to the NL Hydro grid at the Long Harbour Terminal Station. Given the intermittent nature of wind power, when the energy generated by the Argentia Wind Facility is insufficient to continue operation of the plant, electricity will be drawn from the grid. Freshwater will be supplied to the Project by the Town of Placentia municipal water supply system, which draws from the Protected Public Water Supply Area (PPWSA) that encompasses Clarke's Pond and Larkins Pond, with Barrows Pond and Gull Pond as reserves. Availability of water for both municipal and Project requirements was confirmed by a water balance analysis and infrastructure assessment.

The Argentia Wind Facility will consist of up to 46 wind turbines and necessitates the establishment of a network of access roads for the transportation of Project components and equipment, as well as connect the various wind turbine locations. Approximately 42 km of new gravel roads will be constructed, and 6.5 km of existing gravel roads and 1.5 km of an existing paved road will be upgraded.

During Construction, major components will be transported from manufacturers utilizing marine vessels and will be staged at the Port of Argentia for delivery to the designated construction sites. Pending the necessary approvals, construction and associated works of the Argentia Green Fuels Facility is currently scheduled to commence in summer 2025 and is expected to be complete in 2027. Commissioning of the facility is expected to take approximately six to 12 months. Construction of the Argentia Wind Facility, inclusive of tree clearing and grubbing, road construction, foundation works, turbine installation, and mechanical completion, is also scheduled to commence in summer of 2025 and is anticipated to finish by spring of 2027. Turbine commissioning is set to occur from fall 2026 to winter 2027. Although the

Argentia Green Fuels Facility and the Argentia Wind Facility are expected to operate for 30 years, Project components could be repaired or replaced to extend the design life. Decommissioning and rehabilitation of the Project will require an estimated 12 months and entail the removal of Project infrastructure and restoration of the land to its prior state at the discretion of the landowner.

The Project is expected to require capital investment in excess of $1.5 billion CAD, representing one of the largest renewable energy investments in Canadian history. The Project will provide opportunities for workers and businesses to establish long-term careers and relationships within a sector that has the potential to decarbonize challenging global industries and spearhead the creation of a new long-term industry in NL. Argentia Renewables intends to finance the Project through project financing, with the debt sourced from commercial banks and/or institutional lenders.

The failure or withdrawal of a proposal to construct a green energy project on private land would likely be viewed as a shortfall in the implementation of the Province's Renewable Energy Strategy. While the potential negative effects on both the biophysical and socio-economic environments of the Placentia area would be avoided, so too would be the potential benefits, especially to the socio-economic environment. For Argentia Renewables, a decision to cancel this Project would be unlikely to trigger a search for another suitable site within the province; consequently, there is no "other location" alternative for the Project.

Argentia Renewables is well-suited and equipped to carry out the proposed Project in a manner that ensures minimal environmental disruption and optimal socio-economic benefits. Argentia Renewables utilizes a "designed in" approach to mitigation measures: i.e., rather than developing a project and then adding in mitigation and monitoring measures as required to satisfy regulatory requirements, the approach is one of integrating such measures as early as possible in the planning cycle. To this effect, Argentia Renewables considered several design options and technologies as an alternative means for undertaking the Project. Alternatives to the Project which were evaluated included:

- Electrolyzer capacity and type;
- Plant capacity and size;
- Plant water supply including source selection and delivery infrastructure;
- Feedwater treatment technology;
- Plant cooling system technology;
- Wastewater treatment system and selection of effluent discharge location;
- Product storage, transfer, and shipping arrangements;
- Selection of wind turbine sizes and models;

- Siting of wind turbines, linear features such as power lines and access roads, substations, and construction laydowns;
- Wind turbine foundation options; and
- Construction labour force accommodations.

The evaluation of alternatives encompassed technical feasibility, economic feasibility, schedule risk, social effects, and environmental effects. Preferred options for each alternative were carried forward in planning and assessment. Where decisions have yet to be made on viable alternatives, these choices have been identified and described, and the effects assessment included in this EA Registration has been based on conservative assumptions (i.e. by assessing the alternative with the potentially greater environmental footprint). Where a feasible opportunity was presented to utilize existing infrastructure or already disturbed areas, Argentia Renewables incorporated such options into Project design. This is demonstrated, for example, by the access road routing which maximizes the use of existing gravel roads in the Argentia Backlands or siting the ammonia loading facility at the existing POA dockside.

The Argentia Renewables commitment to clear and transparent consultation with stakeholder and Indigenous groups started at the earliest stages of planning for the Project and will continue throughout the duration of all Project phases. Early engagement with the local public, key stakeholders, Indigenous groups, and departments/ agencies of municipal, provincial, and federal government informed the risks and opportunities assessments, and has been an important contribution to the Project design and alternatives development process. Engagement efforts have been ongoing since August 2022. In addition to an extensive series of meetings and stakeholder correspondence, Argentia Renewables has held four public information sessions in the Town of Placentia as of June 2024. Issues and concerns raised during consultation have been collected and inventoried throughout the Project planning process, and summary listings to demonstrate how each item was addressed are presented in this EA Registration.

An effects assessment was conducted following standard methods for describing Project interactions with the biophysical and socio-economic environment and for determining the potential environmental effects associated with the Project during all phases. The environmental effects predictions are based on conservative assumptions, with the objective of avoiding any underestimation of potential adverse effects. The assessment focused on valued components (VCs), which were selected based on several factors, including requirements of the Provincial Guidelines, results of engagement, the role of the VC in the ecosystem, and the importance placed on it as indicated in consultation records. The following table presents the VCs and associated Key Indicators (KIs) that were assessed.

Table 1 Index of Key Indicators Utilized in Effects Assessment.

Valued Component	Key Indicator
Atmospheric Environment	Greenhouse Gas (GHG) Emissions
	Air Quality
	Light
	Sound Quality (Noise)
	Vibration
Aquatic Environment	Surface Water Resources
	Ground Water Resources
	Freshwater Environment (Fish and Fish Habitat)
	Marine Environment (Fish and Fish Habitat)
	Fisheries and Aquaculture
	Species at Risk
	Habitats of Conservation Concern
	Marine Biosecurity
Terrestrial Environment	Flora
	Wetlands
	Fauna (Mammals)
	Avifauna
	Species at Risk
	Habitats of Conservation Concern[1]
Land and Resource Use	Zoning
	Commercial and Industrial Resource Use
	Recreational and Subsistence Resource Use
	Protected, Special and Sensitive Areas
	Indigenous Land Use
Heritage and Cultural Resources	Historic and Archaeological Resources
	Architectural Resources
Socio-Economic Environment	Population Demographics
	Community Health and Wellbeing
	Infrastructure and Services
	Economy
	Employment
	Business
Human Health and Quality of Life	Air Quality[2]
	Light[2]
	Sound Quality (Noise)[2]
	Vibration[2]
	Shadow Flicker
	Ice Throw
	Recreational and Subsistence Resource Use[3]
	Indigenous Land Use[3]

[1]Assessed under Land and Resource Use – “Protected, Special and Sensitive Areas”
[2]Assessed under Atmospheric Environment.
[3]Assessed under Land and Resource Use.

The assessment examined the potential effects of both routine Project activities and accidental events on each VC, as well as potential cumulative effects resulting from the combination of Project effects and other past, present, or likely future activities in the area. To help understand the existing conditions for each VC, numerous baseline studies were conducted between 2022 and 2024, standalone reports for which are appended to this submission.

Residual effects are those adverse environmental effects which cannot be avoided or mitigated, or that remain after the application of environmental control technologies and best management practices. The significance of adverse residual environmental effects was determined using criteria developed for each VC. Effects of the environment (such as due to climate change) on the Project were also assessed. For each VC, mitigation measures were proposed to reduce or eliminate potential adverse effects that may result from the Project. Many of the potential adverse environmental effects can be managed by following accepted procedures and best management practices. In addition to VC-specific mitigation measures presented in the effects assessment sections (Sections 4.2.1-4.2.7), the EA Registration includes:

- Risk assessment for accidents and malfunctions (Section 4.3);
- Standard environmental mitigation measures and best management practices (Section 4.5);
- An environmental management framework which establishes the Project policies on reducing potential negative environmental effects, tracking environmental performance, and advancing long-term environmental sustainability (Section 4.6); and
- A suite of plans for monitoring, management, and emergency response including:
    - Environmental Protection Plan (annotated table of contents, Section 9.0);
    - Transportation Impact Study and Traffic Management Plan (Appendix E);
    - Emergency Response / Contingency Plan (Appendix M);
    - Waste Management Plan (Appendix N);
    - Hazardous Materials Response and Training Plan (Appendix O);
    - Public Participation Plan (Appendix P);
    - Workforce and Employment Plan (Appendix Q);
    - Species at Risk Impact Mitigation and Monitoring Plan (SAR IMMP) (Appendix R);
    - Post-Construction Monitoring Plan (Appendix S); and
    - Domestic Wood Cutting Plan (Appendix T).

Argentia Renewables predicts that routine Project activities will not cause significant adverse environmental effects on any of the VCs. Potential negative effects will be managed by incorporating avoidance and mitigation measures throughout all Project phases. Special attention has focused on

Species at Risk (SAR) as evidenced in the SAR Impact, Mitigation, and Monitoring Plan (SAR IMMP). Argentia Renewables is continuing to work with regulators and resource managers to conduct continuing field surveys and plans to continue monitoring programs over the life of the Project. Follow-up (environmental effects monitoring) programs are proposed to verify key environmental effects predictions, to measure the effectiveness of mitigation measures, and to provide feedback on necessary modifications of such measures.

The risk of a significant negative environmental effect resulting from an accidental or unplanned event (such as a large spill of hazardous materials) is low, given the Project design, maintenance, and monitoring measures that will be in place to reduce the probability and consequences of such an incident. In addition, emergency response plans and contingency measures will be in place to limit the extent and nature of potential environmental interactions in the event of an accident or malfunction.

The detailed layout of the Argentia Wind Facility and supporting infrastructure will be dependent on results of the ongoing meteorological data collection campaign, geotechnical studies, field investigations, and local engagement. Should these ongoing efforts result in changes to the preliminary layout, micro-siting will be conducted in consideration of the mitigation measures presented in this EA Registration, in compliance with all relevant legislation, regulations, and conditions associated with EA release, and such that the conclusions of the effects assessment do not change. Argentia Renewables will continue to consult with all relevant government, community, and Indigenous organizations throughout Project planning, and will continue throughout all Project phases.

Argentia Renewables strives to sustainably develop, construct, and operate clean, renewable energy projects in a safe and responsible manner and with respect for communities, cultures, and the environment. The Project will be developed with the intention of being a part of a community for decades. This Project represents a watershed moment in the mission to transition the world to renewable energy: Argentia Renewables will contribute to the global need to decarbonize the global economy.

1.0 Introduction

Argentia Renewables Wind LP (Argentia Renewables), an affiliate of Pattern Energy Group LP (Pattern), is proposing to develop, construct, operate, and, at the end of the project life, decommission and rehabilitate a renewable energy infrastructure project in eastern Newfoundland and Labrador. The undertaking will consist of a new, dedicated 300 megawatt (MW) onshore wind generation facility (Argentia Wind Facility) powering a new green hydrogen and ammonia production, storage and export facility (Argentia Green Fuels Facility) at the Port of Argentia, collectively, the Argentia Renewables Project (the "Project").

The Argentia Renewables Project will produce green hydrogen using locally produced wind-generated electricity. The hydrogen will be produced at the Argentia Green Fuels Facility on the Argentia Peninsula where it will also be converted to ammonia for shipment by vessels. The location of the Project is on the Avalon Peninsula near Placentia Bay, Newfoundland and Labrador (NL) at approximately 47°18'26.03"N 53°59'4.96"W (Figure 1.0-1). A defining feature of the Project is that all energy generation and green fuels synthesis and export infrastructure will be situated on private, mixed-use lands owned by the Port of Argentia (POA). The POA Property spans 3,500 hectares (ha) (9,000 acres) and encompasses both the brownfield industrial area of the Argentia Peninsula and the rural locally named "Backlands" (hereon referred to as the Argentia Backlands). The Argentia Wind Facility will be principally located on the Argentia Backlands, with several wind turbines and Project electrical infrastructure also proposed on the brownfield portion of the Argentia Peninsula.

The POA is an active heavy industrial seaport located on the southeastern portion of the island of Newfoundland. Formerly the site of a U.S. Naval Base, inclusive of the Argentia Backlands, the POA is being redeveloped with a diverse group of port users and tenants providing support services to key industry sectors, such as marine transportation, renewable energy, aquaculture, offshore oil and gas, and mining. The POA is North America's first monopile marshalling port in support of US energy transition. The POA private land assets on the Argentia Peninsula comprise 3,000 acres of developed, flat land, zoned industrial, adjacent to the port.

POA is planning a major dock expansion project at Cooper Cove in Argentia Harbour. This $100 million infrastructure investment will see the port's quayside capacity add approximately 425 metres (m) of dock facilities alongside more than approximately 12 m water depth at three berths, including a roll-on roll-off feature. Additionally, this development will add approximately 10 hectares of valuable laydown space adjacent to the new dock. The new facility will feature the latest innovations to maximize decarbonization and port electrification. The Cooper Cove Marine Terminal Expansion project has been addressed as part of EA Registration number 2279 and released from Environmental Assessment as of January 18, 2024, subject to conditions.



Pattern | Argentia Renewables	FIGURE NUMBER: 1.0 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Project Location	NOTES:	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-001-Rev1

Additionally, the project was registered under the Canadian **Impact Assessment Act, 2019,** and on April 8, 2024, the Impact Assessment Agency of Canada (IAAC) determined that an impact assessment was not required for the Cooper Cove Marine Terminal Expansion Project.

The Project will be designed to generate approximately 300 MW of wind energy, powering a hydrogen electrolyzer system with an installed capacity of approximately 160 MW. The produced hydrogen will be combined with nitrogen extracted from the air, and the synthesis process will produce up to 146,000 metric tonnes (t) of green ammonia annually, which will be stored and exported to international markets by ship from a marine terminal at the POA. “Green ammonia” refers to ammonia produced using green hydrogen, which is hydrogen produced from the electrolysis of water that is powered by renewable and low-carbon energy sources.

The primary design thesis of the Project is to size the capacity and production output of the Project, including wind energy generation and hydrogen electrolysis capacity, in accordance with the land, power and water resources available at the private land site afforded by the POA. The Project, as proposed, will avoid the use of Crown Lands for wind energy generation. A portion of the Project Interconnect Line, which is the transmission line that will connect to the Newfoundland and Labrador Hydro (NLH) electrical grid at the Long Harbour Terminal Station, is the only part of the Project that involves Crown Land. None of the other material Project components will be located on lands other than those owned and controlled by the POA. The objective underlying the Project’s design is to minimize usage of Crown Lands, focusing all material development, Construction Phase, and Operation and Maintenance Phase activities on POA Property.

The Project also includes civil works, associated infrastructure, and facilities associated with the Argentia Wind Project, as well as green fuels storage and export facilities associated with the Argentia Green Fuels Facility. The Project will provide opportunities for workers and businesses to establish long-term careers and relationships within a sector that has the potential to decarbonize challenging global industries and spearhead the creation of a new long-term industry in NL. The Project’s principal design features, including its use of private land, its size, and overall execution plan, positions it to be an early-moving project.

As an important step in the Project’s planning and approval process, this Environmental Assessment Registration document (Registration) has been prepared in accordance with the Province of NL **Environmental Protection Act** (Part X) and the **Environmental Assessment Regulations**. The format of this submission is consistent with the “*Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects*” (Doc-2022-1022 issued by Department of Environment and Climate Change, Province of NL April 2023) as well as the “*Environmental Assessment Act: A Guide to the Process”*. The Project does not include any activities requiring federal assessment as listed in the **Physical Activities Regulations** under the **Impact Assessment Act, 2019***.*

1.1 Proponent

The Proponent for this undertaking is an affiliate of Pattern, one of the most established, experienced, and leading renewable energy infrastructure developers, constructors, and operators in the world. Pattern, founded in 2009, operates a fleet of utility-scale wind, solar, and transmission assets across North America. In 2020, a majority share of Pattern was acquired by the Canada Pension Plan Investment Board (CPPIB). Pattern's corporate headquarters are based in San Francisco, CA, with North American offices in San Diego, CA, Houston, TX, and Toronto, ON. With more than 30 operating facilities totaling approximately six gigawatts (GW) installed capacity, Pattern's world-class capabilities, operating assets, and development projects are backed by some of the world's largest and most knowledgeable investors. As such, Pattern is securely positioned to advance their mission of transitioning the world to renewable energy.

Contact information for the Proponent, and the primary Proponent contact for the environmental assessment, is provided in Table 1.1-1. A list of key personnel responsible for preparing the Registration, including their roles and qualifications, is provided in Chapter 11. Contact for the environmental assessment study team is provided in Table 1.1-2.

Table 1.1-1 Proponent Information.

Corporate Body Name	Argentia Renewables Wind LP
Proponent Address	1088 Sansome Street, San Francisco, CA 94111
Vice President	Frank Davis[1]
Principal Contact for Environmental Assessment	Adam Cernea Clark Adam.CerneaClark@patternenergy.com
[1]this position relates to Argentia Renewables Wind GP Inc., the general partner of Argentia Renewables Wind LP	

Table 1.1-2 Environmental Consultant Information.

Consultant Name	Sikumiut Environmental Management Limited (SEM)
Consultant Address	2nd Floor, 79 Mews Place, St. John's, NL A1B 4N2
Project Manager	Steve Gullage steve.gullage@semltd.ca

In addition to those provided for regulatory review, physical copies of the Registration have been provided to the Town of Placentia and the POA for public review.

Among its most recent projects, Pattern developed, constructed, and currently operates Western Spirit Wind, a wind project with 1,050 MW of installed capacity at four wind energy sites in New Mexico. Western Spirit Wind represents the most wind power ever constructed as a single phase in the Americas. The project reached operations at the end of 2021. During its 15-month Construction Phase period, Western Spirit Wind and its accompanying transmission line created 1,000 jobs. Currently, there are 35 full-time, permanent employees who maintain the wind facilities; however, the number of workers onsite nearly doubles when supplemental maintenance is required. Western Spirit's annual production

conserves more than two billion gallons of water and avoids four million metric tonnes of carbon dioxide emissions compared to coal-fired generation. The project's annual electricity production meets the needs of 900,000 people and is sold through various power purchase agreements. Western Spirit Wind is expected to provide approximately $3 million per year in increased property tax revenues for communities near the project sites, while its affiliated transmission line will add approximately $1 million per year in addition property tax revenues over the next 40 years.

Pattern is one of the largest wind power operators in Canada and has developed and financed 11 wind energy projects in five provinces. Pattern maintains and operates a portfolio of six wind projects in Ontario in partnership with Samsung Renewable Energy: South Kent Wind (270 MW), North Kent Wind 1 (100 MW), Grand Renewable Wind (149 MW), Belle River Wind (100 MW), Armshow Wind (180 MW), and K2 Wind (270 MW). These projects represent some of the largest wind facilities in the province of Ontario. Development for the projects began in 2013 with the construction of South Kent Wind, Grand Renewables Wind, and K2 Wind, and finished in 2018 with the completion of North Kent Wind. All the projects are currently operational. In total, the projects employed more than 2,000 workers during the Construction Phase, with more than 98% of the workforce being from Ontario. The turbines used were built locally using steel sourced from Ontario. The projects continue to employ local contractors to keep the facilities operational. Ontario committed to phasing out coal-fired generation in 2002 and met this target in 2014 with the help of wind energy. The electricity produced by each project is enough to satisfy the needs of more than 1 million Ontarians and is sold under various power purchase agreements. Each project brings substantial economic benefits to local communities, including more than tens of millions of dollars in property taxes over the first 20 years of the projects' operation, and injecting millions more into the local economy. Furthermore, Pattern remains active in local communities and sponsors many local organizations.

Similar in scale and topography to the Argentia Wind Facility proposed for the Project, Pattern partnered with the Henvey Inlet First Nation, through its subsidiary Nigig Power Corporation, on the Henvey Inlet Wind Project, which is a 300 MW wind power development located on Hevey Inlet First Nation Reserve No. 2 lands along Georgian Bay's northeast shore in Ontario. The Henvey Inlet Wind Energy Centre (HIWEC) study area lies within the Georgian Bay Fringe physiographic region, which is characterized by a gentle plain that inclines gradually from the shores of Georgian Bay to the Algonquin Highlands. The HIWEC study area contains a considerable number of unaltered forested regions with old growth and mature forests. Construction commenced in September 2017, and commercial operation was achieved in December 2019. Henvey Inlet First Nation designed and implemented an Environmental Stewardship Regime under the federal First Nations Land Management Act. Henvey Inlet Wind is the first project to adopt and implement such a regime. The project also required extensive consultation and permitting with the Canadian Wildlife Service (CWS). To enhance the region's biodiversity, Henvey Inlet First Nation and Canadian Wildlife Service (CWS) created the Eastern Georgian Bay Initiative, which will receive $1 million in funding from the facility each year of operation.

1.1.1 Funding

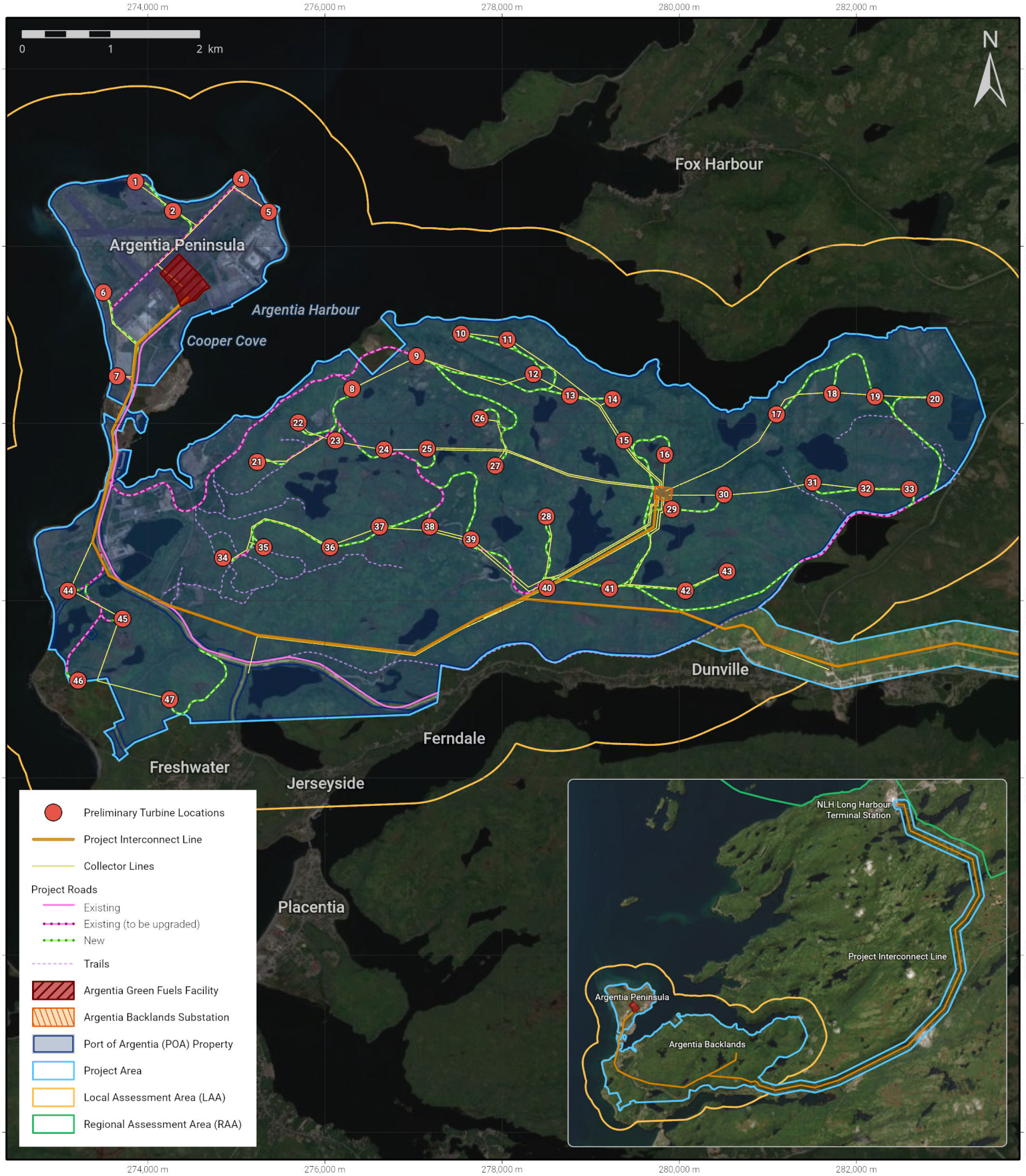
Pattern has led the industry in project financings for more than a decade, securing billions of dollars for renewables and transmission projects through various structures, including experience financing Canadian assets. As a major wind power operator in Canada, Pattern has successfully developed and financed 11 wind energy projects spanning five provinces. Pattern recently closed an $11 billion (USD) construction financing for the SunZia Wind and Transmission Project, an approximately 850-kilometre (km) high-voltage transmission project and 3,500 MW wind project, representing the largest renewable energy financing to date in North America.

The proponent intends to finance the Project through project financing, with the debt sourced from commercial banks and/or institutional lenders. These loans are projected to cover a substantial portion of the Project's capital costs, which will be sized based on the projected operating cashflows, with suitable coverage ratios enabling periodic payment of the loan service and distribution of excess cash flows to equity. The Project's development costs and remaining Construction Phase costs will be covered through Project sponsor equity. Pattern utilizes distributions from its operational assets to reinvest into new projects and receives support from its majority shareholder, the Canada Pension Plan Investment Board.

1.2 Overview of Undertaking

The following is an overview of Project components, activities, and schedule. A complete Project description is provided in Proposed Undertaking (Chapter 2). The Project is a renewable energy project using wind-generated electricity to power an electrolysis process that extracts hydrogen from water. The electrolytic-produced hydrogen will be directed to the Argentia Green Fuels Facility along with nitrogen separated from the air, where ammonia synthesis will occur through the Haber-Bosch process. Hydrogen will be converted into ammonia for more efficient storage and transportation.

The electricity source will be an array of wind turbines comprising approximately 300 MW of installed capacity located throughout the POA Property (Figure 1.2-1). The Argentia Green Fuels Facility will be located at the northern end of the Argentia Peninsula, near the Argentia Graving Dock. The Project is expected to produce up to 400 metric tonnes per day (tpd) of green ammonia, equivalent to up to 146,000 metric tonnes (t) of ammonia per year. The Project will require between 170 to 200 MW of renewable energy and 1,185 cubic metres (m^3) of freshwater daily. The Argentia Green Fuels Facility will have an installed electrolyzer capacity of approximately 160 MW. The product will be exported by third-party marine vessels to international markets.



Pattern | Argentia Renewables	FIGURE NUMBER: 1.2 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/26
	FIGURE TITLE: Proposed Infrastructure	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change.	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	sem

SEM MAP ID: 238-005-GIS-002-Rev1

The Project will encompass all standard components required to operate a renewable project of this kind, including wind turbines, electricity transmission systems, substation(s), water collection and treatment systems, access roads and staging areas, hydrogen electrolyzers and storage, ammonia synthesizers and storage, ammonia vessel loading, and maintenance buildings. Electrical collection infrastructure will be needed to transport energy from the wind turbines to the Argentia Green Fuels Facility. These low-voltage Collector Lines will transfer energy generated by the turbines to a substation in the Argentia Backlands, where it will be stepped up to transmission (high) voltage. The Project Green Fuels Generation Interconnect Line (Project Gen-Tie) will connect the Argentia Backlands Substation to a second substation on the Argentia Peninsula. The Argentia Peninsula Substation will be required to step down to lower voltage for distribution in the adjacent Argentia Green Fuels Facility. This will require approximately 47 km of new overhead and underground Collector Lines. The Project Interconnect Line will span approximately 35 km to connect to the provincial electricity system at the Long Harbour Terminal Station. The Argentia Wind Facility necessitates the establishment of a network of access roads. These roads will facilitate the transportation of Project components and equipment as well as connect the various wind turbine locations. Approximately 42 km of new gravel roads will be constructed, and 6.5 km of existing gravel roads and 1.5 km of an existing paved road will be upgraded.

The Construction Phase of the Argentia Green Fuels Facility and associated works is currently scheduled to commence in summer 2025 and is expected to be complete in 2027. Commissioning of the facility is expected to take approximately six to 12 months. The Construction Phase of the Argentia Wind Facility, inclusive of tree clearing and grubbing, road construction, foundation works, turbine installation, and mechanical completion, is scheduled to commence in summer of 2025 and is expected to be complete by spring of 2027. Turbine commissioning is set to occur from fall 2026 to winter 2027. The Construction Phase will begin following receipt of Authorization to Proceed (including release from the environmental assessment process) and the Final Investment Decision. Although the Argentia Green Fuels Facility and the Argentia Wind Facility are expected to operate for 30 years, Project components could be repaired or replaced prior to considering any Decommissioning and Rehabilitation Phase activities to extend the design life. Alternatively, the Project could begin Decommissioning and Rehabilitation Phase after an estimated 30-year operation. This will entail the removal of Project infrastructure and restoration of the land to its prior state at the discretion of the landowner, which will require approximately 12 months.

1.3 Project Benefits

As one of the largest independent renewable energy companies in North America, Pattern brings a wealth of experience working in communities as a long-term partner. As an affiliate of Argentia Renewables, Pattern is committed to forging partnerships, establishing trust, accountability, and transparency at all its projects. Pattern strives to sustainably develop, construct, and operate clean, renewable energy projects in a safe and responsible manner and with respect for communities and cultures. Pattern is more than an energy developer because it develops projects with the intention of being a part of a community for decades. Pattern's mission statement is to transition the world to renewable energy. This Project

represents a watershed moment in that mission: Pattern will go beyond the electrical grid to begin decarbonizing other sectors of the global economy.

Pioneering an internationally recognized initiative, the first of its kind in Canada, through the Hydrogen Alliance between Canada and Germany: The Memorandum of Understanding ("MOU") signed on March 18, 2024, by the Canadian Minister of Energy and Natural Resources and the German Vice-Chancellor and Minister of Economic Affairs and Climate Action, will catalyze the global hydrogen trade between Germany and Canada and ensure early access to clean hydrogen projects. Concurrently, two additional agreements were inked in Germany to bolster the Canadian-German hydrogen trade alliance:

- Canada's POA and Germany's Hamburg Port Authority signed a Letter of Intent to collaborate on the export and import of green hydrogen from Canada to Germany.
- Pattern and Mabanaft GmbH & Co. KG (Mabanaft) also signed a Letter of Intent, further solidifying the foundations of the Canada Germany Hydrogen Alliance.

Argentia Renewables is committed to maximizing long-term benefits for the Placentia area, its surrounding regions, the Province of Newfoundland and Labrador, and Canada as a whole. The Project offers a myriad of economic, social, and environmental benefits, including the following:

1. **Positively contributing to the Province's objective to implement initiatives to achieve clean economic growth, as per the Province's Way Forward on Climate Change in NL**:

    a. Ammonia is the foundation for nitrogen fertilizers, which help sustain agriculture around the world. Ammonia is also used in chemical manufacturing, as a source of energy in fuel cells, or as a hydrogen carrier in hydrogen storage and transportation systems. Ammonia produced from renewable generation minimizes or eliminates the carbon emissions associated with fossil fuel-based production methods. Climate change is a shared challenge, and the Project, in partnership with the POA, will play an important early leader role in decarbonizing ammonia production.

    b. The Project will stimulate a new clean energy economy and ensure that the Placentia area is part of this emerging sector in NL. The Project will drive growth by creating local jobs in the Placentia area during the Construction Phase and Operation and Maintenance Phase of wind turbines and hydrogen and ammonia production facilities.

    c. The Project will attract investment to the Placentia area and broader region and will help drive economic activity in related industries and local businesses.

    d. The Project represents a new direction for an economy that has heavily relied on oil and gas, fishery, and mining projects. Engaging in the clean energy sector may help provide long-term sustainability and a more diversified suite of economic drivers.

2. **Providing direct economic benefits to the Placentia area and region:** This Project will generate revenue for the Placentia region through taxes and financial agreements, contributing

to municipal and provincial revenues. These funds may be reinvested into community development initiatives, infrastructure upgrades, and public services.

3. **Fostering pride for the Project in the community:** The Project will offer many benefits to society in the area, including:

    a. Pattern has prided itself on regular and open public engagement since the inception of this Project. Pattern has welcomed all community members to engage with Pattern on the Project, to foster a culture of transparency and trust between Pattern and the Placentia region. This commitment will be implemented for the life of the Project.

    b. The Project provides a wealth of opportunities for educational outreach and environmental awareness programs. Local organizations and schools can collaborate with Pattern to educate local community members and visitors about renewable energy technologies and their importance in mitigating climate change.

4. **Locally and regionally tailored community benefits programs:** Pattern prides itself in its commitment to community and environmental stewardship. A dedicated budget has been allocated for a comprehensive Community Benefits Program in Placentia as well as an Environmental Stewardship Program. These commitments align with the Argentia Renewables Statement of Community and Cultural Commitments (Chapter 12), ensuring support for causes that are significant to the community and economy of the Project area, with a focus on creating lasting benefits for the region. Pattern actively contributes to building strong and vibrant communities in their project areas through donations and sponsorships. These contributions not only offer local branding opportunities but also support various facilities, programs, and events by covering capital, operating, or special one-time costs. Pattern develops community and environmental stewardship commitments collaboratively with local and regional stakeholders to ensure benefits match the communities and environment in which we are located.

2.0 Proposed Undertaking

This section describes the proposed undertaking and the context within which it will be carried out. An overview of the proposed Project Area is provided to facilitate the environmental assessment process. This is followed by a presentation of the rationale for the undertaking in the context of broader public sector policies plans and programs. The goal of this document is to provide a comprehensive description of project planning, construction, operation and maintenance, and decommissioning and rehabilitation. Alternatives to the Project, and within components of the Project, are described, along with the implications of the selections to potential environmental effects. Finally, a description is included of the regulatory framework that applies to the geographic area and categories of activities associated with all stages of the Project.

The Project will produce green hydrogen using locally produced wind-generated electricity. Hydrogen will be produced at the Argentia Green Fuels Facility where it will also be converted to ammonia for shipment by third-party marine vessels. The associated Argentia Wind Facility will comprise approximately 300 MW of installed capacity from up to 46 wind turbines located throughout the Port of Argentia (POA) Property. The current wind turbine design for the Project is expected to have a nominal power of 6.8 MW, a hub height of approximately 100-119 m and a rotor diameter of 162 m. For the purposes of this Registration, a hub height of 119 m is conservatively assumed.

Argentia Renewables is well-suited and equipped to carry out the proposed Project in a manner that ensures minimal environmental disruption and optimal socio-economic benefits. Argentia Renewables utilizes a “designed in” approach to mitigation measures; i.e., rather than developing a project and then adding in mitigation and monitoring measures as required to satisfy regulatory requirements, the approach is one of integrating measures as early as possible in the planning cycle.

As an affiliate of Pattern, Argentia Renewables will draw on Pattern’s experience to navigate development challenges and apply existing policies and programs to the undertaking. Pattern is an experienced developer and operator of large renewable energy infrastructure projects throughout North America and has developed and implemented a suite of proven corporate policies and programs.

2.1 Study Areas

The Project Area is in Argentia, Newfoundland and Labrador (NL), a seaport and industrial park located on the brownfield Argentia Peninsula of a former American military base. The Project Area extends eastward into the Argentia Backlands, as well as a narrow corridor to accommodate the electrical infrastructure outside of this area.

2.1.1 Site Description

The elements of the Project will interact with the environment at various spatial scales, therefore three levels of "study area" were assessed: a Project Area, a Local Assessment Area, and a Regional Assessment Area. Each is defined below, along with a rationale for the delineation of boundaries. These study areas encompass the scope of study of the biophysical environment. Adaptations to each study area that were made for the socio-economic and heritage and cultural resources studies are described in Section 3.2 (Baseline Studies).

2.1.1.1 Project Area

The Project Area for the Argentia Renewables Project was defined as "*the area in which Project infrastructure components and activities (e.g., construction, operation and maintenance, decommissioning and rehabilitation) will occur, and within the boundaries of which direct environmental interactions with the Project will likely occur*". Specifically, the Project Area encompassed the collective spatial footprint of the Argentia Wind Facility, the Argentia Green Fuels Facility, ammonia storage infrastructure, electrical substation(s) and power lines, and all the associated roads for those various elements of the Project (further discussed in Section 2.3). Within the Argentia Backlands and the Argentia Peninsula, the Project Area boundaries correspond to the POA Property boundaries. A 250 metre (m) buffer was added to either side of the Project Interconnect Line, which is the transmission line that will connect to the Newfoundland and Labrador Hydro (NLH) electrical grid at the Long Harbour Terminal Station, to account for edge effects of the linear corridor and to provide for alignment adjustments of the transmission line Right of Way (ROW). Figure 2.1.1-1 depicts the Project Area.

2.1.1.2 Local Assessment Area

The Local Assessment Area (LAA) for the Project was defined as "the area in which environmental interactions are detectable (and measurable) beyond the boundaries of the Project Area". Interactions with the Project within the LAA are primarily indirect; often the LAA is sufficiently separated (spatially and/or temporally) from Project features to preclude direct interactions.

A one kilometre (km) buffer was added to the Argentia Backlands and the Argentia Peninsula Project Area, while the 250 m buffer along the Project Interconnect Line remains unchanged, to define the boundary of the LAA. This distance was selected to encompass the local municipalities' infrastructure and housing, as well as the nearshore marine environment. It also encompasses a corridor along the Project Interconnect Line. The LAA is adequate to comprise all the viewscapes of the Project, any noise transmission beyond the Project Area, and the coastal environment which provides habitat for seabirds and shorebirds. The LAA is where indirect but measurable changes to Valued Components (VCs) may occur. Figure 2.1.1-1 depicts the core LAA for the Project.



Pattern | Argentia Renewables	FIGURE NUMBER: 2.1.1 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/25
	FIGURE TITLE: Study Area Boundaries Associated with the Project	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change.	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	sem

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2.1.1.3 Regional Assessment Area

The Regional Assessment Area (RAA) was defined as “the 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 localities of Argentia, Dunville, Fox Harbour, Freshwater, Iona, Little Barasway, Placentia, Point Verde, Jerseyside, Ferndale, and Ship Harbour (Figure 2.1.1-1). While the RAA is based on the Census subdivision, the Census boundary is not arbitrary, rather it aligns with regional drainage basins.

The RAA includes the area within which most cumulative effects would occur, such as additive interactions from other local industrial installments, projects, or infrastructure. In particular, the extent of the RAA boundary considers changes to the environment that may indirectly interact with the landscape or resources for local communities or migratory wildlife species. The RAA boundary encompasses other projects such as the Voisey’s Bay Nickel Processing Facility, the POA Cooper Cove Project, the Monopile Marshalling Port, and others as further discussed in Chapter 6 (Cumulative Effects).

The RAA will be adjusted appropriately for each VC, especially with respect to the socio-economic interactions of the Project as discussed in Section 3.2 (Baseline Studies).

2.1.2 Project Land and Property Ownership

The Project will be located primarily on the POA Property. The Argentia Green Fuels Facility will be situated on the Argentia Peninsula, and the Argentia Wind Facility will be primarily on the Argentia Backlands, north of the communities of Dunville and Ferndale. The Project Interconnect Line intersects both private and Provincial Crown Land.

The POA Property borders on several other privately and publicly held lands. Opposite to the intersection of the Argentia Access Road and the Main Road to Freshwater is the Provincially owned tourist bureau. Project interactions with tourism activity and business are addressed in Sections 3.1.4 and 3.1.6 (Land and Resource Use and Socio-economic Environment, respectively).

Within the POA Property on the Argentia Peninsula, the industrial park has approximately 40 existing tenants that offer a variety of goods and services, many of which are compatible with supporting construction projects and industrial operations. More details pertaining to POA business activities are provided in the Socio-economic Baseline Report (Appendix G). The Marine Atlantic ferry service, a Crown Corporation, connects North Sydney, NS, and Argentia, NL, and operates from June to September. According to the 2024 passenger ferry timetable, arrivals from North Sydney are set for 09:30 on Mondays, Thursdays, and Saturdays, with departures the same day at 17:00 (Marine Atlantic, 2024). Historic ferry crossings are discussed in Section 3.1.4 and Project interactions are discussed in the Transportation Impact Study and Traffic Management Plan (Appendix E).

On the southwest corner of the Project Area along the coast is the T.E. Site, a remnant of the former United States (US) military base. The property is currently owned by the US Department of the Navy.

The Canadian Coast Guard infrastructure occupies two locations within the Project Area: one is the Freshwater Hill VHF tower located just outside the southern extent of the POA Property; the second is the Pearce Peake VHF Radar tower, which is located on the western side of the Argentia Backlands. More details pertaining to the Canadian Coast Guard Radar Station are provided in Section 3.1.4 and Chapter 8 (Land and Resource Use and Public and Indigenous Consultation, respectively). Adjacent to the Freshwater Hill VHF tower there are four additional communication towers operated by the Royal Canadian Mounted Police (RCMP), Boeing Corporation Satellite Signal Receiving Site, Newfoundland Broadcasting Company Limited, and Newtel Communications. All four are located outside of the southern boundary of the POA Property.

Two quarries currently located within the POA Property on the Argentia Backlands and are being considered as aggregate borrow sources for the Project. One is permitted to Tier 1 Capital Corporation located on Broad Cove Head, Argentia and encompasses 3.17 hectares (ha). The second is permitted to Pennecon Heavy Civil Limited located on Silver Mine Road, Argentia and encompasses 3.87 ha. More details pertaining to mining and quarrying are in Section 3.1.4 (Land and Resource Use).

Argentia Renewables will develop and finance the construction of the Project Interconnect Line; however, the operation and maintenance of the line, once completed, will rest with NLH. The Project Interconnect Line will primarily parallel existing rights-of-way for a large portion of the route, but a section will require greenfield construction. The Project Interconnect Line is the only portion of the Project that involves Provincial Crown Land.

2.2 Rationale for the Undertaking

The Project aims to foster the growth of the green hydrogen and ammonia industry in NL, creating opportunities for workers and businesses to establish long-term careers and partnerships within an industry capable of decarbonizing challenging sectors. The Project objective is to produce economically viable green hydrogen and ammonia for export, meeting increasing market demands, while contributing to the reduction of greenhouse gas emissions and promoting the global shift to decarbonization. Ammonia will be produced from hydrogen (electrolysis process) and nitrogen (air separation) for transport to export markets. The green hydrogen and ammonia industry will play an important role in addressing Europe’s green energy transition and climate objectives.

2.2.1 Global Market for Hydrogen and Ammonia

Global demand for hydrogen, especially green hydrogen (i.e., hydrogen produced without carbon, e.g., using renewables to power the electrolysis of water) has been growing rapidly in recent years as countries

attempt to decarbonize various industries, energy sources, and modes of transportation. Hydrogen is beginning to be used as a clean energy carrier to help reduce dependence on fossil fuels and lower greenhouse gas emissions across myriad sectors of the economy. A particularly important use for hydrogen is its catalytic reaction with nitrogen to create ammonia, the foundation for fertilizers around the world and a vital aspect of world food security. Ammonia is a key feedstock for other chemical processes as well, including the production of methanol.

The extensive coastline, high wind speeds, and abundance of high elevation terrain of NL make it one of the premium jurisdictions in North America for wind energy projects. The Island of Newfoundland also has a geographic advantage over competitors to the west and south – it contains the closest ports to Europe, a primary market for green hydrogen. The European Commission is implementing strict regulations as to what constitutes green hydrogen and will require producers to prove the origins of their hydrogen. Green energy for electrolyzers must be sourced from dedicated new capacity (such as a wind farm) or from green electricity purchased from a grid. The NL hydroelectric-powered grid provides an interconnection opportunity that is greener than most other jurisdictions, offering a competitive advantage in achieving European standards (Department of Industry, Energy and Technology, 2021).

2.2.2 Provincial and Federal Commitments to Address Climate Change

Canada is one of many countries that have made a policy commitment seeking to achieve “Net Zero” carbon emissions by 2050. Consistent with this national policy, the Province of NL has developed a Renewable Energy Strategy and a Hydrogen Development Action Plan.

The Renewable Energy Strategy encourages the development of a green hydrogen industry in the province by committing to such action items as:

- Continue to advance the development of a clean power roadmap for Atlantic Canada;
- Pursue export opportunities; and
- Build the Province’s understanding of opportunities to generate new green products such as green hydrogen, green ammonia, or biofuel, and to export the energy via ship.

In a recently signed Memorandum of Understanding (MOU), the Province of NL reiterated its commitment to identify and pursue hydrogen opportunities that provide the best long-term benefit for the province (e.g., increased jobs, gross domestic product, and tax revenue to support government programs and services -Government of Newfoundland and Labrador, 2022). In 2022, the Province of NL acted on these commitments by repealing the onshore wind moratorium policy established in 2006, a major barrier to industrial-scale wind development.

The Province of NL released its Hydrogen Development Action Plan on May 14, 2024 (NL Department of Industry, Energy and Technology, 2024). This plan identifies green hydrogen as a key resource in global efforts to decarbonize fossil fuel dependent sectors. Through the plan, the Province of NL commits to supporting the development of a globally competitive green hydrogen and ammonia industry (Government of Newfoundland and Labrador, 2024). The Argentia Renewables Project is noted in the document as a trailblazing green hydrogen and ammonia project that will lead the establishment of this new industry.

2.2.3 The Argentia Renewables Commitment to Environmental and Community Stewardship

Argentia Renewables is committed to the sustainable development, construction, and operation of renewable energy facilities, while providing a workplace that is diverse, equitable, and inclusive. The company is also committed to developing lasting partnerships with the local communities in proximity to the Project Area. Argentia Renewables believes that being a good neighbor benefits both the areas where they operate and their long-term success. Argentia Renewables is committed to listening to and respecting the landowners and communities that will host and have interest in this Project, and to being involved in meaningful stakeholder engagement throughout the lifetime of the Project. To this end, Argentia Renewables will:

- Respect the heritage and history of Indigenous Peoples in all communities;
- Treat landowners and community members with respect and seek to gain their trust;
- Share information and solicit input to build local relationships while respecting and considering all points of view;
- Explore ways to support the growth of healthy and vibrant communities while providing sponsorships and donations;
- Identify and assess potential positive and negative community and cultural effects to inform planning and decision-making;
- Design and construct projects and operate facilities in a manner that complies with all applicable regulations; and
- Work to monitor, report, and continually improve overall performance, incorporating feedback into outreach programs.

2.3 Project Description

The Project involves the installation of 300 MW of wind power on the POA Property, shown in Figure 2.3-1. The wind turbine sites will be dispersed throughout the POA Property to maximize the potential of the

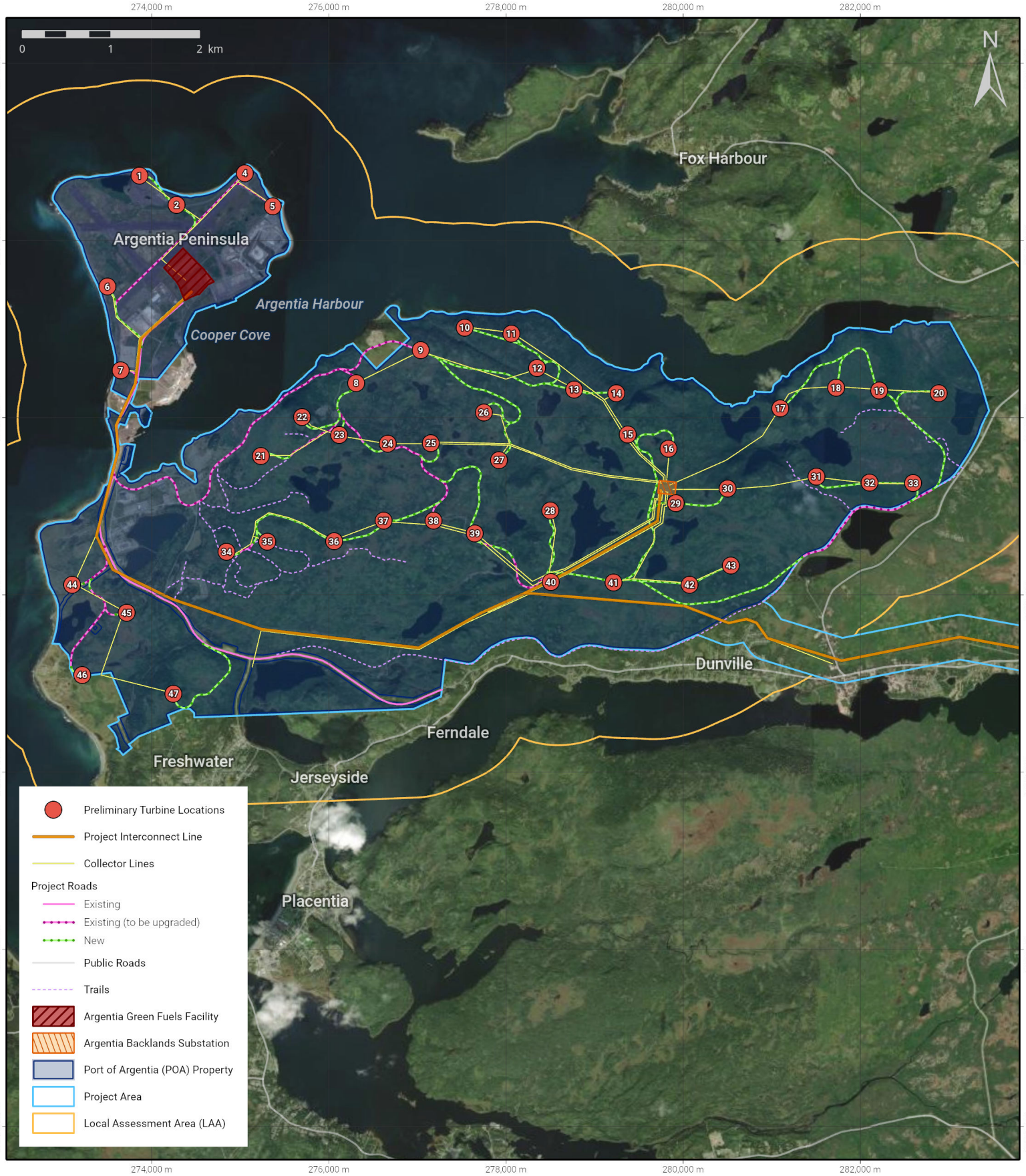
wind component of the Project. The Argentia Green Fuels Facility will be located at the northern end of the Argentia Peninsula, near the Argentia graving dock, which is brownfield private land zoned for industrial use. The facility will produce hydrogen through the electrolysis of water and nitrogen by air separation. Ammonia will be created when the hydrogen and nitrogen gases react, and its energy content is a product of the energy used to produce these gases. The Argentia Green Fuels Facility will run on locally generated renewable energy from the Argentia Wind Facility, supplemented by energy from the NLH grid, which is expected to be almost entirely hydroelectric in origin. The ancillary services at the Argentia Green Fuels Facility will also run on this renewable energy. As a result, the produced ammonia will have near-zero carbon intensity. The Project is expected to produce up to 400 metric tonnes per day (tpd) of green ammonia, equivalent to up to 146,000 metric tonnes (t) of ammonia per year. The Project will require between 170 to 200 MW of renewable energy and 1,185 cubic metres (m^3) of freshwater daily.

Electrical infrastructure will be required to connect wind power generated in the Argentia Backlands to the Argentia Green Fuels Facility, as well as to connect the Argentia Green Fuels Facility to the NLH grid as shown in Figure 2.3-2. Energy generated at each wind turbine site will be conveyed by a series of low voltage (34.5 kV) Collector Lines that run to a substation in the Argentia Backlands (the Argentia Backlands Substation). The Project Green Fuels Generation Interconnect Line (Project Gen-Tie), a high voltage (230 kV) overhead powerline, will connect the Argentia Peninsula Substation to the Argentia Backlands Substation. Another high voltage overhead powerline, the Project Interconnect Line, will connect the NLH Long Harbour Terminal Station to the Argentia Backlands Substation to transmit electricity from the NLH grid to the Project. The Preliminary Layout of the Project Interconnect Line generally follows a corridor along an existing Newfoundland Power 69 kV powerline ROW to the Long Harbour Terminal Station as shown in Figure 2.3-2.

The Argentia Green Fuels Facility will include a hydrogen electrolyzer, air separators, ammonia synthesizers, hydrogen, and ammonia storage, as well as ancillary equipment and maintenance buildings required to operate and maintain the facility (Figure 2.3-3). An electrical substation will be constructed near the Argentia Green Fuels Facility, referred to as the Argentia Peninsula Substation.

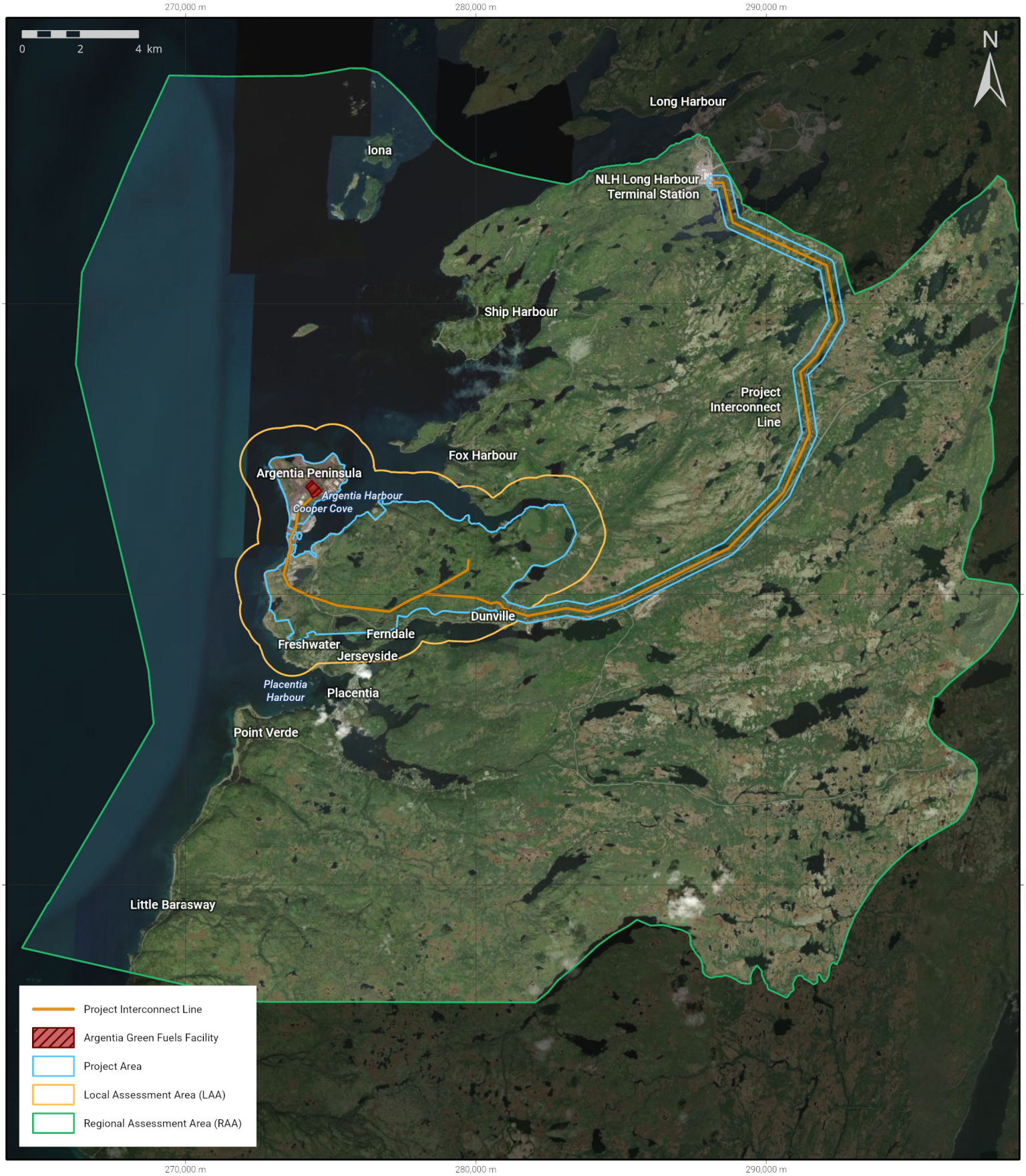
The Argentia Wind Facility component of the Project is anticipated to include up to 46 wind turbines based on the Preliminary Layout provided in Figure 2.3-1. This is the layout that was used for studies and surveys contained in this Registration. Throughout the early engagement process for this Project, as described in Chapter 8, Argentia Renewables has sought to gather feedback from the public, key stakeholders, Indigenous Peoples, and government departments and agencies regarding siting of wind turbines. In response to feedback obtained through the public consultation process, turbines 7, 22 and 47 have been removed from the preliminary layout. Additional layout changes based on stakeholder feedback have been presented later in Figure 2.4.2-1.

Where practicable, existing roads in the Argentia Backlands have been incorporated into the Project design to limit additional habitat fragmentation. Figure 2.3-1 categorizes the roads in the Argentia Backlands into new roads, existing roads that will be upgraded and existing roads that will not be upgraded. The Project will require a water collection and purification system, which will include infrastructure for the delivery of water from the selected source to a water treatment plant located at the Argentia Green Fuels Facility. The treated water will feed into the hydrogen facility. A wastewater treatment system will also be required for effluent.



Pattern | Argentia Renewables	FIGURE NUMBER: 2.3 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/25
	FIGURE TITLE: Preliminary Layout of the Argentia Wind Facility	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change.	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	sem

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Pattern | Argentia Renewables	FIGURE NUMBER: 2.3 - 2	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/26
	FIGURE TITLE: Preliminary Layout of the Project Interconnect Line	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change.	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	sem

SEM MAP ID: 238-005-GIS-005-Rev1



Figure 2.3-3 Preliminary Development Concept of the Argentia Green Fuels Facility.

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

CONSULTANT: AtkinsRéalis

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

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PROJECT: Argentia Renewables - Feasibility Study

DRAWING TITLE: CONCEPT PLOT PLAN

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

REV: 00

Pending the necessary approvals, Project construction is expected to begin in Q2 of 2025, with commissioning occurring in Q4 of 2027. Once the Project is operational, the product will be exported by third-party marine vessels to international markets. Although the Project is expected to operate for 30 years, Project components could be repaired or replaced to extend the design life. Decommissioning and rehabilitation of the Project will require an estimated 12 months and entail the removal of Project infrastructure and restoration of the land to its prior state at the discretion of the landowner.

2.3.1 Argentia Green Fuels Facility

The Argentia Green Fuels Facility infrastructure will be sited based on property availability, ease of construction and infrastructure access, proximity to suitable dock space, adequate buffer space allowance from other industrial activities, and foundation conditions. The facility will include the following:

- Hydrogen production (electrolyzer, hydrogen storage tanks, cooling water system, firewater / buffer tank, feedwater treatment, and wastewater treatment);
- Ammonia production (ammonia synthesis and refrigerant compression, air separation units, nitrogen compressor, ammonia storage tank and boil off units, tank flare, and an ammonia flare); and
- Ancillary service buildings and laydown areas for the maintenance and operation of the facility.

The facility is expected to have an installed capacity of 400 tpd of ammonia. The electrolyzer facility is anticipated to have an installed capacity of 80 tpd of hydrogen. Figure 2.3.1-1 depicts the process of producing green ammonia from renewable power.

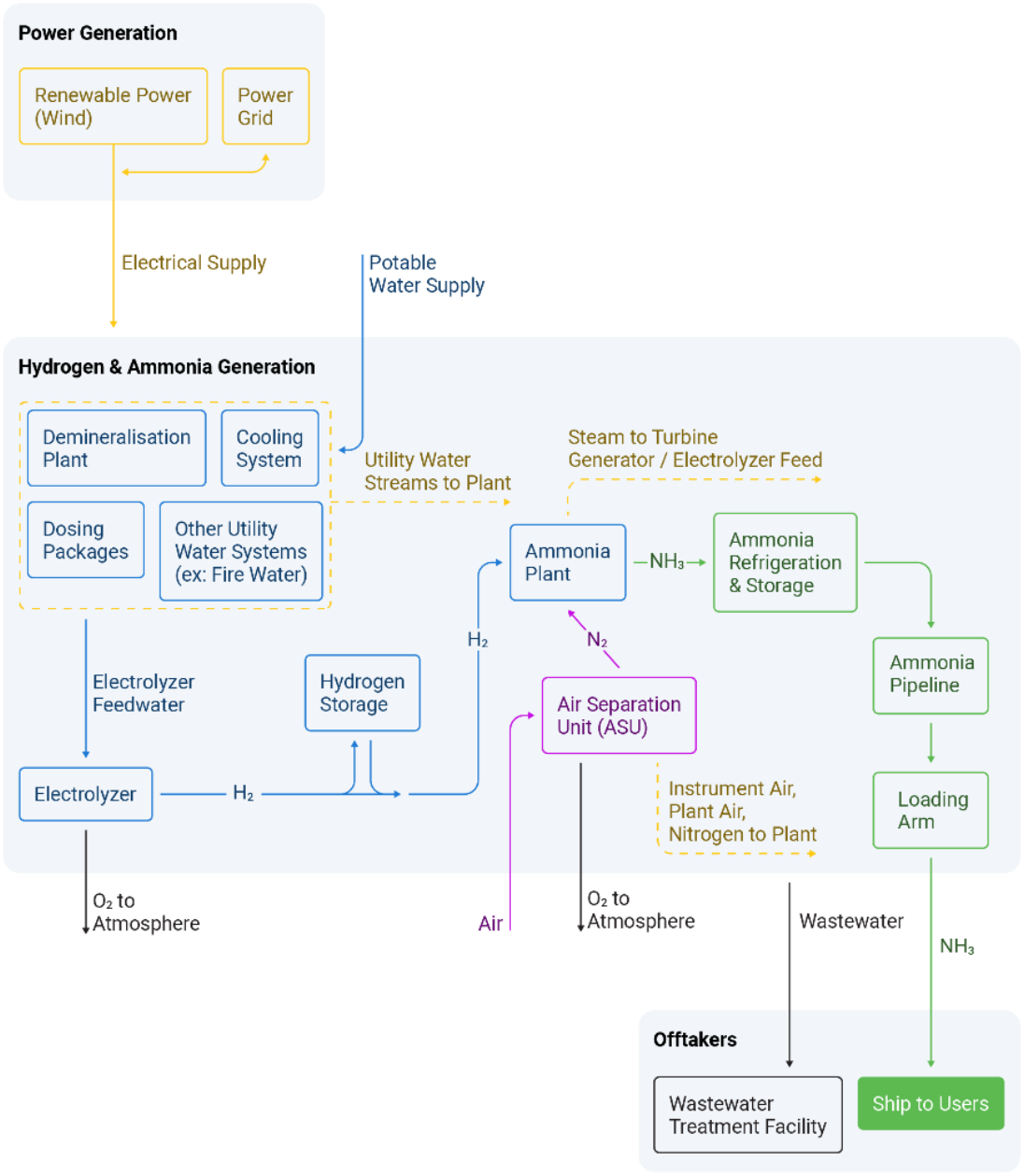


Figure 2.3.1-1 Argentia Green Fuels Facility Process Flow Diagram (adapted from AtkinsRéalis, 2023).

The feasibility study conducted by AtkinsRéalis (formerly SNC-Lavalin Group) in 2023 concluded that a 160 MW alkaline electrolyzer connected to a 140 kilo-tonnes per annum (ktpa) (384 tpd) ammonia plant

is the optimal facility size accounting for both economic and Project risk considerations. The ammonia plant has been marginally upgraded to 146 ktpa (400 tpd). The average potable water consumption is expected at 0.0142 cubic metres per second (m^3/s) (equivalent to 14.2 litres per second (L/s)), ranging from 0.0116 to 0.0144 m^3/s (11.6 – 14.4 L/s).

2.3.1.1 Hydrogen Production

Generated wind energy will be used to power the electrolysis process which splits water molecules (H_2O) into hydrogen (H_2) and oxygen (O_2) constituent parts. Oxygen produced will be vented to the atmosphere at a safe location. Hydrogen from the electrolyzer will be fed to the ammonia plant. Hydrogen will be mixed in a 3:1 stoichiometric ratio with nitrogen produced by air separation. A limited quantity of hydrogen may be stored as a buffer during periods of low electricity generation.

An alkaline electrolyzer is currently anticipated to be the optimal type of technology for this Project given the logistics, manufacturing capability, financials, water consumption, and maintenance ease. Water consumption by an alkaline electrolyzer is in the range of 9-11 kilograms (kg) of water per kg of hydrogen produced. The amount of potable water rejected was assumed to be in the range of 25-40%, based on the quality of the source water in the municipal supply. The electrolyzer rated capacity is 160 MW with a hydrogen production capacity of 2,960 kilograms per hour (kg/h), equivalent to 71,040 kg/day.

A schematic diagram of the alkaline electrolysis process is displayed in Figure 2.3.1-2. The electrolyzer cell inputs are direct current electricity and deionized water from the water treatment process. The electrolyzer electrodes (anode and cathode) are separated by a diaphragm. Water molecules are broken down in the cathode to produce hydrogen gas and hydroxide ions (OH^-) when electrical current is applied. Hydroxide ions pass through a permeable membrane where they recombine to form oxygen and water. Potassium hydroxide (KOH) or sodium hydroxide (NaOH) at 20-40 weight percent (wt.%) are commonly used as the cell electrolyte in alkaline electrolysis. A summary of the half cell reactions and overall reaction are detailed below:

$$\text{Anode: } 2OH^- \rightarrow \frac{1}{2}O_2 + H_2O + 2e^-$$

$$\text{Cathode: } 2H_2O + 2e^- \rightarrow 2OH^- + H_2$$

$$\text{Overall: } H_2O \rightarrow \frac{1}{2}O_2 + H_2$$

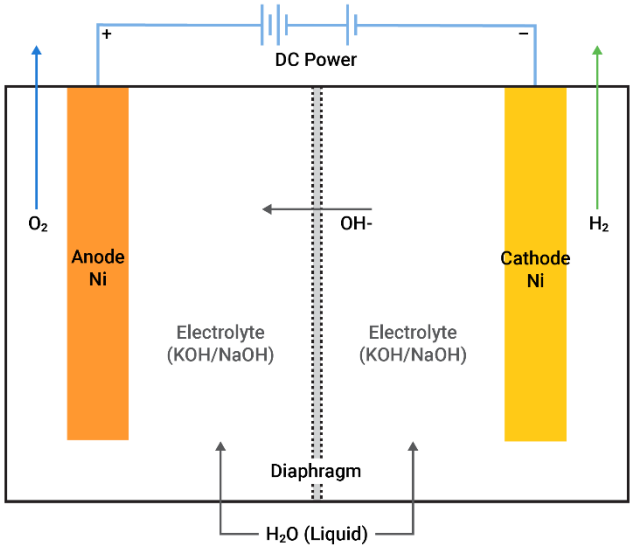


Figure 2.3.1-2 Alkaline Electrolyzer Cell.

Alkaline electrolysis is a low temperature technology, typically operating at temperatures of 70-90°C, and pressures of 1-30 bar-gauge (barg). Ammonia production process efficiency is achieved by the provision of a continuous supply of hydrogen; therefore, the design allows for 14 t of hydrogen storage in an above ground steel container. This represents 0.2 days of production, considered optimal given the availability of electric power to the plant.

2.3.1.2 Ammonia Production

Nitrogen (N_2) will be produced by an air separation unit (ASU), which extracts nitrogen that naturally occurs in the atmosphere. The main air compressor filters and compresses the air, a knockout drum removes moisture, and molecular sieve beds purify the air. The air is then cooled in a heat exchanger before entering the column. A stream of high purity nitrogen is produced by the top product of the column, which is pressurised to 30 barg by the nitrogen compressor, and then sent to the syngas mixing drum in the Argentia Green Fuels Facility. A stream of waste oxygen and some argon is produced by the bottom product of the column, which is used by the molecular sieve beds or vented to a safe location.

The Haber-Bosch process will be used to produce ammonia (NH_3), which involves mixing hydrogen produced from the electrolyzer in a 3:1 stoichiometric ratio with high purity nitrogen from the ASU using a catalyst under high temperature and pressure. A multistage centrifugal compressor train compresses the ammonia syngas to 140 barg and 70°C. Unreacted components are recycled back into the compressor's stages to improve plant conversion overall.

$$N_2 + 3H_2 \rightarrow NH_3 \rightarrow \Delta H_{298K} = -91.4 \frac{kJ}{mol}$$

The ammonia reaction is exothermic, and depending on operation circumstances typically exhibits a per-pass conversion of 20-30%. Overall conversion efficiency of the system is enhanced/increased by employing a recycle reactor, which cycles the syngas stream through a loop to generate more product.

Chilling machines and refrigeration units will cool the hot ammonia product to its saturation temperature of -32°C at atmospheric pressure. The high temperature reactor effluent is used for heat integration of the reactor feed. A system of chillers is employed in conjunction with a vapour compression refrigeration cycle to reach saturation temperature.

The ammonia plant efficiency does not reduce linearly. All rotating equipment still needs similar power draw during turndown compared to operating at full capacity to circulate unreacted synthesis gas, maintain temperatures in the storage tanks, and maintain the refrigeration loop cycle.

Table 2.3.1-1 Ammonia and Nitrogen Input Parameters for the Model.

Input	Value	Unit
Turndown	40	% of maximum capacity
Syngas Conversion	99.7	% of correct stoichiometric ratio
ASU Power Consumption	107	kilowatt hour per tonne (kWh/t) of N_2

2.3.1.3 Water Supply

The Town of Placentia's municipal water supply system currently provides water to the Argentia Peninsula. The Town of Placentia Protected Public Water Supply Area (PPWSA) encompasses Clarke's Pond and Larkins Pond, with Barrows Pond and Gull Pond as backups when necessary. Wyses Pond is also listed as a part of the PPWSA, however, the supply line has been closed off for some time and the Town of Placentia does not intend to reopen it due to water quality concerns.

Water supply for the Project will be obtained from the PPWSA, which would require connection to the town's water infrastructure. According to preliminary discussions with Town Officials, it is anticipated that the surface water resources in the Town of Placentia PPWSA can supply all the process water requirements for the Project. A Source Water Hydrology Analysis (Appendix C1) was completed to confirm availability of water for both municipal and Project requirements. An alternative water supply option was also reviewed and described in Section 2.4.1.3.

2.3.1.4 Water Requirements

The electrolyzer in the Argentia Green Fuels Facility will receive water that has been demineralized and treated, likely via de-chlorination and reverse osmosis, before it enters the electrolyzer. In the production of demineralised feedwater, reject water with a higher conductivity than the intake water will be generated. The percentage of water rejected is estimated to be 25%, based on the source water quality data. A considerable increase in water demand of up to 80-90 L/s would be required for evaporative cooling of the plant, and so non-evaporative cooling will be the design basis for the Project. The Town of Placentia water flow requirement was evaluated against electrolyzer plant sizes in the preliminary assessment of proposed water requirements by AtkinsRéalis. The calculation results showed that a minimum flow rate of 11.6 L/s (25% reject water) and a maximum of 14.4 L/s (40% reject water) are needed for an electrolyzer system with 150 MW installed capacity and 67,920 kg/day of hydrogen production. Optimization modelling determined that the optimal facility size is a 160 MW electrolyzer connected to a 400 TPD ammonia plant.

The water demand for the Project is based on an electrolyzer rated capacity of 71,040 kg/day of hydrogen production, and an electrolyzer consumption of between 9-11 kg of water per 1 kg of hydrogen produced. The water requirement for the Project is calculated from the above-mentioned parameters:

$$71{,}040\ \frac{\text{kg of } H_2}{\text{day}} \times 9\ \frac{\text{kg of } H_2O}{\text{kg of } H_2} \times 0.001\ \frac{\text{m}^3 \text{ of } H_2O}{\text{kg of } H_2O} = 639.36\ \frac{\text{m}^3}{\text{day}}$$

$$71{,}040\ \frac{\text{kg of } H_2}{\text{day}} \times 11\ \frac{\text{kg of } H_2O}{\text{kg of } H_2} \times 0.001\ \frac{\text{m}^3 \text{ of } H_2O}{\text{kg of } H_2O} = 781.44\ \frac{\text{m}^3}{\text{day}}$$

The Project is expected to require between 639.36 m^3/day and 781.44 m^3/day of water, which assuming 40% reject water from water treatment is equivalent to 1,065.6 m^3/day and 1,320.4 m^3/day, respectively. The water consumption demand was therefore conservatively estimated at 1,185 m^3/day (13.7 L/s) (AtkinsRéalis, 2023).

The Argentia Green Fuels Facility will require a non-evaporative cooling water system which is estimated to require an instantaneous maximum flow rate of 44 L/s at times. The cooling water system flow rate will not be a constant demand and is accounted for in the Project water consumption of 1,185 m^3/day (13.7 L/s). The cooling water system will be designed to remove heat from the electrolyzer and ammonia plant by rejecting the absorbed heat through an air-cooling mechanism. This design minimizes evaporative water losses and makes use of the colder climatic conditions of the region. The cooling water system consists of a holding tank, circulation pumps, chemical treatment packages, and fin-fan air coolers. The

fin-fan air coolers will be elevated banks of tubes, with fans assisting the air flow across the banks of tubes to extract heat from the atmosphere.

The Source Water Hydrology Report (Appendix C1) confirmed sufficient baseline water availability for the needs (13.7 L/s) of the Project, with provisions in place for operational adjustments during infrequent and extreme dry periods. Prior to commencement of Project operations, the Project will develop a Real-Time Water Monitoring Plan (Water Monitoring Plan), a draft Table of Contents (TOC) for this plan has been provided in Appendix C2. This plan will consist of not only a Surface Water Monitoring Plan but also an Ambient Surface Water Quality Grab Sampling Site Plan. The Water Monitoring Plan will outline water level and water quality thresholds (i.e., normal range, alert levels, critical levels), methods for monitoring that will include utilization of a real-time hydrometric station, as well as actions that would be taken based on water level and water quality thresholds, including potential curtailment of Project water use. This will allow the Project to monitor water levels, water quality, and climate. The Water Monitoring Plan will be developed in consultation with both the Town of Placentia and the Water Resource Management Department.

During operation of the Project, the Project will implement the Water Monitoring Plan and operate a water monitoring system utilizing a real-time hydrometric station and be monitored as per the Project Water Monitoring Plan to monitor source surface water used by the Project. These systems will monitor water levels, water quality, and climate. These systems will be integrated with water level monitoring thresholds and adaptive water management strategies to support the Project long-term and ensure the protection of the Public Water Supply and mitigate against drawdown below prescribed thresholds during potential dry conditions.

If real-time or grab sample water monitoring results pursuant to the Project Water Monitoring Plan indicate that curtailment thresholds for water levels or water quality conditions during dry conditions at the Public Water Supply are triggered as defined in the Water Monitoring Plan, Pattern will curtail water use from the Public Water Supply. Specifically, water use will be reduced or halted to prevent any adverse impact on the water availability and quality of the Public Water Supplies.

2.3.1.5 Storage and Transfer of Hydrogen and Ammonia

As described above, hydrogen and nitrogen will be generated on-site. The variable gaseous production resulting from the changing renewable energy flows to the ammonia synthesis facility will be buffered using gaseous storage tanks.

Hydrogen storage will be used to ensure a continuous supply for ammonia production, given the variability of electricity supply from intermittent wind production. Hydrogen will be stored in pressurized gaseous format in above ground pressure vessels. There will be a nominal amount of above-ground hydrogen storage in mild steel buffering tanks, however this is more for operational control rather than

storage. The Optimization Modelling carried out by AtkinsRéalis revealed that the optimal vessel size is for 0.2 days of hydrogen storage. Therefore, the amount of hydrogen storage required for the Project is approximately 14 t.

Liquified ammonia will be stored on-site in a 15 kilo-tonne (kt) tank as a link between continuous ammonia production and routine ship pickups. Ammonia will be stored in the tank at its saturation temperature at atmospheric pressure. The storage capacity of the ammonia tank is designed to contain approximately 40 days of 400 tpd ammonia production. The shipping routine will require transit ships that follow a 30-day schedule, therefore requiring 29 days of ammonia storage on-site and one day for loading onto the transport vessel. The extra storage capacity will serve as a reserve to handle contingencies and delays in maritime operations.

Ammonia will be transferred through a constantly circulating transfer line from the storage tanks to the loading arms for offtake in the ammonia carrying vessel at the Loading Facility, further described in Section 2.3.4. Up to two loading arms will be fixed to the Cooper Cove wharf extension. The wharf extension is included as part of the Cooper Cove Marine Terminal Expansion Project (Registration No. 2279). It is the only in-water infrastructure required for the loading of ammonia.

2.3.1.6 Wastewater

The Argentia Green Fuels Facility will use water according to the water balance diagram, shown in Figure 2.3.1-3. The hydrogen and ammonia production processes will generate wastewater streams with varying compositions, depending on the specific processes and raw materials used, necessitating different treatment regimes. Water usage within the Argentia Green Fuels Facility is outlines as follows:

- Hydrogen production:
    - Reagent utilized in the production of hydrogen.
    - Cooling employed in the hydrogen electrolysis process.

- Ammonia Synthesis:
    - Boiler feed water used for the ammonia synthesis process boiler.
    - Cooling applied to manage the heat generated during exothermic ammonia synthesis reactions.

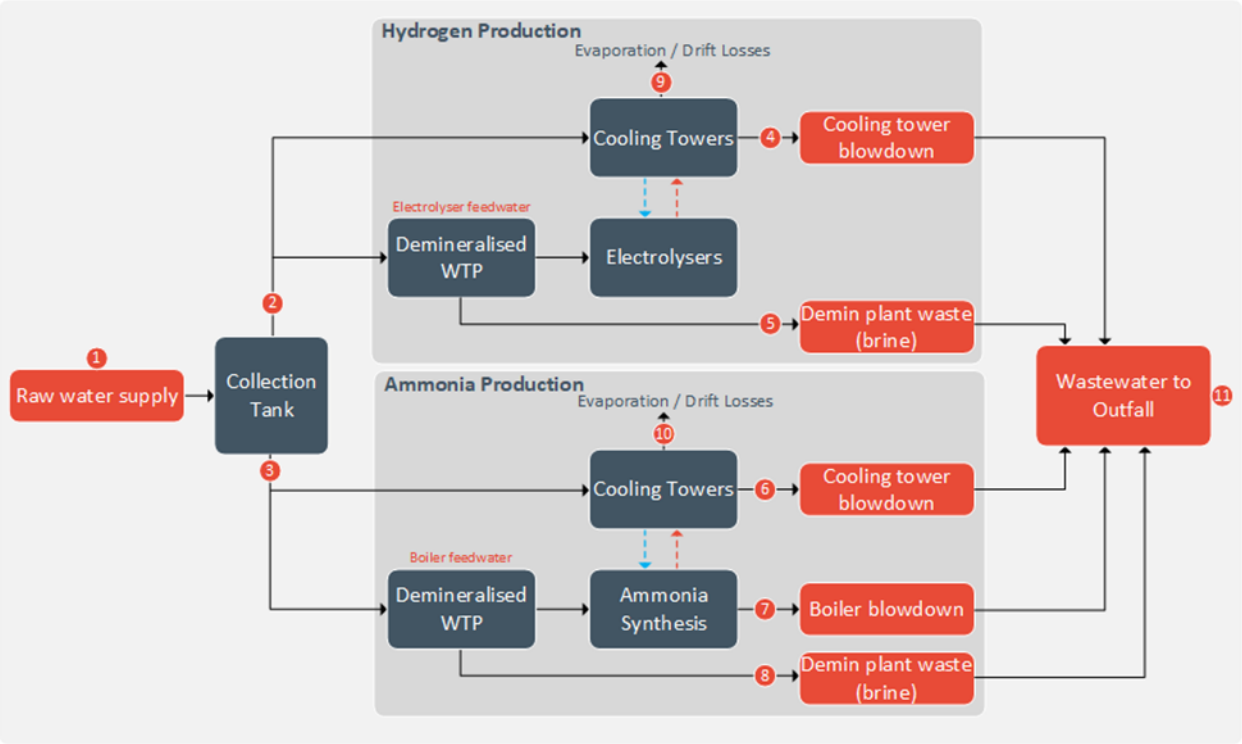


Figure 2.3.1-3 Site-Wide Water Balance Diagram for Hydrogen Generation and Ammonia Synthesis Processes.

The following wastewater streams are expected:

Demineralized Water Treatment Plant (WTP) Concentrate/Brine

The concentrate or brine from the demineralized WTP, assumed to be a membrane process, is a fraction of the feedwater containing a high concentration of dissolved solids derived from the feedwater to the system. Essentially, the basic chemistry of the brine stream is mirrors that of the raw water supply, but with the salts concentrated up by a concentration factor determined by the system's recovery rate (i.e., [1/(1-y)] where Y is the recovery expressed as a decimal). Assuming an overall recovery of 75% for the demineralized WTP, the concentration factor is calculated to be 4.

In addition to the original components of the raw water, chemicals may be dosed to help prevent scaling on the membranes. The type of scaling inhibitor will be selected based on local regulations relating to their concentrations in the effluent discharge. Understanding the requirements of the receiving water body is critical in selecting the chemical dosing regimen. It is expected that the TDS of this blowdown stream will be significantly lower than the overall concentration of the seawater, and therefore the effluent discharge is not expected to be an environmental concern.

The demineralized WTP will produce a low volume of chemical waster during periodic chemical cleaning (high and low pH), which will be neutralized and discharged to the marine environment.

Boiler Blowdown

Boiler blowdown is a small proportion of the boiler feedwater and steam condensate systems. The blowdown is typically less than 1% of the total mass of water circulating within the steam systems and is required to purge contaminants from the system. Boiler feedwater is a very pure water, so the blowdown is generally very clean by most standards.

Domestic Sewage

Domestic sewage from site administration and operational buildings is expected to be sent to the local municipal wastewater treatment works/outfall. No provision is made for on-site sewage treatment.

Cooling Tower Blowdown

Cooling tower blowdown will be derived from the evaporative cooling systems at the hydrogen and ammonia production facility. The cooling towers are expected to operate with cycles of concentration between 1.5 and 3 to control the concentration of dissolved solids (TDS) within the circulating cooling water.

The basic chemistry of the blowdown stream will be essentially the same as the raw water supply but with salts concentrated by a factor of 1.5 to 3 times. In addition to the original components of the make-up water, chemicals may be dosed to help prevent scaling and the buildup of biofilms within the system. The types of biocides and scaling inhibitors will be selected based on local regulations relating to their concentrations in the effluent discharge.

Understanding the requirements of the receiving water body is critical in selecting the chemical dosing regimen. It is expected that the TDS concentration of this blowdown stream will be significantly lower than the overall TDS concentration of the seawater. Consequently, the effluent discharge is not expected to be an environmental concern.

Process Contact Wastewater

Process contact wastewater will be treated in a comprehensive system that includes a wastewater drum, stripper, various coolers, and transfer pumps designed to handle electrolysis reject water, blowdown, and water that comes into contact with process gas. Wastewater generated from the Argentia Green Fuels Facility will accumulate in the wastewater drum. When the volume in the drum reaches a certain level,

an automatic level controller will start the pit pump to transfer the water to the stripper. The stripper will be a vertical packed bed tower designed to remove traces of ammonia from the wastewater, with the assistance of low-pressure steam. The stripped gaseous ammonia will be sent to the flare, while the remaining wastewater will be cooled and held in a transfer sump before being discharged or sent for additional effluent treatment. Additionally, temperature control in the transfer sump will ensure the wastewater is adequately cooled for safe discharge to the marine environment.

Wastewater from the Argentia Green Fuels Facility will be processed and discharged to the marine environment. Argentia Renewables will ensure that the wastewater contaminant concentrations are within the allowable limits for discharge as specified in Schedule A of NLR65/03: **Environmental Control Water and Sewage Regulations** under the **Water Resources Act**.

Electrolyzers used for hydrogen production typically require in-line water treatment technologies to manage and treat water used in the electrolysis process. Water treatment is crucial to ensure the quality of incoming and outgoing water, prevent equipment corrosion, and comply with environmental regulations. The pretreatment process will utilize reverse osmosis due to the Town's water supply system having low total dissolved solids (TDS) levels. Surface water sampling results from May 2023 showed significant chloride content. The chloride content necessitates dechlorination prior to electrolysis, as halogens can react with the hydrogen product. Sampling results also revealed elevated concentrations of magnesium, sodium, and calcium. The need to treat these parameters will depend on the specific requirements of the electrolyzer.

Wastewater treatment requirements will be established during the detailed design of the Project to align with the composition of wastewaters produced from the selected electrolyzer technology and will be provided to the NL Department of Environment and Climate Change (NL DECC) once available. The characterization of influent quality and quantity is subject to modification; however, estimates are provided in Section 2.3.4.2. Wastewater will be generated when the inflow water is purified before entering the electrolyzer, as well as when water and process gases interact.

Based on the detailed characterization of the effluent in Section 2.3.4.2, no parameters of concern have been identified. As a result, the wastewater is anticipated to meet the regulatory standards for discharge without necessitating additional treatment system(s) other than possible neutralization of membrane cleaning solutions. This assessment indicates that the effluent quality is within acceptable limits, thereby negating the need for extensive wastewater treatment infrastructure. However, ongoing monitoring will be implemented to ensure continued compliance and to address any potential issues that may arise in the future.

Outfall

The preferred effluent outfall location has not yet been selected. The location will be selected with a consideration of several factors, including; existing nearby outfall infrastructure, other existing marine operations, suitability of shoreline conditions, suitability of sea bottom conditions, property ownership, existing underground utilities, geotechnical conditions, pumping requirements, and cost effectiveness.

The final design of the outfall will show features and dimensions including:

- Routing and profile;
- Location of pipe discharge, including depth from surface and distance from shore;
- Pipe sizes and type;
- Joint details, including fittings/fastenings;
- Headworks structure;
- Rockfill protection in tidal zone;
- Cribbing; and
- Weight blocks and/or anchor blocks.

Existing public outfalls will not be used; however, existing industrial outfalls at the POA Property are being considered including the outfall associated with the West White Rose Project, and the outfall located at the northern end of Cooper Cove. More information regarding these outfalls can be found in Appendix B2.

2.3.1.7 Water Quality/Quantity Monitoring

Real-time water quality of incoming and outgoing water streams to and from the Argentia Green Fuels Facility will be monitored by an online analyzer. Design of the water quality and quantity monitoring systems is ongoing, and Argentia Renewables will comply with the NL Water Resources Management Division (NL WRMD), as well as Environment and Climate Change Canada (ECCC) to ensure enforceable operational requirements for industry stations are met.

Argentia Renewables will establish a Real Time Water Quality (RTWQ)/hydrometric monitoring station to provide near real time water quantity and quality information for a selected waterbody outflow within the PPWSA from which the Project will draw water. There are no existing hydrometric or RTWQ monitoring stations at any of the streams within the Town of Placentia PPWSA. The ponds have surface water intakes in Larkins Pond, Clarke's Pond, and Gull Pond. According to the National Hydro Network linear flow data, surface water ultimately flows out of the PPWSA system at the outlet of Larkins Pond (Water Resources Portal, 2024). Prior to Project construction, RTWQ/hydrometric monitoring station(s) be installed and commissioned to continuously monitor water quantity and quality at waterbodies from which

the Project draws water. Station locations will be selected in consultation with NL DECC. Collected water quality and quantity data will also support the ongoing efforts by WRMD to collect grab samples from PPWSA ponds to monitor source water quality. Station design (such as equipment with digital data loggers and satellite transmission) and data quality assurance/quality control will adhere to the guidance established in the WRMD Protocols Manual for Real-Time Water Quality Monitoring in NL (2023).

The continuous collection of water quality data will be used to monitor the health of the aquatic ecosystem in the selected source waterbody and to determine timelines for specific events that occur. Moreover, this information will prove valuable to the Town of Placentia in ensuring availability of water for municipal use. As noted in Appendix W (Mitigation Measures) if it is determined based on water monitoring during Operations that Project drawdown of available water could cause a temporary water shortage or any material water quality changes to the Town of Placentia municipal water supply, Project consumption of water affecting the Placentia municipal water supply would be curtailed until this condition is no longer met.

Further specifications regarding water management and monitoring during Construction, Operation and Maintenance, and Decommissioning and Rehabilitation shall be developed as the Project progresses. A Water Management and Monitoring Plan annotated table of contents appears in Appendix C2.

2.3.1.8 Operations and Maintenance Building

Up to two operations and maintenance buildings (O&M buildings) will be constructed in the Project Area to monitor daily operations of the Argentia Green Fuels Facility and provide an area for storage of spare parts and maintenance equipment. The O&M buildings will have offices, staff parking, a workshop, parts and vehicle storage, a sewage treatment system, a storage yard, and other ancillary amenities. Water will be supplied by the Town of Placentia. Workers will produce a limited amount of solid waste (garbage and recycling) when performing maintenance and this waste will be collected and disposed of at an authorized facility. Power to the O&M buildings will be provided by the local distribution network.

2.3.2 Argentia Wind Facility

The Argentia Wind Facility will include up to 46 wind turbine sites connected by a network of access roads and electrical infrastructure. Based on the Preliminary Layout, six wind turbines will be sited on the Argentia Peninsula, four turbines will be located just south of Highway 102 near Cooper Drive, and the remaining 36 turbines will be distributed throughout the Argentia Backlands (Figure 2.3-1). A series of water supply pipelines connecting the municipal water supply to the Argentia Green Fuels Facility.

The proposed Argentia Wind Facility will be the primary source of electricity for the Argentia Green Fuels Facility. The NLH electricity grid will serve as a backup power source to ensure continued operation of the Argentia Green Fuels Facility. The electricity provided from the NLH grid is produced mainly from

hydropower, therefore, the output is expected to qualify as renewable, or “green” hydrogen and ammonia. This link will be designed to enable the delivery of 10 MW of firm power and 145 MW of non-firm power. Alternatives to the Preliminary Layout are described in Section 2.4 (Alternative Methods of Carrying Out the Undertaking).

2.3.2.1 Wind Turbines

The Project electricity generation will total 300 MW of installed capacity from wind turbines located throughout the POA Property (Figure 2.3-1). The current wind turbine model for the Project is a 6.8 MW wind turbine, with a hub height of 100 - 119 m (119 assumed), and a rotor diameter of 162 m. The final wind turbine model selection is anticipated to be substantially similar to the model provided in Figure 2.3.2-1. The wind turbine towers will be constructed from tubular steel and concrete or a combination of tubular steel and concrete. Concrete hybrid towers consist of a concrete base with a transition piece towards a tubular steel top. The concrete bottom is comprised of precast high strength concrete rings, and the tubular steel top is comprised of flange joined steel sections. The rotor blades are made of fiberglass and epoxy resin. Each wind turbine will have a nacelle at the top of the tower to contain a generator, gearbox, bearings, couplings, and auxiliary equipment.

Each turbine will require a foundation and an adjacent crane pad for installation of the wind turbine components. The foundation cleared area will be approximately 100 m X 75 m. Crane pads typically measure 20 m x 30 m, with their detailed design reflecting the specific requirements of the cranes used. Following Construction, each crane pad will remain in place during Operation and Maintenance, and Decommissioning and Rehabilitation to support such activities as the removal or replacement of wind turbine components.

The 6.8 MW wind turbine is a pitch-regulated upwind turbine with a three-blade rotor. The blades consist of two airfoil shells with incorporated structure. The blade angles are optimized by a pitch control microprocessor system that constantly adjusts blade position according to ambient wind conditions. The wind turbine is powered by a magnet generator and full-scale converter. The pitch control microprocessor concept and the power system features allow each unit to operate continuously at or close to their rated power.

The 6.8 MW wind turbine is designed for medium to high sustained wind velocity sites. Operational specifications (Table 2.3.2-1) include a cut-in wind speed of 3 m/s, a cut-out wind speed of 25 m/s, and an operating temperature range between -20 °C and +45°C.

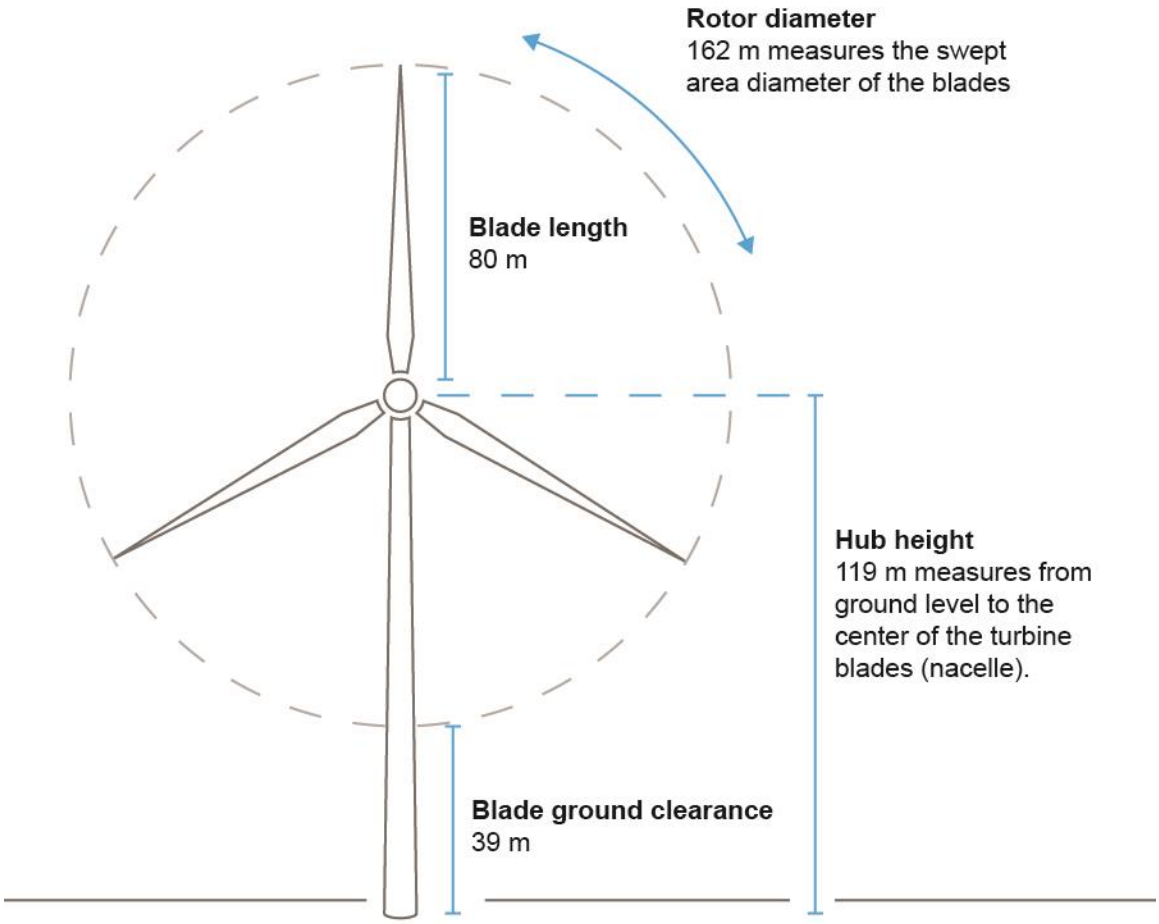


Figure 2.3.2-1 Standard Wind Turbine Profile.

Table 2.3.2-1 Wind Turbine Mechanical Design Specifications.

Wind Turbine Component	Specification
Rotor	
Rotor Diameter	162 m
Swept Area	20,612 m^2
Speed, Dynamic Operation Range	4.3 – 12.1 rpm
Rotational Direction	Clockwise (front view)
Orientation	Upwind
Tilt	6°
Hub Coning	6°
Number of Blades	3
Aerodynamic Brakes	Full feathering
Blade	
Blade Length	80 m
Maximum Chord	4.3 m
Chord at 90% blade radius	1.68 m
Type Description	Structural airfoil shell
Material	Fibreglass reinforced epoxy, carbon fibres and Solid Metal Tip
Blade Connection	Steel roots inserted
Airfoils	High-lift profile
Pitch System	
Type	Hydraulic
Number	1 cylinder per blade
Range	-20°C to +45°C
Hydraulic System	
Main Pump	Redundant internal-gear oil pumps
Pressure	Max. 260 bar
Filtration	3 µm (absolute) 40 µm in line
Hub	
Type	Ball shell hub
Material	Cast iron
Main Shaft	
Type Description	Hollow shaft
Material	Cast iron
Main Bearing Housing	
Material	Cast iron
Main Bearing	
Type	Rolling bearings
Lubrication	Oil circulation
Gearbox	
Type	2 Planetary stages
Gear House Material	Cast
Lubrication System	Pressure oil lubrication

Wind Turbine Component	Specification
Total Gear Oil Volume	900-1,100 L
Oil Cleanliness Codes	ISO 4406-/15/12
Generator Bearing	
Type	Rolling bearings
Lubrication	Oil circulation
Yaw System	
Type	Plain bearing system
Material	Forged yaw ring heat-treated. Plain bearings PETP
Yaw gear type	Multiple stages planetary gear
Yawing Speed (50 Hz)	Approx. 0.4°/sec.
Yawing Speed (60 Hz)	Approx. 0.5°/sec.
Crane	
Lifting Capacity	Max 800 kg
Towers	
Type	Tubular steel towers Concrete Hybrid Towers
Modularized Nacelle	
Main nacelle house and side compartment structure	Sheet metal structure. GRP components in roof dome and front cover.
Base frame	Cast iron

2.3.2.2 Wind Turbine Foundations

Foundation conditions will vary throughout the Project Area; hence several types of foundation designs will apply. Geotechnical evaluations will be required to determine the most suitable design for each wind turbine location. The most common foundation is expected to be rock-anchored concrete cap type (Table 2.3.2-2), with gravity cast-in-place concrete making up the remainder (Table 2.3.2-3). The latter design includes provision to accommodate buoyant conditions where groundwater presence is shallow.

Table 2.3.2-2 Rock-Anchored Foundation Design Quantities.

Concrete	Base	Diameter (m)	14.5
		Thickness (m)	3
		Total Structural Volume (m^3)	462
	Min. Lean Concrete	Thickness (m)	0.3
		Volume (m^3)	54
Rock Anchors	Number		24
	Diameter (mm)		64
	Length (m)		15.24
	Bonded Length (m)		7.5
	Pre-Stress Load (kN)		2,100
Reinforcement	Density (kg/m^3)		150
	Quantity (kg)		69,300
Earthworks	Excavation	Volume (m^3)	864
	Backfill	Volume (m^3)	381

Table 2.3.2-3 Gravity Foundation Design Quantities.

Foundation Type			**Non-Buoyant**	**Buoyant**
Groundwater Level Below Existing Grade (m)			>3.1	0.3
Top of Concrete (TOC) Elevation Above Existing Grade (m)			0.5	0.9
Concrete	Base	Diameter (m)	23.5	27.0
		Thickness (m)	2.5	2.7
		Toe Thickness (m)	0.5	0.5
		Volume (m^3)	618	843
	Pedestal	Diameter (m)	7	7
		Thickness (m)	1.1	1.5
		Volume (m^3)	42	58
	Total Structural Volume (m^3)		660	901
	Min. Lean Concrete	Thickness (m)	0.1	0.1
		Volume (m^3)	51	66
Reinforcement	Density (kg/m^3)		100	100
	Quantity (kg)		66,000	90,100
Earthworks	Excavation	Volume (m^3)	2,079	2,814
	Backfill	Volume (m^3)	1,430	2,645

2.3.2.3 Electrical Infrastructure

Electrical infrastructure will be required to collect power generated by the Argentia Wind Facility, transmit the power to the Argentia Green Fuels Facility, as well as to transmit power from the NLH grid to the Argentia Green Fuels Facility, when required.

Energy generated at each wind turbine site will be conveyed by a series of low voltage (34.5 kV) Collector Lines that run to a substation in the Argentia Backlands (the Argentia Backlands Substation). Approximately 39 km of overhead lines with approximately 8 km of underground in/out cabling will be used to connect the Collector Lines System to the turbine sites. The overhead portions of the system will have a single wood pole design. Substantial bedrock exists in Argentia, and soil conditions may not be suitable for a trenched system, therefore final differences between overhead and underground configurations will be refined based on additional geotechnical work. For that reason, the Collector Lines System is mostly planned as an above-ground system to limit the extent of drilling and blasting of cable trenches.

There will be two electrical substations located in the Project Area, one in the Argentia Backlands and the other on the Argentia Peninsula. The Collector Lines will connect to the Argentia Backlands Substation, where the generated power will be increased to transmission voltage (230 kV) to reduce energy loss due to resistance that occurs over long distances. The Project Green Fuels Generation Interconnect Line (Project Gen-Tie), a high voltage (230 kV) overhead powerline, will transmit the power from the Argentia Backlands Substation to the Argentia Peninsula Substation. The Argentia Peninsula Substation will decrease power to distribution voltage (34.5 kV) to provide energy for use in the Argentia Green Fuels Facility and ancillary buildings. In this way, the Argentia Wind Facility will connect to the Argentia Green Fuels Facility “behind the meter”. Both substations have an overhead bus design which includes main power transformers (with containment), high and medium voltage breakers, disconnects, surge arrestors, fencing, lighting, instrumentation, a station service transformer, and a control building. The Argentia Backlands Substation is anticipated to have two 230-34.5 kV power transformers, a capacitor bank, and a radial high voltage breaker present. The Argentia Peninsula Substation is expected to have two 230-34.5 kV power transformers and one 34.5-15 kV power transformer present.

The Project Interconnect Line will be approximately 35 km long and will connect the NLH Long Harbour Terminal Station to the Argentia Backlands Substation to transmit electricity from the Island Interconnected System to the Project, when required. The Project Interconnect Line will match the voltage of the NLH TL208 transmission line (230 kV). Utility poles will be H-frame wood poles with 3-pole dead-ends and heavy angles, with a ruling span of 80 m.

The Preliminary Layout provided in Figures 2.3-1 and 2.3-2 include the current design configurations of the collector lines, substations, and transmission lines. The Project Interconnect Line generally follows a corridor along an existing Newfoundland Power 69 kV powerline right-of-way to the Long Harbour

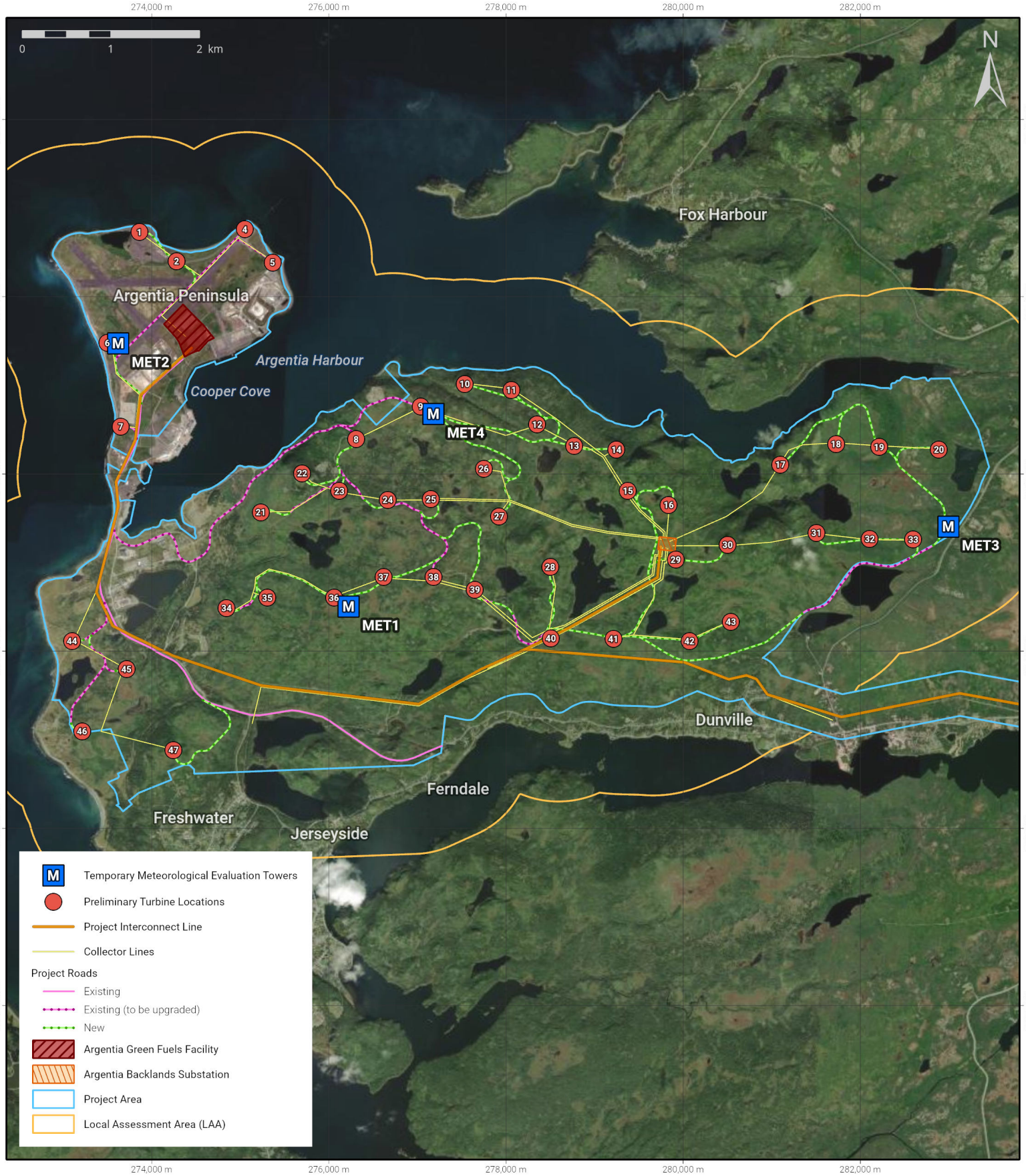
Terminal Station. The Collector Lines System preliminary layout was produced by Capacitated Minimum Spanning Tree analysis with ten circuits connecting to the Argentia Backlands substation and two circuits connecting to the Argentia Peninsula Substation, with a maximum of four turbines per circuit and a capacity of 27.2 MW per circuit.

2.3.2.4 Project Access Roads

Access roads will be required for construction, operation and maintenance, and decommissioning and rehabilitation phases of the Project. Figure 2.3-1 provides an overview of the Project road infrastructure and categorizes the road network into new roads, existing roads that will not be upgraded, and existing roads that will be upgraded. Road stream crossings will be designed for 1:100-year climate change flows to avoid waterlogging and drainage issues in the project area. One of the key design considerations for road placement is the transportation of cranes, wind turbine components, and foundation components to each site. The current estimate is for 42 km of new gravel roads to be constructed, and the upgrade of 6.5 km of existing gravel roads and 1.5 km of existing paved road. Access roads will range in width from 5 to 20 m and be designed to avoid or reduce negative environmental effects (i.e., maintaining local drainage patterns and reducing width of disturbance). Project access roads are further discussed in Appendix E (Transportation Impact Study).

2.3.2.5 Meteorological Evaluation Towers

Meteorological measurements are necessary for the accurate quantification of the available energy from the Argentia Wind Facility. The collected data includes wind speed and direction, air temperature, barometric pressure, and relative humidity. Four temporary meteorological evaluation towers (METs), which are 60 - 80 m in height above ground surface, have been installed in the Project Area as shown in Figure 2.3.2-2. Ground-based remote sensors, commonly referred to as LiDAR (Light Detection and Ranging), have also been installed. Two permanent METs will be installed with the turbines, and these shall remain with the Project through its lifetime for performance monitoring, resource forecasting, and to satisfy grid offtaker requirements. The permanent MET masts are typically self-supported, painted and lit steel lattice structures with a height equal to the hub height of the turbines (currently 119 m). These permanent structures have an approximate base footprint of 15 m x 15 m and no guy wires. The locations of the permanent METs will be determined during a later phase of the Project design.

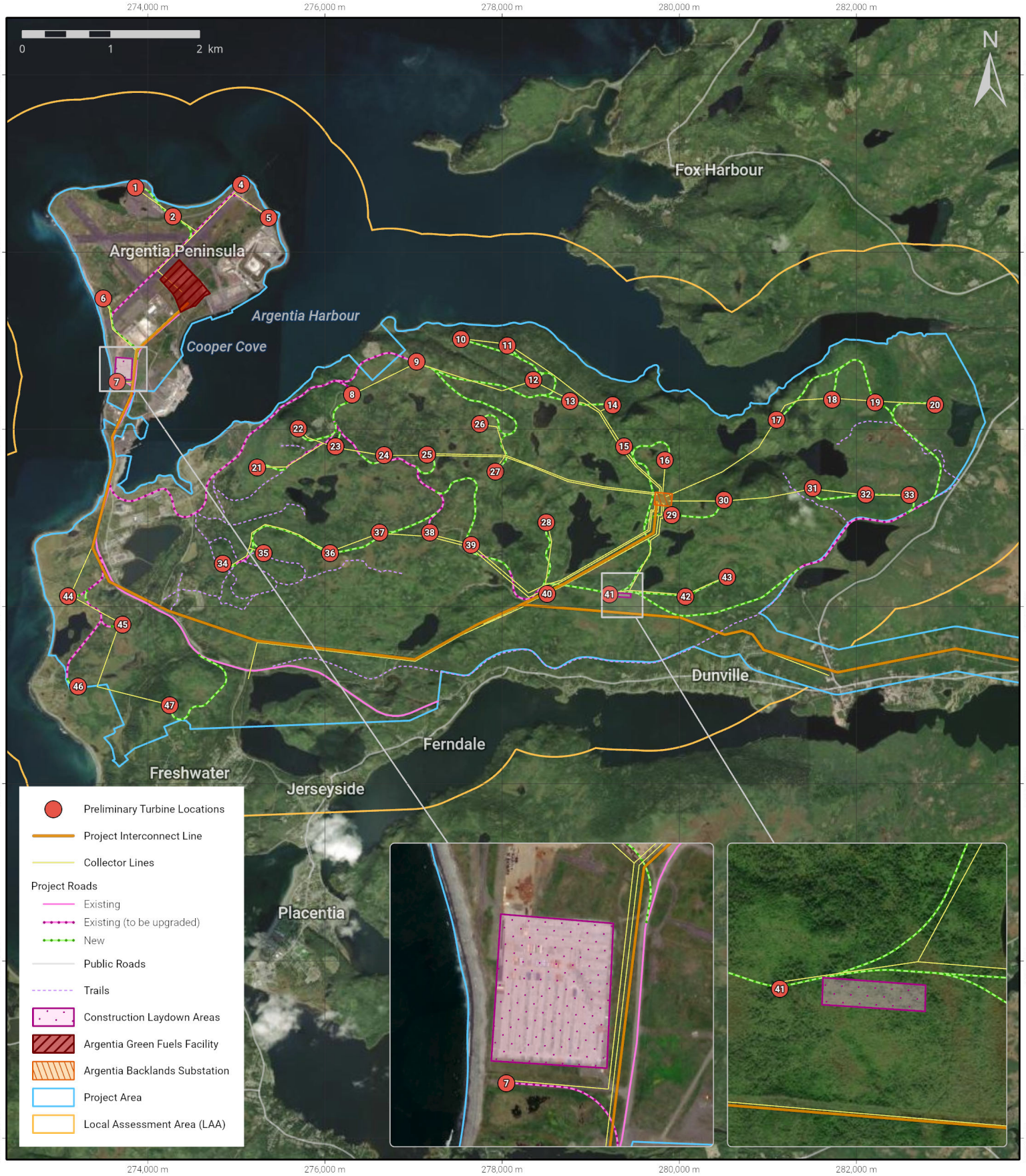


Pattern | Argentia Renewables	FIGURE NUMBER: 2.3.2 - 2	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/25
	FIGURE TITLE: Locations of Temporary Meteorological Evaluation Towers	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change.	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	sem

SEM MAP ID: 238-005-GIS-006-Rev1

2.3.2.6 Laydown Areas

Temporary construction compounds and laydown areas will be needed for general construction activities and the temporary storage of wind turbine components, electrical equipment such as cable reels and pad-mounted transformers, construction materials and equipment, vehicles, office trailers, a concrete batch plant, crusher(s), and portable toilets. The existing available POA Property on the Argentia Peninsula will be used extensively to reduce the need for additional terrain disturbance. At the Argentia Backlands, however, an area comprising six ha will be required. The anticipated configurations of laydown areas are provided below in Figure 2.3.2-3.



Pattern | Argentia Renewables	FIGURE NUMBER: 2.3.2 - 3	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/25
	FIGURE TITLE: Location of Construction Laydown Areas	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change.	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	sem

SEM MAP ID: 238-005-GIS-007-Rev1

2.3.3 Construction

The Project construction phase will include the installation of wind turbines, electrical infrastructure, water collection systems, access roads, hydrogen electrolyzers and storage, ammonia synthesizer units and storage, maintenance buildings, and other supporting infrastructure for the Argentia Green Fuels Facility and the Argentia Wind Facility. The key features of Project Construction are summarized in Table 2.3.3-1.

Comprehensive planning and design activities were conducted, including the collection of required site-specific information. These surveys characterize a variety of site conditions. Major studies include geotechnical surveys to analyze soil and foundation conditions, installation and operation of meteorological towers to gather critical weather data and environmental surveys to establish baseline conditions. Wind turbine site selection, infrastructure routing, and wind turbine foundation design are dependent on the results of these surveys.

A wind resource assessment began in late 2022 and is ongoing through 2024 to determine the average wind speeds, wind direction, and frequency of high wind events. Specifications for wind turbines, such as rotor diameter, hub height, and power capacity, will be made based on the site's conditions, while also considering reliability, efficiency, and cost.

Table 2.3.3-1 Key Metrics Associated with the Construction of the Project.

Key Metrics	Estimated Quantity
Total Road Length	1.5 km of paved road upgrades, 6.5 km of gravel road upgrades, and 42 km of new gravel roads
Number of Wind Turbine Sites	46
Wind Turbine Major Component Deliveries	352 deliveries via marine vessel for nacelles, hubs, blades and towers
Wind Turbine Site Laydowns	6 ha
Concrete	23,520 m^3 (foundations), 425 m^3 (substations), 113 m^3 (building)
Common Excavation	238,000 m^3 (gravel roads), 115,500 m^3 (turbine areas), 12,000 m^3 (Port laydown and staging area), 25,000 m^3 (Backlands laydown), 56,600 m^3 (foundations), 4,150 m^3 (substations), 1,500 m^3 (yard)
Rock Excavation (Quarried)	133,500 m^3 (gravel roads), 69,300 m^3 (turbine areas)
Crushed Aggregate	5,830 m^3 Argentia Green Fuels Facility and 144,740 m^3 Argentia Wind Facility
Bulk Explosives	250,000 kg
Person Hours	3,848,000
Construction Duration	29 months for the Argentia Green Fuels Facility and 22 months for the Argentia Wind Facility

Once the initial planning and design are completed, and approvals issued by regulatory agencies, Project Construction will commence. Initial efforts will focus on the preparation of infrastructure such as the construction of access roads, installation of above and below-ground collector lines and substations for the electrical transmission system, installation of temporary infrastructure, such as wind turbine staging areas, construction compounds, and laydown areas, and construction of necessary support facilities.

Temporary laydown and storage areas will be established to accommodate the placement of various construction materials and equipment. The establishment of infrastructure for the Argentia Wind Facility component of the Project requires transportation and storage of Project materials and equipment, wind turbine foundation construction, wind turbine tower assembly, and wind turbine installation. Foundation installation for wind turbines involves excavation, concrete pouring, and installation of anchors. Soil conditions, wind loads, and seismic activity need to be factored into the foundation design. Foundations will be built for stability and longevity. The towers will be assembled on-site and firmly anchored to the foundation. For the rotors to reach optimal wind speed, each tower must be of a prescribed height and able to accommodate anticipated wind loads. The wind turbine components (rotor, gearbox, generator, control systems) must be transported to each site and installed following the manufacturer's instructions.

The development and design phase will guide the construction of the hydrogen and ammonia facility components, ensuring alignment with the availability of necessary resources. The establishment of infrastructure for the Argentia Green Fuels Facility involves an array of construction activities. These encompass the construction of essential electrical infrastructure, installation of critical components such as the Haber-Bosch reactor and electrolyzer, piping systems, and deployment of the air separation unit, nitrogen compressors, and an emergency power generation unit. The particulars of the Project also include the installation of the ammonia synthesis unit, the refrigeration unit, and the ammonia storage tank, accompanied by a boil-off unit. The installation of process flare and storage flare units is integral to the facility's safety and operational protocols.

The Project will employ approximately 960 full-time equivalent positions (50 hr/week) for construction and on-site assembly work during peak construction activities, requiring a variety of skills. Section 3.1.6.1 Project Occupations provides a detailed list and categorization of occupations anticipated during the construction phase according to the National Occupational Classification (NOC) 2021.

2.3.3.1 Emissions and Energy Use

The Project construction phase will generate noise, vibration, and light emissions (Table 2.3.3-2). Construction Phase noise, vibration and light emission assessments are detailed further in Appendix J (Noise and Vibration Impact Assessment) and I (Light Impact Assessment). The Noise and Vibration Impact Assessment evaluates potential noise and vibration impacts from the Project based upon the largest potential wind turbine model that is being considered for the Project. This turbine model corresponds to an anticipated greatest potential level of sound and vibration relative to receptors in the

Project area. The purpose of evaluating the Project's noise and vibration impacts relative to the largest potential turbine model is to take a conservative approach to impact assessment.

Table 2.3.3-2 Noise, Vibration and Light Emission Sources: Project Construction.

Emission	Source
Light	Mobile equipment headlights, portable construction lighting
Noise	Operation of mobile equipment and small stationary construction equipment (e.g., generators, compressors, compactors, etc.), blasting activities
Vibration	Operation of mobile equipment and small stationary construction equipment (e.g., generators, compressors, compactors, etc.), blasting activities, site works (e.g., pile driving, site preparation, road construction, etc.)

The ranges of intensity of noise and light emissions are provided in Table 2.3.3-3; vibration emissions are assumed to be negligible during Project construction.

Table 2.3.3-3 Intensity of Noise and Vibration Emissions: Project Construction.

Emission	Metric	Range	Unit
Light	Luminous flux	5,200 - 85,000	Lumen (lum)
Noise	Sound power level	87 - 145	A-weighted decibel (dBA)

Project construction activities are not anticipated to generate sustained periods of low-frequency noise (LFN). LFN has frequency content ranging between 16 and 200 hertz (Hz), and is not well perceived by the human ear and is experienced instead as vibrations (Health Canada, 2017).

Additionally, Project construction activities will release carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen oxides (NO_x), and particulate matter (PM) to air. Emissions to air are generated via non-combustion and combustion processes, as detailed in Table 2.3.3-4.

Table 2.3.3-4 Air Emission Sources: Project Construction.

Emission	Source
Carbon Dioxide (CO_2)	Operation of mobile and stationary construction equipment, blasting
Methane (CH_4)	
Nitrous Oxide (N_2O)	
Carbon Monoxide (CO)	
Sulfur Dioxide (SO_2)	
Nitrogen Oxides (NO_x)	
Particulate Matter (PM)	Operation of mobile and stationary construction equipment, blasting, wind erosion of exposed surfaces (e.g., stockpiles, laydown areas), material handling, unpaved roads

CO_2, CH_4 and N_2O are greenhouse gases (GHGs) that directly contribute to climate warming. CO, SO_2, NO_x and PM are considered air pollutants; some air pollutants are indirect GHGs that contribute to climate warming by influencing atmospheric chemistry. Nitrogenous air contaminants were divided into two categories since N_2O is a direct GHG and NO_x are indirect GHGs. Key components of NO_x include nitric oxide (NO) and nitrogen dioxide (N_2O). Particulate matter referenced in Table 2.3.3-5 considers three size fractions: (1) fine particulate matter; (2) coarse particulate matter; and (3) total suspended particulate (TSP). Fine particulate matter is defined as particles with diameters less than or equal to 2.5 microns ($PM_{2.5}$) while coarse particulate matter is less than or equal to 10 microns (PM_{10}).

The primary source of air emissions released during Project construction is related to fossil fuel combustion in stationary and mobile equipment in the Project Area. Outside of the Project Area, fossil fuel (i.e., diesel) combustion will be required in marine vessels for the transport of major components from manufacturers. Annual fuel consumption requirements and associated GHG emissions for Project construction are provided in Table 2.3.3-5. GHG emissions are provided in terms of carbon dioxide equivalents (CO_2e), the sum of emissions of CO_2, CH_4, and N_2O following standardization by global warming potentials (GWPs) for each GHG. Emission calculation methodology, associated assumptions, and rationale is provided in Appendix H (Energy and Emissions Study). Appendix H also details indirect emissions and emissions generated from less dominant sources (i.e., non-fossil fuel related emissions).

Table 2.3.3-5 Annual Fuel Consumption and Emissions: Project Construction.

Construction Activity	Annual Fuel Consumption (L)	Annual GHG Emissions (tonnes CO2e)
Within Project Area[1]		
Stationary Combustion	182,862	1,531
Mobile Equipment	2,342,912	6,426
Outside of Project Area[2]		
Marine Transport	80,000,000[3]	172,223

[1] Projected to occur across two calendar years.
[2] Projected to occur across one calendar year.
[3] Provided as an estimate based on assumed routes and fleet, further details on estimation methods provided in Appendix H.

Within the Project Area, annual fuel consumption demand is dominated by mobile equipment during the construction phase. A list of key construction equipment is provided in Table 2.3.3-6. Emissions by mobile equipment category are provided in Appendix H.

Table 2.3.3-6 Equipment List: Project Construction.

Equipment Category		
Argentia Wind Facility	**Argentia Green Fuels Facility**	
Articulated Truck	Backhoe	Explosive Fasteners
Boom Truck	Compactor	Fork Truck
Bulldozer	Bulldozer	Generator
Compactor	Pickup Truck	Grinders and Cutters
Concrete Load Truck	Impact Pile Driver	Jack Hammers
Concrete Truck	Hydraulic Rock Breakers	Manlift
Crane	Vibratory Hammer	Welder
Drill	Flat Bed Truck	
Excavator	Concrete Truck	
Fuel Truck	Concrete Pump Truck	
Grader	Crane	
High Deck Trailer	Air Tracks (blasting)	
Loader	Backhoe	
Pickup Truck	Blasting Equipment	
Skid Steer	Compressor	
Telehandler	Concrete Saws	
Water Truck	Concrete Vibrators	

2.3.4 Operation and Maintenance

The operation and maintenance phase of the Project is anticipated to require a labour force of an estimated 51 full-time equivalent positions for the Argentia Green Fuels Facility. The Project will employ approximately 14 workers for the Argentia Wind Facility. Argentia Wind Facility staff will include a variety of service technicians including wind turbine monitors, geotechnical technicians for access road maintenance, electrical, electronics, and computer technicians for electrical transmission system, as well as engineers who will oversee operation of wind turbines and meteorological data acquisition. Section 3.1.6.1 Project Occupations provides a breakdown and listing of job categories, NOC designation, and number of occupations expected during the operation and maintenance phase according to the NOC 2021.

Regular maintenance is crucial for sustaining the efficiency and longevity of the Argentia Green Fuels Facility. Routine inspections will be conducted to detect faults in the equipment, especially piping, storage facilities, and related infrastructure. This can trigger changing out catalysts, replacing aged process equipment, and repairing or replacing damaged process components.

Argentia Wind Facility maintenance activities will include regularly scheduled monitoring of performance leading to updates to equipment and preventative maintenance and repairs. To ensure that all parts of the Argentia Wind Facility are inspected and maintained on a regular basis, a maintenance schedule will be developed and followed. Data collected during operation of the Argentia Wind Facility will be analyzed

to find trends and improve performance. This includes monitoring energy output, availability, and reliability of the wind turbines. A key objective is the avoidance of unplanned outages. These will be reduced through timely identification of changes in wind turbine performance. Continuous monitoring of wind speed and direction, air temperature, atmospheric pressure, electricity generation, and turbine performance will ensure optimal performance of the Argentia Wind Facility.

All components of the Argentia Wind Facility will be routinely inspected and serviced. The wind turbines will undergo regular inspections of the rotor, gearbox, and other crucial parts. Regular maintenance will be performed, including, cleaning and lubricating moving parts, checking electrical connections, and inspecting structural components. The manufacturer's recommendations and the Argentia Wind Facility operating conditions will serve as the foundation for the preventative maintenance schedule. The Argentia Wind Facility will be upgraded regularly to increase effectiveness and performance. This activity will include replacement of worn or damaged components, repair of electrical faults, troubleshooting control systems, and installing new technologies. Comprehensive documentation will be kept for all maintenance, repairs, and upgrades. The performance and maintenance of the Argentia Wind Facility such as road maintenance will be tracked using these records, and they will be reviewed regularly to pinpoint potential improvement areas.

Safety is of the highest priority for the Project, including the operation and maintenance of the Argentia Wind Facility. All personnel will receive regular safety training and follow the safety procedures in place. This includes checking that the wind turbines are free of hazardous debris and that all electrical components are grounded correctly. Emergency procedures will be in place to address equipment failure or other unplanned events. The Argentia Green Fuels Facility will adhere to industry safety standard operations and maintenance processes. The Argentia Wind Facility will be operated and maintained in a way that protects both people and the natural environment.

Preventative measures are necessary to inspect, maintain, and repair electrical systems safely and efficiently. Vegetation control methods may be implemented around transmission lines and substations to prevent damage to infrastructure and minimize any potential for contact with electric conductors. Along the 230kV interconnection with the NLH grid, clearing trees and excessive vegetation will be the responsibility of NLH. The objective of vegetation management is to remove potentially hazardous vegetation (spruce, fir, juniper, birch, and alder) and promote the growth of low-lying plant species (shrubs, grasses, and berries) to ensure reliability and safety objectives are met while minimizing potential environmental effects. Vegetation management techniques include application of selective (approved) herbicides in conjunction with manual brush clearing and tree trimming. Selective herbicides use drastically reduces the likelihood of power outages, fire hazards, and safety risks (Newfoundland Labrador Hydro, n.d.).

Produced ammonia will be stored between the arrival and loading of ammonia carrying vessels. The capacity of the storage tank will be paired with the shipping schedule for the ammonia product, currently estimated at 30 days of production. Liquified ammonia will be stored on-site in a 15 kt tank at its saturation temperature at atmospheric pressure. The storage capacity of the ammonia tank is designed to contain approximately 40 days of 400 tpd ammonia production. The buffering tank will provide operational control of the feed of hydrogen to the ammonia plant.

The extra storage capacity will serve as a reserve to handle contingencies and delays in maritime operations. The storage tank will be double walled, double integrity type, which consists of an inner and outer tank with insulation in annular space between the two tanks or on the outer tank. Storage tanks will be equipped with a deluge system. Since ammonia has a saturation temperature of -32°C, heat from the atmosphere will be absorbed by the contents of the tank. The evolved vapours will be sent to a boil-off unit, where they will be chilled and then returned to the tank to maintain the saturation temperature.

A continuously circulating transfer line will move ammonia from the storage tanks to the Loading Facility at the Argentia Peninsula dock. The loading mechanism will consist of a vendor supplied package of up to two loading arms. Liquid ammonia will be transferred to a refrigerated marine transport vessel which is headed for international markets. The Loading Facility dockside arrangement may be adjusted pending further design discussions with the POA, as described in Section 2.4.1.6.

Water supply for the Project will be obtained from the Town of Placentia PPWSA, which would require connection to the town's water infrastructure. Water treatment will involve dechlorination and reverse osmosis. The selected alkaline electrolyzer technology will determine the precise requirements of the feedstock water. Dechlorination is necessary prior to electrolysis since halogens will contaminate the hydrogen product.

The Argentia Green Fuels Facility will implement a closed loop system for equipment drainage. The following four water collection systems are assumed to be included in the wastewater treatment design such that direct discharge is permitted (contaminated water is subject to a wastewater stripper before being released):

- Clean Storm Water System drains to a clean storm water pond from both process and non-process areas. The collected water is to be pumped to the sea at the east side of the peninsula.

- Potentially Contaminated Sewer System – Surface runoff from potential contaminated process areas is drained into a potentially contaminated storm water pond. The pond is intended to hold ammonia-containing water from emergency spillage, spent fire water, storm events, and water from the diked impoundment of the ammonia storage tanks. If there is an ammonia release from the storage tanks, the pond design must have mechanisms for the environmentally safe

evaporation of the ammonia and foam that is added to the pond, as well as for the potential foam and water application emergencies. All effluent in this stream will be regularly sampled and analysed before being released into the environment. The electrolyzer water purification system will likely combine with the contaminated sewer system.

- Oily Water Sewer System – Potentially contaminated water from machinery houses is drained to nearby oily sumps. The collected water will be pumped to an effluent treatment plant oily water tank.

- Sanitary Water System – Sanitary water is emptied into a sanitary water tank from outlying buildings with kitchens, sinks, showers, and restrooms. The collected water is pumped to a sanitary sewage treatment plant.

2.3.4.1 Emissions and Energy Use

The 'Noise and Vibration Impact Study' (Appendix J) evaluated cumulative noise and vibration emissions from the concurrent operation of the Argentia Wind Facility and Argentia Green Fuels Facility for the lifetime of the Project. The study modelled sound and vibration levels at sensitive receptors with the greatest potential exposure to Project noise. The largest potential wind turbine model that is being considered for the Project was used in the modelling exercise as it corresponds to an anticipated greatest potential level of sound and vibration relative to sensitive receptors. Noise sources for Project operation are outlined in Table 2.3.4-1. Both A-weighted sound power level (dBA) by octave band in hertz (Hz) and total sound power level (dBA) are provided for each noise source. As a conservative measure, it was assumed that all noise sources will operate outside (i.e., not enclosed in buildings or structures).

For the most part, noise emissions will be constrained to the Project Area. The geographic reach of noise beyond the Project Area is detailed in Appendix J. The acoustic environment in the Local Assessment Area is not anticipated to change significantly because of Project operation and maintenance activities. Total (i.e., baseline plus Project) day-night average sound levels will deviate slightly from baseline levels, but will continue to comply with limits set forth by Health Canada (Health Canada, 2017). Modeling data was used to assess whether low frequency noise (LFN) will be generated by wind turbines. Per calculations performed as part of the Noise and Vibration Impact Study (Appendix J), LFN is not anticipated to be an issue at identified sensitive receptors.

Project operation and maintenance activities are not anticipated to generate substantial vibration emissions. A minimum setback to sensitive areas of 550 m will be maintained around all potential vibration sources to ensure that vibration effects are not experienced by receptors (FPT Committee on Health and the Environment Working Group on Wind Turbine Noise, 2012).

Table 2.3.4-1 Noise Sources: Project Operation and Maintenance.

Source	A-weighted sound power level (dBA) by Octave Band (Hz)									Total Sound Power Level (dBA)
	31.5	63	125	250	500	1,000	2,000	4,000	8,000	
Argentia Wind Facility										
Wind Turbine [1]	81.0	91	99	104	105	104	100	93	83	110
Argentia Green Fuels Facility										
Cooling Water Tower	39	52	60	77	72	77	79	79	75	85
Cooling Water Tower Vent	35	45	56	72	64	69	70	68	61	77
Nitrogen Compressor	65	79	92	101	110	123	129	122	114	131
Electrolyser Compressors 1	38	52	65	74	83	96	102	95	89	104
Electrolyser Compressors 2	49	63	76	85	94	107	113	106	98	115
Ammonia Air Coolers	81	97	107	111	114	113	111	108	98	119
Transformers [2]	70	89	101	103	109	106	102	97	88	112
Boil Off Gas Compressors	46	60	73	82	92	104	110	103	95	112
Tank Flare	81	91	108	111	114	117	116	115	109	122
Ammonia Flare	81	91	108	111	114	117	116	115	109	122
Piping Valves 1	41	53	60	69	78	93	96	99	97	103
Piping Valves 2	41	53	60	69	78	93	96	99	97	103
Piping Valves 3	41	53	60	69	78	93	96	99	97	103
Turbine Glycol Chiller	74	86	91	92	95	92	90	90	85	100
Turbine Combustion Intake	51	67	79	86	91	93	92	89	82	98
Diesel Generator 1	0	81	86	86	89	83	80	74	67	93
Diesel Generator 2	0	81	86	86	89	83	80	74	67	93

[1] Sound pressure level at hub height.
[2] 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.

Permanent lighting will be required for infrastructure in the Argentia Wind Facility and Argentia Green Fuels Facility. Turbines in the Argentia Wind Facility will be equipped with navigation light fixtures, as necessary, to satisfy requirements of the Transport Canada Standard 621 – Obstruction Marking and Lighting (Canadian Aviation Regulations). Other sources of light include mobile equipment required for the operation and maintenance of both facilities and permanent lighting on Argentia Green Fuels Facility Infrastructure. Geographic reach of light emissions will be limited; it is assumed that 50% of incident light will not extend beyond the Project Area due to directionality and line of sight obstructions, namely thick tree cover in the area. Based on surrounding woodland and topographic changes, the true quantity of light blocked will be much higher (i.e., greater than 90%), especially when foliage is in full bloom.

In addition to artificial light, the Project will generate shadow flicker (SF). SF occurs when sunlight shines through rotating wind turbine blades, generating pulsating light and shadow (Haac *et al*., 2022). SF most commonly occurs in the morning and evening hours when the sun is at the horizon (i.e., sunrise and sunset). SF intensity diminishes with increasing distance from wind turbines; thus, SF is most noticeable to receptors closest to the turbines.

Operation and maintenance activities will generate combustion and non-combustion process emissions to air over the lifetime of the Project. Combustion process emissions will arise as a result of fossil fuel combustion in mobile equipment, emergency generator, and flare stacks. Non-combustion process emissions will be discharged to the atmosphere via venting to maintain equilibrium of the Argentia Green Fuels Facility. The facility will be designed such that outputs are vented to a safe location. Oxygen produced in the electrolyzer is not required for the ammonia production process and will be vented to the atmosphere. The air separation unit (ASU), used to extract nitrogen from ambient air for use in the ammonia production process, will vent oxygen and trace amounts of argon to the atmosphere. The stream of ambient air used in the ASU will be purified through molecular sieve beds, which will remove contaminants from the stream. As such, local air quality will not change due to ASU outputs (i.e., oxygen and trace argon) to the atmosphere.

Table 2.3.4-2 details air emission sources generated during Project operation and maintenance. In addition to species emitted during Project construction, nominal emissions of volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) will be generated during operation and maintenance activities.

Table 2.3.4-2 Air Emission Sources: Project Operation and Maintenance.

Emission	Source
Combustion Processes	
Carbon Dioxide (CO_2)	Operation of mobile equipment and emergency generator, flare stacks
Methane (CH_4)	
Nitrous Oxide (N_2O)	
Carbon Monoxide (CO)	
Sulfur Dioxide (SO_2)	
Oxides of Nitrogen (NO_x)	
Particulate Matter (PM)	Operation of mobile equipment and emergency generator, flare stacks, unpaved roads
Volatile Organic Compounds (VOCs)	Operation of emergency generator
Polycyclic Aromatic Hydrocarbons (PAHs)	
Non-combustion Processes	
Oxygen (O_2)	Operation of electrolyzer and air separation unit
Argon (Ar)	Operation of air separation unit
Water vapour (H_2O)	Operation of steam boiler

Air emission sources listed in Table 2.3.4-2 account for those generated within the Project Area. Emissions will also be generated by marine transport of the end product and electricity consumption, which are both generated outside of the Project Area.

The primary source of air emissions released during Project operation and maintenance is related to fossil fuel combustion in mobile equipment, emergency generator, and flare stacks, as well as marine transport. Annual fuel consumption requirements, along with GHG emissions associated with fuel combustion, are provided in Table 2.3.4-3. Emission calculation methodology and rationale is provided in Appendix H (Energy and Emissions Study). Appendix H also details indirect emissions and emissions generated from less dominant sources (i.e., non-fossil fuel related emissions).

Table 2.3.4-3 Annual Fuel Consumption and Emissions: Project Operation and Maintenance.

Operation and Maintenance Activity	Fuel Type	Annual Fuel Consumption (L)	Annual GHG Emissions (tonnes CO_2e)
Within Project Area			
Mobile Equipment	Diesel	17,400	48
Emergency Generator	Diesel	307,200	826
Flare Stacks	Propane	16,915,862	101
Outside of Project Area			
Marine Transport	Diesel	62,000,000[1]	19,393
[1] Provided as an estimate based on assumed routes and fleet.			

Emissions from emergency generator use within the Project Area are overestimated. As a conservative measure, it was assumed that annual usage would not exceed 100 hours of use per year for the lifetime of the Project. However, it is possible that the emergency generator may not be required at all in a given year, thereby significantly reducing annual emissions. Since the NLH grid has not yet transitioned to 100% renewable power, GHG emissions associated with electricity consumption must be considered. It was estimated that 1,489 tonnes of CO_2e will be emitted as a result of NLH grid consumption. As a conservative measure, it was assumed that 10 MW of firm power will be required each year (i.e., 8,760 hours), resulting in 87,600 megawatt hours (MWh) per year.

The Argentia Green Fuels Facility will be equipped with flare systems to mitigate, prevent, and disperse releases of off-gases from the ammonia production and storage areas. Flare tips will be continuously lit with a flammable gas source (e.g., commercial propane (C_3H_8)) should flaring be needed. Flares will be equipped with a variety of monitoring equipment such as instantaneous imaging devices (cameras), continuous emissions measurement (CEM) devices, and predictive emission monitoring systems (PEMS). The PEMS software will be connected to the ammonia plant data and control system, which will provide feed gas data input to estimate pollutant emission concentration in real-time. Monitoring equipment shall ensure adherence to regulatory requirements. The current design is for two flares: one for the ammonia plant (the “process flare”) and one for the ammonia storage tank (the “tank flare”).

The process flare is required for process upsets, maintenance, start-up, and shutdown. In particular, emergency and relief cases from the main process areas (electrolysis, ammonia loop, refrigeration) and some of the balance of plant systems (steam, cooling water) will be managed by the process flare. Vented gas streams destined for the process flare may contain liquid and thus will be directed to the flare separator to remove condensable material (mainly contaminated water) prior to relief to the atmosphere via the flare stack top outlet. Condensable material from the flare separator will be pumped to the wastewater circuit. Molar composition of vented gas streams ("streams") directed to the process flare, as identified in the FEL1 study are presented in Table 2.3.4-4. Key constituents of streams include hydrogen (H_2), water (H_2O), nitrogen (N_2), ammonia (NH_3) and argon (Ar). Streams are not anticipated to include oxygen; when generated, it will be vented to the atmosphere at a safe location and/or used to regenerate molecular sieves in the air separation unit.

Table 2.3.4-4 Molar Composition of Vented Gas Streams.

Stream	Source	Temperature (°C)	Enthalpy (kJ/kmol)	Molar Composition (%)[1]				
				H_2	H_2O	N_2	NH_3	Ar
Hydrogen	Electrolyzer	80	1,659	100	0	0	0	0
Syngas	Mixing Drum	75.9	1,504	75	0	25	0	0
Syngas	Syngas Compressor	10	-431	75	0	25	0	0
Syngas	Syngas Compressor	56	-809	62	0	21	4	14
Syngas	Cold Exchanger	34.1	-2,071	58	0	19	5	18
Purge Gas	Wash Water Column	50.7	-28,078	30	9	13	13	34
Purge Gas	Purge Gas Separator	10	-16,373	25	0	11	34	29

The process flare will relieve intermittently vented gas streams from the electrolyzer, mixing drum, syngas compressor, cold exchanger, wash water column and purge gas separator. Frequency of flaring is anticipated to be intermittent in nature to maintain equilibrium of the plant, however, the pilot light will be continuously lit should process flaring be needed.

The tank flare is required to support 15 kT of liquid ammonia storage capacity at the site. The primary function of the tank flare is to relieve tank vapours when the boil-off unit is not in operation. Since liquified ammonia is stored at its saturation temperature (-32°C) at atmospheric pressure, ammonia vapour evolution will occur as heat is absorbed from the atmosphere. Evolved vapours will be sent to the boil-off unit for refrigeration. Resulting liquified ammonia will be sent back to the storage tank. In the absence of the boil-off unit, evolved vapours will be directed to the tank flare to maintain system equilibrium. Beyond continuous ignition of the pilot flare, continuous use of the tank flare is not anticipated. Intermittent inputs to the tank flare are anticipated to occur only as a result of process upsets, maintenance, start-up, and shutdown.

In addition to annual emissions detailed above, atmospheric discharges were estimated for the Argentia Green Fuels Facility. Daily and annual atmospheric discharge rates were computed for flare stacks and emergency generator use. Atmospheric discharges associated with flare stacks include those generated from operation of continuous pilots and intermittent releases. For estimation purposes, intermittent releases were defined as scenarios where a maximum of 16.7 tonnes of ammonia (i.e., one hour of production) is released over a one-hour period per year. Flare stack atmospheric discharges also account for residual propane and ammonia releases. The assumed destruction efficiency of both flares is 98%, thus 2% of residual flare fuel (i.e., C_3H_8, NH_3) will be released. Emission rates, in units of grams per second ($g \cdot s^{-1}$), of flare stacks for Argentia Green Fuels Facility operation are outlined in Table 2.3.4-5. Calculation methodology, including associated assumptions, is detailed in Appendix H (Energy and Emissions Study).

Table 2.3.4-5 Flare Stack Atmospheric Discharges: Project Operation and Maintenance.

Function			**Continuous Pilots**		**Intermittent Releases**	
Flare			**Process Flare**	**Tank Flare**	**Process Flare**	**Tank Flare**
Fuel Combusted			**C_3H_8**	**C_3H_8**	**NH_3**	**NH_3**
Annual Operating Hours			**8,760**	**8,760**	**1**	**1**
Emission Rate (g/s)	Hourly	NO_x	1.51E-03	1.51E-03	26.2	26.2
		CO	1.22E-02	1.22E-02	-	-
		TSP	4.99E-01	4.99E-01	-	-
		C_3H_8	2.06E-02	2.06E-02	-	-
		NH_3	-	-	92.6	92.6
	Daily	NO_x	1.51E-03	1.51E-03	1.09	1.09
		CO	1.22E-02	1.22E-02	-	-
		TSP	4.99E-01	4.99E-01	-	-
		C_3H_8	2.06E-02	2.06E-02	-	-
		NH_3	-	-	3.86	3.86
	Annual	NO_x	1.51E-03	1.51E-03	2.99E-03	2.99E-03
		CO	1.22E-02	1.22E-02	-	-
		TSP	4.99E-01	4.99E-01	-	-
		C_3H_8	2.06E-02	2.06E-02	-	-
		NH_3	-	-	1.06E-02	1.06E-02

Atmospheric discharges were also estimated for the emergency generator, should it be required, during operation of the Argentia Green Fuels Facility. In the event of power loss, the emergency generator will be required to supply 8 MW of standby (i.e., emergency) power to support the Argentia Green Fuels Facility. It was assumed that the emergency generator will be used for a maximum of 96 hours per year (i.e., one day per quarter). Estimated atmospheric discharges associated with operation of the emergency generator are provided in Table 2.3.4-6. Atmospheric discharge estimates provided in Table 2.3.4-6 include key air contaminants but is not an exhaustive list. Appendix H (Energy and Emissions Study)

details atmospheric discharges of all air contaminants, as well as calculation methodology and associated assumptions.

Table 2.3.4-6 Emergency Generator Atmospheric Discharges: Project Operation and Maintenance.

Function			Emergency Generator
Fuel Combusted			**Diesel**
Annual Operating Hours			**96**
Emission Rate (g/s)	Hourly	CO	12.4
		SO_2	1.47
		NO_x	46.7
		TSP	9.05E-01
		PM_{10}	7.24E-01
		$PM_{2.5}$	6.99E-01
	Daily	CO	12.40
		SO_2	1.47
		NO_x	46.7
		TSP	9.05E-01
		PM_{10}	7.24E-01
		$PM_{2.5}$	6.99E-01
	Annual	CO	1.36E-01
		SO_2	1.62E-02
		NO_x	5.12E-01
		TSP	9.91E-03
		PM_{10}	7.93E-03
		$PM_{2.5}$	7.66E-03

2.3.4.2 Effluent Discharge / Wastewater Treatment

The Argentia Geen Fuels Facility will receive water that has been demineralized to ensure high purity before it enters the electrolyzer. During the production of this high purity feedwater, a significant volume of reject water is generated. A conservative estimate of 60% system recovery with 40% reject has been used, though it is likely lower than achievable efficiency. In subsequent engineering design phases, Argentia Renewables aims to target a recovery rate of 70-80% (i.e., 20-30% reject).

The Argentia Renewables Feasibility Study Report conducted by AtkinsRéalis concluded that the proposed ammonia production at 146,000 tonnes per year would require a fresh water supply of 1,185 m^3/day. It is estimated that 25% to 40% of the total water supply will be diverted to wastewater streams from the purification treatment system, while the remainder will be used for electrolysis. Reject water from the production of demineralized feedwater will have a higher salinity compared to the intake water due to the removal of minerals and impurities. Wastewater influent will contain nutrients, metals, physical

parameters, and major ions originally present in the water supply, concentrated to 2.5 times the initial concentrations based on the worst-case scenario of 40% reject water or concentrated to 4 times the initial concentrations based on the more probable scenario of 25% reject water.

It is estimated that wastewater discharged from the site would exhibit slightly elevated total dissolved solids (TDS) levels compared to the intake water. The increase in TDS can be attributed to the cooling tower cycle (non-evaporative cooling) and demineralized water treatment plant (WTP) brine. The cooling towers are anticipated to operate within a concentration cycle between 1.5 and 3. The wastewater influent calculations did not explicitly include cooling tower blowdown, as the concentration factors of 2.5 and 4 already account for elevated TDS levels. Therefore, the effluent quality derived from these calculations can be directly applied to the cooling tower blowdown.

The Aquatic Baseline Study (Appendix B1) presented an evaluation of the Public Water Supply (PWS) for the Town of Placentia and ponds within the watershed boundary area to effectively characterize potential source water quality for the Argentia Green Fuels Facility and to supplement historic data available from the Water Resources Management Division (WRMD). Water supply for the Argentia Green Fuels Facility is planned to be sourced from the PWS – Clarke's Pond, Larkins Pond, Barrows Pond, and Gull Pond. Surface water samples were collected from the PWS waterbodies in May 2023 and October 2023. Bureau Veritas (BV) Laboratories conducted comprehensive chemical analysis of surface water samples, which included the assessment of metals and general chemistry parameters (e.g., nutrients, inorganics).

Wastewater influent was estimated based on surface water data analyzed from Clarke's Pond, Larkins Pond, Barrows Pond, and Gull Pond. The surface water quality data was multiplied by 4 and 2.5 times the initial concentrations to characterize wastewater from the purification process. For analytical results below the reportable detection limit used for each laboratory test, concentrations were considered to be equal to one half of the detection limit multiplied by either 4 or 2.5 depending on the percent reject water. The concentrations of chemical parameters were then compared with the constituents listed under Schedule A in the NLR65/03, ensuring thorough evaluation and regulatory compliance (Table 2.3.4-7). Chemical parameters in in the wastewater influent, estimated from the 25% and 40% reject water cases, are significantly lower than the maximum authorized limits specified under Schedule A in the **Environmental Control Water and Sewage Regulations**.

Table 2.3.4-7 Predicted Wastewater Influent: Project Operation and Maintenance.

Parameter	Concentration (mg/L)		Maximum Authorized Limit
	25% reject	40% reject	
Metals			
Arsenic	0.0020	0.00125	0.50
Barium	0.0080 - 0.0400	0.0050 - 0.0250	5.0
Boron	0.100	0.0625	5.0
Cadmium	0.00002 - 0.00004	0.0000125 - 0.0000250	0.050
Chromium	0.0020 - 0.0084	0.001250 - 0.00525	0.05 / 1.0 *
Copper	0.0023 - 0.0044	0.00145 - 0.00275	0.30
Iron	0.10 - 2.64	0.0625 - 1.65	10
Lead	0.0010	0.000625	0.20
Nickel	0.0040	0.0025	0.50
Selenium	0.0010	0.000625	0.010
Silver	0.0002	0.000125	0.050
Zinc	0.0100	0.00625	0.500
General Chemistry			
Nitrogen (Ammonia nitrogen)	0.10 - 0.21	0.0625 - 0.130	2.0
Nitrate	0.100 - 0.288	0.0625 - 0.180	10
Total suspended solids (TSS)	2.0 - 10.4	1.25 - 6.5	30
Total dissolved solids (TDS)	88 - 224	55 - 140	1000
*hexavalent / trivalent chromium			

It is important to note that in addition to the parameters previously mentioned, there are other specific requirements outlined in the NLR65/03. These include biological oxygen demand (B.O.D.), bacterial levels (coliform), cyanide, mercury, phenol, phosphorus, phosphates, chlorine, sulfides, oils, and floating debris. Although the values of these additional water quality parameters are not available, it is unlikely that the electrolyzer will significantly contribute to these constituents. However, it is critical that these constituents do not exceed the maximum content specified in Schedule A of the NLR65/03 before any effluent can be discharged into the Argentia Harbour.

Metals and general chemistry parameters (e.g., nutrients and inorganics) are not anticipated to exceed the thresholds specified in the **Environmental Control Water and Sewage Regulations**, as detailed above for the characterization of wastewater influent from hydrogen and ammonia production. Trace amounts of ammonia are expected to be present in the wastewater system; therefore, ammonia stripping will be used to remove ammonia from the wastewater. Ammonia stripping involves a phase transition from liquid ammonia to gaseous ammonia by increasing the temperature of the water and then passing it through a vertical packed bed tower. In the tower, the wastewater flows downward while the steam is blown upward. This countercurrent flow facilitates the transfer of ammonia gas out of the water, where it can be treated or directed to a flare.

2.3.5 Decommissioning and Rehabilitation

The Project will have a Decommissioning and Rehabilitation Plan associated with all aspects of work at the Project site. The Project's decommissioning and rehabilitation activities will aim to restore the site to its original state at the discretion of the landowner. The preliminary Decommissioning and Rehabilitation Plan will be dynamic, and wherever practical, rehabilitation measures will be implemented progressively as opportunities arise throughout the lifetime of the Project. All permits, licences, and other authorizations required for the decommissioning and rehabilitation will be obtained as required.

Argentia Renewables will continue to seek solutions and improve the decommissioning strategy as the Project progresses considering available technologies. Argentia Renewables is committed to complying with all environmental regulations and requirements in place at the time of decommissioning. A Project decommissioning plan will be developed and finalized once all Project infrastructure has been finalized to allow for a properly scoped plan prior to commencement of commercial operations.

The Project's decommissioning and rehabilitation activities aim to restore the site and typically include:

- Removal and appropriate disposal of equipment, materials, and supplies;
- Demolition and removal of Project related infrastructure;
- Removal and appropriate disposal of non-hazardous demolition debris; and
- Overburden and topsoil replacement and re-contouring of land if required.

During all phases of the Project, equipment and infrastructure will be demobilized when it is no longer required. Equipment will be carefully removed, and infrastructure no longer required will be taken down in reverse order of setup. Materials and equipment will be removed and transported off site per the Waste Management Plan (Appendix N).

At the end of Project operational life, Argentia Renewables will ensure that the site is fully demobilized. Final grading will be completed at the site once infrastructure has been removed. These areas will have organic materials re-spread and seeded.

The following sections pertain to specific decommissioning and rehabilitation practices that will be considered for select Project infrastructure and equipment. These are followed by a discussion of emissions and energy use during the decommissioning and rehabilitation phase.

2.3.5.1 Argentia Wind Facility

The decommissioning and rehabilitation of the wind turbines will involve removing the base of the structure and the turbine blades. Components such as nacelle and tower sections have an established practice of recycling, and appropriate plans will be implemented. Some wind turbine manufacturers have recently introduced recyclable wind blades which will be factored into the decommissioning and rehabilitation approach. Typically, the turbine base will be removed to 1 m below ground, rebar cut off and the site covered with soil. The area immediately surrounding the turbine foundation will be re-graded, and soil that was removed will be replaced.

Access roads will be reclaimed, while public roads will remain, and gates will be removed.

The decommissioning of the electrical infrastructure will include removal of the conductors, reducing poles to ground level, and disassembling and removing infrastructure from right-of-ways. Removal of transmission lines and inactive conductors will be carried out in a safe manner in accordance with approvals. Decommissioned electrical infrastructure will be considered for reuse or recycling wherever possible (such as wood or metals) or transported to an appropriate facility for disposal. Portions of this decommissioning activity will involve cranes and a specialist contractor. Underground electrical cables will be cut off and removed to 1 m depth.

2.3.5.2 Argentia Green Fuels Facility

The decommissioning and rehabilitation of the Argentia Green Fuels Facility will involve the dismantlement of the electrolyzers, water treatment systems, and hydrogen handling systems. These components will be recycled or refurbished for continued use wherever possible. Buildings housing the electrolyzers can be demolished or left in place to facilitate redevelopment of the site by other industries. If demolished, building foundations will be removed, and the site will be cleaned and graded. Piping associated with the facility will be dismantled and removed from site. The ammonia loading infrastructure such as loading lines and loading arms will be fully cleaned and dismantled prior to removal from site for disposal. The ammonia tank and water tanks will be purged, cleaned, disassembled, and removed from site for recycling or disposal at the appropriate facility. The Argentia Green Fuels Facility will be reclaimed with minimal disturbance to shorelines and waterways. Rehabilitation of any shoreline erosion and bank restabilization will be carried out, if required. Storm water ponds, will be remediated by pumping out standing water, removing the piping and liners from site, infilling the ponds with overburden, grading the area and applying a single application of seed. These facilities will be included in the Project decommissioning plan.

2.3.5.3 Emissions and Energy Use

The decommissioning and rehabilitation phase of the Project will have similar fuel consumption requirements as the construction phase. As such, emissions generated from within the Project Area from

fossil fuel consumption will be comparable, and likely not exceed to those detailed in Section 2.3.3.1. Additionally, mobile equipment requirements for decommissioning and rehabilitation will be similar to those outlined in Table 2.3.3-6.

2.4 Alternative Methods of Carrying Out the Undertaking

Argentia Renewables considered several alternatives in the process of developing the optimum project — a project that is financially viable, employs proven but innovative technology, has minimal negative environmental effects, and addresses sustainability objectives in an environmentally responsible manner.

One major consideration is the “no project” alternative. The failure or withdrawal of a proposal to construct a green energy project on private land would likely be viewed as a shortfall in the implementation of the Province’s Renewable Energy Strategy. While the potential negative effects on both the biophysical and socio-economic environments of the Placentia area would be avoided, so too would be the potential benefits, especially to the socio-economic environment. For Argentia Renewables, a decision to cancel this Project would be unlikely to trigger a search for another suitable site within the province; consequently, there is no “other location” alternative for the Project.

Several alternatives within the Project are still under consideration or may be carried as possibilities should the preferred approach become unattractive or unavailable. Final selections have yet to be made as to the make/model of the wind turbines, electrolysis technology, and ammonia synthesizer. Where alternatives remain under consideration, each are described below, and the alternative with the greatest potential for interaction with the environment will be assessed. In this manner, the assessment will be conservative and a future decision to select another alternative will result in less, not greater potential environmental consequences. The major Project alternatives and their potential environmental consequences are described below.

2.4.1 Argentia Green Fuels Facility Alternatives

The Argentia Green Fuels Facility will be located on POA Property and sited based on property availability, ease of construction and infrastructure access, proximity to suitable dock space, adequate buffer space allowance from other industrial activities, and foundation conditions. While there may be minor relocations of the plant footprint or specific features, these will remain within the boundaries of the site identified in this Registration.

AtkinsRéalis (formerly SNC-Lavalin Group) conducted a first-order plant optimization study by assessing different technologies and financial sensitivities to determine the best configuration to bring forward to the next level of engineering cost estimation. Determination of the minimum hydrogen storage

requirements, as well as optimal electrolyzer type and size, ammonia plant, ASU and storage sizes were all considered. Financial risks were incorporated into the decision-making. The study concluded that a 160 MW alkaline electrolyzer connected to a 140 kilo-tonnes per annum (kTpa) (384 MTPD) ammonia plant is the optimal facility size accounting for both economic and Project risk considerations. The optimal plant sizing summary is provided in Table 2.4.1-1.

Table 2.4.1-1 Results of Plant Optimization Study.

Parameter	Optimal Value
Electrolyzer installed capacity, MW	160
Ammonia installed capacity, MTPD	400
Hydrogen storage, tonnes	15
Water consumption, m^3/day	1,185 (assumes 40% reject water from water treatment)
Electrolyzer load factor, %	95
Ammonia plant load factor, %	93
Firm NLH grid power import assumed, MW	10

Summaries of alternatives considered regarding the electrolyzer technology, the water-cooling system, and the size of the overall plant are provided in the following sections.

2.4.1.1 Electrolyzer Selection

Three candidate hydrogen electrolysis technologies were considered for the Project: Alkaline, Proton Exchange Membrane (PEM), and Solid-Oxide Electrolyzer Cells (SOEC). Each technology uses an electric charge (electrolysis) to break water molecules into their two constituents, oxygen and hydrogen. The required inputs are similar among the technologies and include clean water (treated to reduce mineral content and adjust pH) and electricity. Alkaline electrolysis uses potassium hydroxide or sodium hydroxide at around 20-40 percent by weight (wt%) as the cell electrolyte. The PEM process is widely considered to have the largest market share in the coming decades as the process is well-suited to the generation profile of renewable energy. PEM uses a solid polymer as both the electrolyte and the cell membrane. An SOEC operates at high temperatures to achieve electrolysis by using a solid oxide or ceramic electrolyte and high-pressure steam to produce hydrogen gas and oxygen.

All electrolysis methods produce similar discharges (hydrogen, oxygen, slightly saline-warmed wastewater). As well, ammonia-rated capacities (100-125 kTpa) vary due to the differing efficiencies of each technology. Table 2.4.1-2 presents key indicators for the candidate technologies and serves to indicate a preference for SOEC and alkaline mixed technology. After a qualitative assessment of key performance indicators (such as logistics, and manufacturing capability) it was found that SOEC had excessive Project risk to schedule and was therefore discounted from the study. The alkaline technology exhibited slightly better financial results relative to PEM technology and has slight advantages with respect to lower water consumption and maintenance ease. Hence, alkaline electrolyzers were selected as the optimal choice to be carried forward.

Table 2.4.1-2 Comparison of PEM, Alkaline, and SOEC Electrolyzer Technologies.

Input	PEM	Alkaline	SOEC	Unit
Module size	10	10	10	MW
Efficiency (at BOL)	55	55	40	kWh / kgH_2
Efficiency (at EOL)	59.31	58.47	40.09	kWh / kgH_2
Stack Lifetime	10	10	6	years
Degradation	1	1	0	% / year
Hydrogen outlet pressure	30	0.3	0.0	barg
Turndown	10	10	10	% of total MW
CAPEX	720	570	1200	$/kW

2.4.1.2 Plant Size Optimization

The key factor determining optimal facility size is the Argentia Wind Facility electricity production capacity and profile. The average electrical production and variability determines the sizing and utilization of installed electrolyzers and ammonia plant. The land area available to host wind turbines, plus the wind profile for candidate generation sites enables the construction of a 300 MW Argentia Wind Facility. Varying sizes and combination of the above-mentioned electrolyzers were considered to balance demand from the NLH grid on a net-zero annual basis (i.e., total annual import from the grid equals total annual export to the grid). Note, provision has been made in planning to allow for plant expansion should there be a future expansion to other Argentia Wind Facilities.

2.4.1.3 Water Supply Selection

The amount of water required for the plant was examined as part of the optimization study. The size of the electrolyzer, the hydrogen production rate, requirements for cooling water, and the physical and chemical properties of the potential feedwater all contributed to the calculation. The POA is supplied with water from the Town of Placentia municipal water supply, which includes Larkins Pond, Clarke's Pond, and Barrows Ponds, with backup provided from Gull Pond. Water quality records (both historical records obtained from the Water Resources Division and samples collected from the freshwater environment in 2023) indicate that the water is amenable to treatment and suitable for use by the Project. A Source Water Hydrology Analysis (Appendix C1) demonstrates that there is availability of water for both municipal and Project requirements. For these reasons, the Placentia municipal water supply was selected as the water source for the Project.

Should water quantity or quality become an issue, an alternative would be the development of a separate water supply dedicated to the Project. One potential supply is the Shalloway Ponds watershed which has a total drainage area of 8.3 km^2 as shown in Figure 2.4.1-1. As existing historic data within this watershed was unavailable, the hydrology of Shalloway Ponds was evaluated by transposing average daily streamflow measurements from the nearby Water Survey of Canada (WSC) hydrometric station, Northeast River near Placentia (02ZK002), using the drainage area ratio method, whereby streamflow

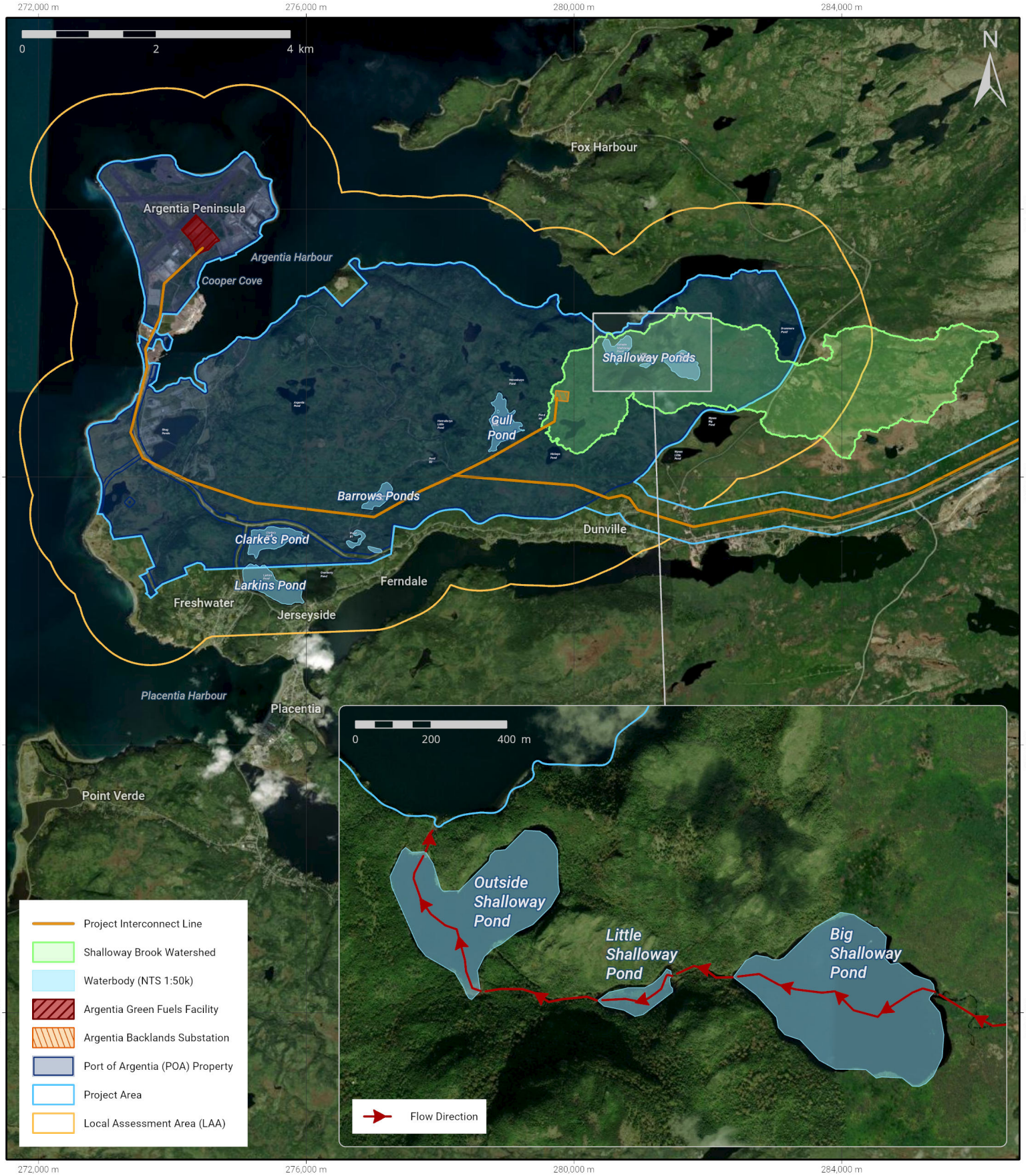
data is multiplied by the drainage area ratio of the ungauged and gauged location (CPL, 2023). The Northeast River watershed near Placentia has an upstream drainage area of 90 km^2. One limitation of transposing streamflow data from one location to another is that it does not account for the differences in physical geography of the watersheds. The Northeast River watershed has a larger portion of pond/ lake area than the Shalloway Pond watershed, and therefore greater water storage potential and likely a more stable flow regime. The Shalloway Pond watershed would likely experience more extreme peak inflows and lower minimum inflows. This intermittency in flow regime could be accounted for by including additional storage in the Shalloway Pond water supply.

A preliminary investigation of the expected natural exceedance inflows (using transposed WSC daily flow data) for Shalloway Ponds suggests that this watershed would have adequate supply required to meet Project needs without considering storage (Table 2.4.1-3) (CPL, 2023). For redundancy purposes, additional storage would likely be built into the design.

Table 2.4.1-3 Shalloway Ponds Exceedance Flows (CPL, 2023).

Probability of Exceedance	Shalloway Ponds Inflow (L/s)
99.9%	26
99%	35
95%	58
90%	82
50%	243
10%	687

Additional infrastructure required to advance this alternative would include a 1.5 km access road, a containment dam, a low-level outlet, a pump house, and a water transmission main pipeline (CPL, 2023). Should this alternative be selected for the Project, surveys would be required to characterize the aquatic and terrestrial environments, as well as the watershed hydrology, minimum flow requirements, and water quality. Other investigations would be required to identify suitable locations and design parameters for containment dams, intakes, and water supply pipeline routing.



Pattern | Argentia Renewables	FIGURE NUMBER: 2.4.1 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/25
	FIGURE TITLE: Shalloway Ponds Alternative Project Water Supply	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change. Watershed delineation derived from NRCan HRDEM Digital Terrain Model. Waterbodies and flow direction sourced from Canadian National Topographic System (NTS).	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	sem

SEM MAP ID: 238-005-GIS-042-Rev0

2.4.1.4 Feedwater Treatment and Cooling Systems

The electrolyzer will require a reliable supply of demineralized feedwater. Water consumption by an alkaline electrolyzer is in the range of 9 -11 kg of water per kg of hydrogen produced. The amount of water rejected was assumed to be in the range of 25 - 40%, based on the historic quality of the source water in the PPWSA. In addition, the low-temperature water electrolyzers will generate heat which will be removed via cooling towers. Non-evaporative cooling will also be used for the plant to decrease water demand significantly. Additionally, alternative methods such as a seawater cooling system will be considered at later stages of design. For these reasons, the quantities of both water intake and discharge can be regarded as highly conservative.

2.4.1.5 Wastewater Treatment System

In producing feedwater for the electrolyzer, reject water will be generated of a higher salinity than the intake. Other discharge water will be produced by the ammonia process and may require treatment before discharge. Wastewater treatment packages will be defined to suit the composition of wastewaters produced and ensure regulatory compliance at a minimum. Further design efforts will also seek means to reduce water throughout (e.g., closed loop, dry cooling) and thereby minimize water supply demand.

Argentia Renewables is evaluating the existing water treatment system related to the West White Rose Project to determine if the facility can be re-used as a permanent wastewater treatment facility for the Project. The following sewer systems will be included in the facility and designed as per permits issued to Argentia Renewables: Clean Storm Water Sewer System, Potentially Contaminated Sewer System, Oil-Water Separator and Retention System, and Sanitary Water System. These were described earlier in Section 2.3.4.

2.4.1.6 Product Storage, Transfer, and Shipping

Several options are being considered for storage and transfer of the ammonia produced at the facility. The preferred configuration which utilizes a continuous transfer line, and up to two permanent loading arms fixed to the Cooper Cove wharf extension is described above in Section 2.3.1.5. The wharf extension is included as part of the Cooper Cove Marine Terminal Expansion Project (Registration No. 2279). It is the only in-water infrastructure required for the loading of ammonia. Pending progression of the Cooper Cove Marine Terminal Expansion Project, Argentia Renewables will consider alternate Loading Facility arrangements.

2.4.2 Argentia Wind Facility Alternatives

In order to best utilize the available space, generate electricity at optimum efficiency, and ensure environmental sustainability, a number of choices for the Argentia Wind Facility have been considered, including the size of each wind turbine generator, the type of foundations, and the optimal location for each structure.

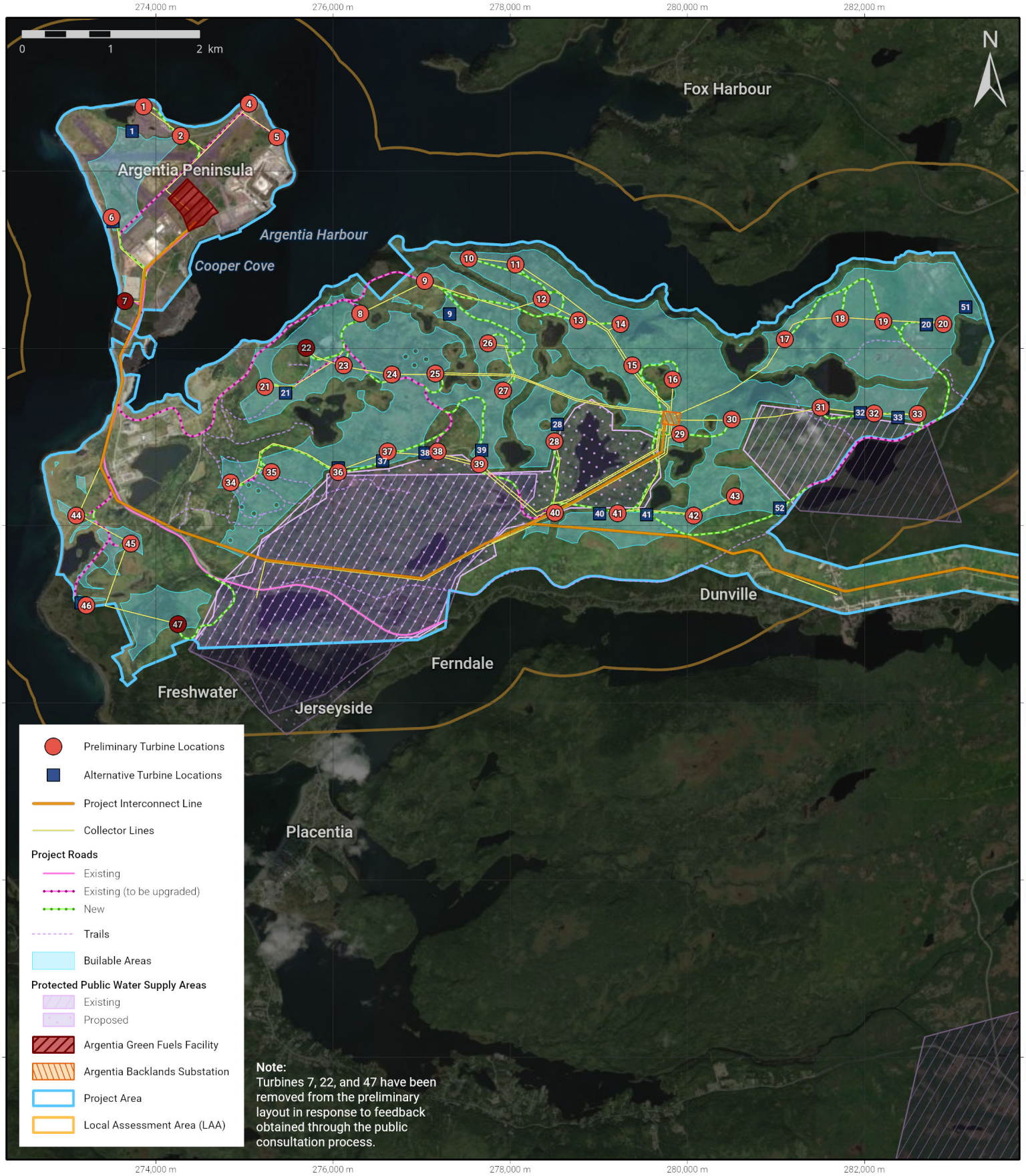
2.4.2.1 Selection of Wind Turbines

The Project has taken into consideration a variety of turbine sizes and configurations, including a 6.8 MW and 7.2 MW wind turbine. The selection of a wind turbine manufacturer is determined from the rated power capacity, rotor diameter, and tower heights of the wind turbines. In general, the larger the turbine, the greater its power generation capacity. This results in a trade-off between turbine size and turbine numbers. The current Project layout is based on a 6.8 MW wind turbine. Alternative, smaller power output models were also considered. A greater number of 6.6 MW or 5.0 MW wind turbines would be needed to meet the Project requirement of 300 MW of generation capacity. As a result of the larger generating capacity of the 6.8 MW wind turbine, the Project will produce more energy annually per turbine, will incur less in operational and capital expenditures for the Project, and will result in a reduced footprint for the Argentia Wind Facility.

2.4.2.2 Siting of Turbines and Linear Features

The detailed siting of each wind turbine will be a combination of factors including wind profile, spacing to clear other turbines, avoidance of interference with other uses/users, foundation conditions, and accessibility for construction and service maintenance. The routing of surface access will be determined by nature of surface features (existing roads/trails, presence of wetlands, sensitive habitat (especially for species at risk) natural gradients, design requirements for road surface grade and turning radius.

As more information is gathered, especially concerning site geotechnical conditions, some adjustments to access road and electrical system alignment will be made, along with slight adjustments to turbine foundations. Such minor realignments of generation sites and linear features will also serve to reduce the degree of physical disturbance to vegetation and terrain features. All siting choices will be contained within the defined Project Area and located to reduce or avoid negative environmental effects or restrictions on development (such as within the PPWSA). Accounting for these siting constraints, the “Buildable Areas” below in Figure 2.4.2-1 depict the areas considered for wind turbine siting.



Pattern | Argentia Renewables	FIGURE NUMBER: 2.4.2 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/26
	FIGURE TITLE: Wind Turbine Alternative Buildable Areas	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change. Public Water Supply data sourced from the NL Government Land Use Atlas.	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	sem

SEM MAP ID: 238-005-GIS-008-Rev2

Throughout the early engagement process, as described in Chapter 8, Argentia Renewables has sought to gather feedback from the public, key stakeholders, Indigenous peoples, and government departments and agencies regarding siting of wind turbines. Wind turbine sites which were specifically discussed in early engagements are highlighted in Figure 2.4.2-1. In each of these discussions Argentia Renewables has committed to continue exploring alternative wind turbine placement, technology, or other mitigations with the interested party to come to a mutually beneficial solution (e.g., to accommodate wind turbine micrositing relative to Canadian Coast Guard radar use in the Project Area). In response to feedback obtained through the public consultation process, turbines 7, 22 and 47 have been removed from the preliminary layout.

Alternative interconnection locations within the Project Area will be considered. During a later stage of the Project, an assessment will be made to determine if the Collector Lines will be constructed underground or overhead. There may also be a need to upgrade or “twin” the high-voltage transmission line which connects the Long Harbour Terminal Station to the rest of the NLH grid. These decisions will be made in close consultation with NLH and appropriate agencies.

2.4.2.3 Foundations for Wind Turbine Alternatives

Site conditions will dictate the choice of foundation type. Factors include depth to groundwater, presence of bedrock and type of overburden. Geotechnical evaluations will be required to determine the most suitable foundation design for each wind turbine. The soils and terrain in the Project Area vary greatly and thus several wind turbine foundation types were considered: cast-in-place gravity, cast-in-place rock anchored, segmental pre-cast concrete girder, pre-cast cross girders, post-tensioned pre-cast concrete, and pre-cast steed girder with reinforced concrete base slab. Based on preliminary site reconnaissance most of the foundations will be rock-anchored concrete cap type, with gravity cast-in-place concrete making up the remainder.

2.4.2.4 Construction Labour Force Accommodation

The construction labour force could be accommodated in a construction camp located proximate to the Project site. Alternately, personnel could commute from their homes or arrange local temporary housing in the adjacent communities. Based on a comparison of construction labour requirements (numbers and work classifications) and the available local workforce, it has been concluded that most of the construction labour force can be obtained locally through contractor hires, and there is an adequate supply of short-term rental accommodation available from the nearby communities. As Project planning and implementation develops, supplemental Project-specific accommodation may be required. In such a case, the most likely alternative will be to utilize the construction work camp at Long Harbour and provide bus service between the camp and the Project site. Therefore, a dedicated construction camp will not be required at the POA.

2.5 Regulatory Framework

Following the announcement made by the Honourable Andrew Parsons, Minister of Industry, Energy and Technology on April 5, 2022, lifting the moratorium on wind development in NL, the private sector has been in a position to generate electricity from wind energy for their own consumption and export. This proposed undertaking falls within the scope of Government Policy and will endeavour to comply fully with all applicable regulatory processes.

The primary environmental regulatory requirement for this and similar undertakings is laid out in the NL **Environmental Protection Act, 2002,** and associated **Environmental Assessment Regulations**. As a first step in the environmental regulatory process, this Registration is submitted for consideration. Once a determination has been made by the Minister under the **Environmental Protection Act**, other permitting and approval processes are able to commence. Additionally, work associated with early Project phases (such as meteorological towers to characterize wind resource availability) are allowed to proceed, subject to compliance with applicable Federal, Provincial and Municipal permitting processes. The other required environmental permits and approvals are typically fulfilled once a release is granted from the EA review process. These permits and approvals are listed in Table 2.5.2-1.

The Project will also be subject to provisions of federal legislation that may not have specific permits and approvals including:

- **Canadian Environmental Protection Act, 1999 (CEPA).**
- **Fisheries Act.**
- **Species at Risk Act (SARA).**
- **Migratory Birds Convention Act, 1994 (MBCA).**
- **Aeronautics Act.**
- **Canadian Navigable Waters Act.**

To avoid or reduce potential negative environmental effects and to enhance benefits, the principles and practices of sustainability and environmental and social responsibility are incorporated into resource management plans that form part of the proponent's internal organization and approval structure. Several such plans will be developed by Argentia Renewables to apply throughout the Project, as detailed in Section 4.6. Typically, these management plans are required as a condition of environmental registration approval.

The Argentia Renewables Project will be located primarily upon the POA Property within the Town of Placentia Municipal Planning area (D.W. Knight Associates, 2015). The Project Interconnect Line may intersect both private and Provincial Crown Land. The Argentia Peninsula and lands to the south-west

are zoned as Industrial, whereas the eastern portion of the Argentia Backlands are zoned as Rural. A portion of the POA Property also includes PPWSAs (listed as Clarkes Pond, Larkins Pond, and Wyses Pond), which include prohibitions and protection measures for development to protect drinking water quality.

Project execution will involve regular engagement with communities and other stakeholders. This Project will have a long-term presence in the communities where it is being proposed, therefore Argentia Renewables is committed to utilizing community engagement to foster support for the Project and establish mutually beneficial partnerships with the community. This commitment plays a fundamental role in achieving long-term partnerships with landowners and stakeholders.

2.5.1 Environmental Assessment Process

There are two environmental assessment processes that could apply to the Argentia Renewables Project – Federal and Provincial.

The Government of Canada **Impact Assessment Act, 2019** (IAA 2019) is the legislative basis for federal EA in Canada. Federal EA focuses on potential Project effects that are within federal jurisdiction, including on:

- Fish and fish habitat;
- Other aquatic species;
- Migratory birds;
- Federal lands;
- Effects that cross provincial or international boundaries;
- Effects that impact on Indigenous peoples, such as their use of lands and resources for traditional purposes; and
- Changes to the environment that are directly linked to or necessarily incidental to any federal decisions about a project.

The **Physical Activities Regulations** issued under IAA 2019 list projects which would be subject to federal EA. These regulations clearly exclude the Argentia Renewables Project from the federal process. The Minister of Environment and Climate Change Canada may, however, designate a project that is not currently listed in the regulations if there is the potential for environmental effects in areas of federal jurisdiction or in response to public concerns about such effects.

The **NL Environmental Protection Act** (NLEPA) has associated **Environmental Assessment Regulations** (Part 3) that list those projects that require registration and review. As well, the Minister has the authority to order an environmental impact assessment for any project. The Argentia Renewables Project requires Registration following the provincial process. On April 6, 2022, the NL Environmental Assessment Division (NLEAD) issued "Environmental Assessment Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects". This set of Guidelines is specific to the wind-to-hydrogen industry and is supplemental to the NL EAD document "Environmental Assessment – A Guide to the Process".

Upon receipt and acceptance of a Registration document, the Minister of Environment and Climate Change will conduct a public and governmental review of the submission. The Minister then determines whether the Project may proceed, subject to any terms and conditions and other applicable legislation, or whether further assessment is required.

2.5.2 Approvals

Table 2.5.2-1 provides a preliminary list of permits, approvals, licences, and authorizations that may be required for the Project. This list will be continuously updated throughout the Project to confirm and adjust as necessary, through consultation with regulatory authorities.

Table 2.5.2-1 List of Potential Permit/Approval/Licence/Authorization Requirements for the Project.

Permit / Approval / Licence / Authorization	Legislation / Regulation Reference	Agency
Municipal		
Development Permit	**Urban and Rural Planning Act**	Town of Placentia
Provincial		
Environmental Assessment Approval	**Environmental Protection Act and Environmental Assessment Regulations**	Department of Environment and Climate Change - Environmental Assessment Division
Certificate of Approval for Construction and/or Operation of Industrial Facilities	**Environmental Protection Act**	Department of Environment and Climate Change - Pollution Prevention Division, Industrial Compliance Section
Certificate of Approval for Generator Operation	**Environmental Protection Act and Air Pollution Control Regulations**	
Development Activity In A Protected Public Water Supply Area	**Water Resources Act**	Department of Environment and Climate Change - Water Resources Management Division
Permit to Alter a Body of Water (Culvert, Bridge, Dam, Fording, Pipe Crossing/Water Intake, Stream Modification, Infilling/Dredging, Flood Risk Area, Miscellaneous works within 15 m)		
Water Use Licences		

Permit / Approval / Licence / Authorization	Legislation / Regulation Reference	Agency
Commercial Cutting Permit	**Forestry Act**	Department of Fisheries, Forestry, and Agriculture
Operating Permit		
Crown Lands Lease	**Lands Act**	Department of Fisheries, Forestry, and Agriculture - Lands Branch
Section 19 – Economic Activity Permit	**Endangered Species Act (ESA)**	Department of Fisheries, Forestry, and Agriculture – Wildlife Division
Quarry Development Permit	**Quarry Materials Act, Quarry Materials Regulations**	Department of Industry, Energy, and Technology, Mining and Mineral Development
Building Accessibility Registration Exemption Request and Fire and Life Safety Plans Review (National Building Code of Canada)	**Building Accessibility Act, Fire Protection Services Act**	Digital Government and Service NL
Certificate of Approval for Waste Management System (Landfill or Incinerator if applicable)	**Environmental Protection Act, Air Pollution Control Regulations, Storage of PCB Wastes Regulations and Waste Management Regulations, 2003**	
Food Establishment Licence	**Food Premises Act** **Food Premises Regulations**	
Fuel Storage Tank Registration	**Storage and Handling of Gasoline and Associated Products Regulations, 2003, under the Environmental Protection Act**	
Preliminary Permit to Develop Land (Highway Access Permit)	**Urban and Rural Planning Act, Protected Road Zoning Regulations, & Works, Services and Transportation Act**	
Used Oil or Glycol Storage Application for Registration / Approval	**Used Oil and Used Glycol Control Regulations, Used Oil Control Regulations**	
Certificate of Approval for Transportation of Waste Dangerous Goods / Hazardous Waste	**Environmental Protection Act**	NL DECC; Pollution Prevention Division, Waste Management Section
Federal		
Fisheries Act Authorization Permitting harmful alteration, disruption or destruction of fish habitat, and/or the death of fish.	**Fisheries Act**	Department of Fisheries and Oceans Canada (DFO)
Permits Authorizing an Activity Affecting Listed Wildlife Species	**Species at Risk Act**	Environment and Climate Change Canada (ECCC)
DND Letter of Non-Objection	**Civil Air Navigation Services Commercialization Act**	Department of National Defense
Storage Tank Regulations	**Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations, Canadian**	Environment and Climate Change Canada (ECCC)

Permit / Approval / Licence / Authorization	Legislation / Regulation Reference	Agency
	Environmental Protection Act, 1999	
Weather Radar Assessment	N/A - ECCC Guidelines for Wind Turbine and Weather Radar Siting	
Land Use Approval (General)	**Civil Air Navigation Services Commercialization Act**	Nav Canada
Land Use Approval (Cranes)		
Aeronautical Assessment for Obstruction Evaluation	**Aeronautics Act; Canadian Aviation Regulations**	Transport Canada
Approval under the Canadian Navigable Waters Act (CNWA)	**Canadian Navigable Waters Act (CNWA)**	
Notice Regarding Substances Located at a Facility (Schedule 2)	**Environmental Emergency Regulations, 2019**	ECCC
Notice Regarding the Preparation of an Environmental Emergency Plan (Schedule 3)		
Notice Regarding the Bringing Into Effect of an Environmental Emergency Plan (Schedule 4)		
Notice Regarding Simulation Exercises (Schedule 5)		

3.0 Environment

The following sections describe the existing biophysical and socio-economic environment before implementation of the proposed Project. Section 3.1 provides an overview of the Project setting and the various Valued Components (VC) that may interact with the Project. These VCs include the atmospheric, aquatic, terrestrial, and socio-economic environments, land and resource use, and heritage and cultural resources.

Section 3.2 describes the baseline studies conducted for this Project, including summaries of methodologies employed for desktop and field surveys, synopses of results, and data gaps. The full reports for the baseline studies can be found in Appendices A to L.

Section 3.3 describes the predicted future condition of the environment over the expected lifespan of the Project if it were not to proceed.

3.1 Description of Existing Environment and Valued Components

The environment within the Project Area has experienced a long history of anthropogenic use, including the development of the Argentia Peninsula as a U.S. naval base, an industrial seaport, a port for the Marine Atlantic ferry terminal, a hydrometallurgy nickel processing test facility, a glider training facility for the Royal Canadian Air Cadets, and a marshalling port for monopiles for wind projects. In progress (as of 2024) are plans for a marine terminal expansion in Cooper Cove in Argentia Harbour (NL EA registration no. 2279). The Argentia Backlands also has a long history of anthropogenic use dating back to the naval base, and infrastructure remains today in the form of a road network and bunkers scattered throughout the landscape. The Argentia Backlands also includes a hiking trail with plans for expansion to provide 16 km of recreational hiking trails throughout the area (NL EA registration no. 2257).

The Argentia Peninsula is essentially a brownfield site with few remaining natural terrain features; however, the adjacent Argentia Backlands provide a mosaic of different habitat types including young and mature coniferous forest, wetlands, meadows, ponds, and scrub forest, with a history of habitat modification from the naval base and domestic use. The transmission line route to Long Harbour will parallel existing linear features for the greater portion of the distance with only one section likely to intersect intact natural land, along the last 5 km to Long Harbour.

Given that this Project has three distinct sections comprising the Project Area (i.e., the peninsula, the Argentia Backlands, and the transmission line to Long Harbour), VCs were chosen to ensure that the entire Project Area was reflected in this assessment. VCs are elements of natural and human

environments that have scientific/socio-economic/cultural/historical importance to stakeholders, the public, the proponent, regulators, scientists, or Indigenous Peoples.

VCs for this Project were selected to comply with guidance provided by NL DECC and to characterize the biophysical/ecological environment, the anthropogenic environment, and the social/economic/cultural environment. For this Registration, a set of Key Indicators (KI) were identified within each VC to address the full suite of potential and anticipated interactions with the Project. The focus of this chapter is to provide a baseline description of each of the KIs using measurable parameters that will enable a detailed examination and prediction of environmental effects (Section 4).

3.1.1 Atmospheric Environment

The scope of the atmospheric environment VC encompasses regional climate, greenhouse gas (GHG) emissions, air quality, light, vibration, and noise. Information from regulatory agencies and baseline studies have been distilled into the following subsections to illustrate the existing condition of the atmospheric environment in the Project Area.

3.1.1.1 Regional Climate

The Project Area is in the Southeastern Barrens Subregion of the Maritime Barrens Ecoregion. The Ecoregion is characterized by foggy, cool summers and short, relatively moderate winters along the coasts and colder inland (Protected Areas Association of Newfoundland and Labrador [PAANL], 2008). Due to the proximity to the Atlantic Ocean, the region is susceptible to prolonged periods of dense fog.

Canadian Climate Normals calculated for data collected from a nearby meteorological station in Long Harbour (approximately 15 km from the Project Area) are presented in Table 3.1.1-1 (Government of Canada, 2023a). While a meteorological station exists in Argentia, data collection has been historically sporadic, thus hindering the calculation of Canadian Climate Normals. For this Registration, it has been assumed that meteorological data collected at the Long Harbour Station are representative of regional climatic conditions.

Daily average temperatures in Long Harbour ranged from -4.0 to 15.9 degrees Celsius (°C), with the lowest average temperatures occurring in February and the highest in August (Government of Canada, 2023a). The average daily temperature drops below freezing in December and remains below zero until March. Annual average precipitation in Long Harbour is approximately 1,366.3 millimetres (mm), which includes approximately 1,205.9 mm of rain and 160.4 centimetres (cm) of snow. Monthly average precipitation ranged from 91.5 mm to 150.2 mm; the least was measured in May and the most in October.

Table 3.1.1-1 Long Harbour Canadian Climate Normals (1971-2000).

Month	Daily Temperature			Precipitation			Wind
	Average (°C)	Maximum (°C)	Minimum (°C)	Total (mm)	Rain (mm)	Snow (cm)	Maximum Hourly Speed ($km \cdot h^{-1}$)[1]
January	-3.5	0.4	-7.4	130.5	86.9	43.6	72 (1977)
February	-4	0	-7.8	108.1	67.6	40.5	79 (1982)
March	-1.1	2.7	-4.9	110.9	83.6	27.3	72 (1976)
April	3	6.4	-0.5	102.3	92.7	9.6	53 (1975)
May	6.8	10.7	2.9	91.5	89.9	1.7	64 (1970)
June	10.8	14.9	6.7	112	112	0	55 (1978)
July	14.9	18.7	11.1	93.5	93.5	0	53 (1983)
August	15.9	19.5	12.2	102.4	102.4	0	56 (1972)
September	12.9	16.4	9.3	123.8	123.8	0	63 (1979)
October	8.2	11.5	4.9	150.2	149.8	0.4	71 (1976)
November	4	7.1	0.8	125.2	117.4	7.8	72 (1976)
December	-0.7	2.7	-4	116.2	86.5	29.7	74 (1971)
Year	5.6	9.2	1.9	1366.3	1205.9	160.4	79 (1982)

NOTES
[1] Bracketed values indicate the year in which maximum hourly wind speed was recorded.

Maximum hourly wind speeds were recorded at 53 to 79 kilometres per hour ($km \cdot hr^{-1}$); the highest wind speeds have been historically detected between October and March.

Wind speed and direction were not recorded at the Long Harbour station; however, wind data collected at the Argentia station in 2023, marking the first year of continuous data collection in several years, were reviewed (Government of Canada, 2023b). The wind rose presented in Figure 3.1.1-1 shows that wind speeds most frequently occurred from the southeast direction. Predominant wind directions were from the southeast and northwest, with a larger proportion of strong wind speeds occurring from the southeast.

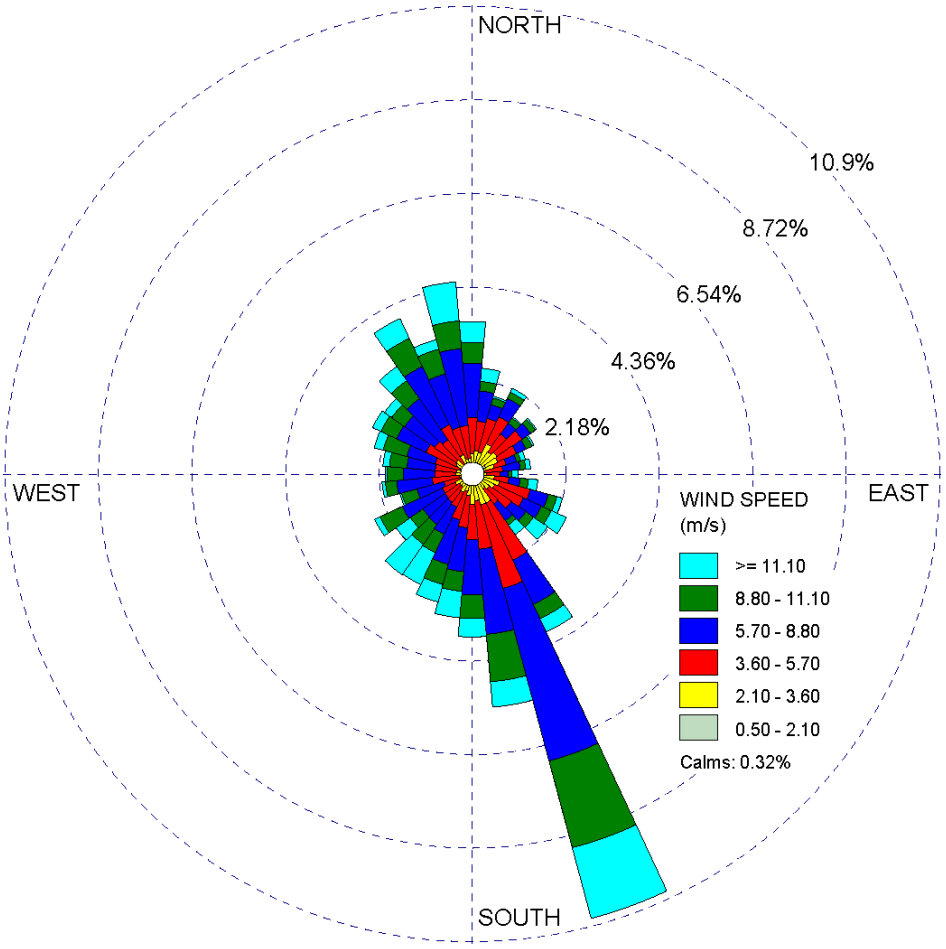


Figure 3.1.1-1 Winds at Argentia, NL (2023).

In addition to temperature, precipitation, and wind data, incidences of historical extreme weather events were also included in Long Harbour Canadian Climate Normals (Table 3.1.1-2). The extreme maximum and minimum daily temperatures were 30.6°C and -25°C, recorded in August 1972, and February 1975, respectively (Government of Canada, 2023a). The highest single day total of precipitation was recorded in October 1981, where 119 mm of rain fell. Extreme snow depths were recorded between November and May, with the most extreme snow depth of 84 cm measured in March 1987.

Table 3.1.1-2 Long Harbour Extremes (1971-2000).

Month	Temperature		Precipitation			
	Extreme Maximum (°C) [1]	Extreme Minimum (°C)[1]	Extreme Daily Rainfall (mm) [1]	Extreme Daily Snowfall (cm) [1]	Extreme Daily Precipitation (mm) [1]	Extreme Snow Depth (cm)[1]
January	15 (1976)	-24 (1984)	53.8 (1999)	30.5 (1971)	53.8 (1999)	60 (1992)
February	16 (1996)	-25 (1975)	59.2 (1970)	30 (1987)	59.2 (1970)	40 (1982)
March	17.2 (1976)	-22.5 (1986)	80.2 (1994)	35.6 (1974)	80.2 (1994)	84 (1987)
April	21 (1986)	-14 (1994)	82 (1986)	24 (1999)	82 (1986)	24 (1999)
May	20.5 (1989)	-6.7 (1974)	55 (1999)	31 (1972)	55 (1999)	4 (1988)
June	25 (1977)	-5 (1981)	92.4 (1986)	0 (1970)	92.4 (1986)	0 (1988)
July	26.1 (1973)	-1 (1982)	63 (1998)	0 (1970)	63 (1998)	0 (1988)
August	30.6 (1972)	1.7 (1975)	78.5 (1974)	0 (1970)	78.5 (1974)	0 (1988)
September	27 (1989)	-2.5 (1982)	68 (1995)	0 (1970)	68 (1995)	0 (1988)
October	22.5 (1987)	-6 (1982)	119 (1981)	10.2 (1975)	119 (1981)	0 (1987)
November	19.5 (1989)	-12 (1978)	66.4 (1983)	23 (1997)	66.4 (1983)	28 (1997)
December	16.1 (1969)	-20 (1993)	41 (1992)	30 (1991)	41 (1992)	60 (1991)

NOTES
[1] Bracketed values indicate the year in which extreme was recorded.

3.1.1.2 Climate Change Projections

Impacts of climate change for Newfoundland and Labrador were projected using available observations and regional climate models (Finnis, 2013; Finnis & Daraio, 2018). A summary of projected climate change impacts for Argentia is presented in Table 3.1.1-3. Projected climate change impacts are based on temperature and precipitation indices.

Table 3.1.1-3 Climate change projections for Argentia, NL.

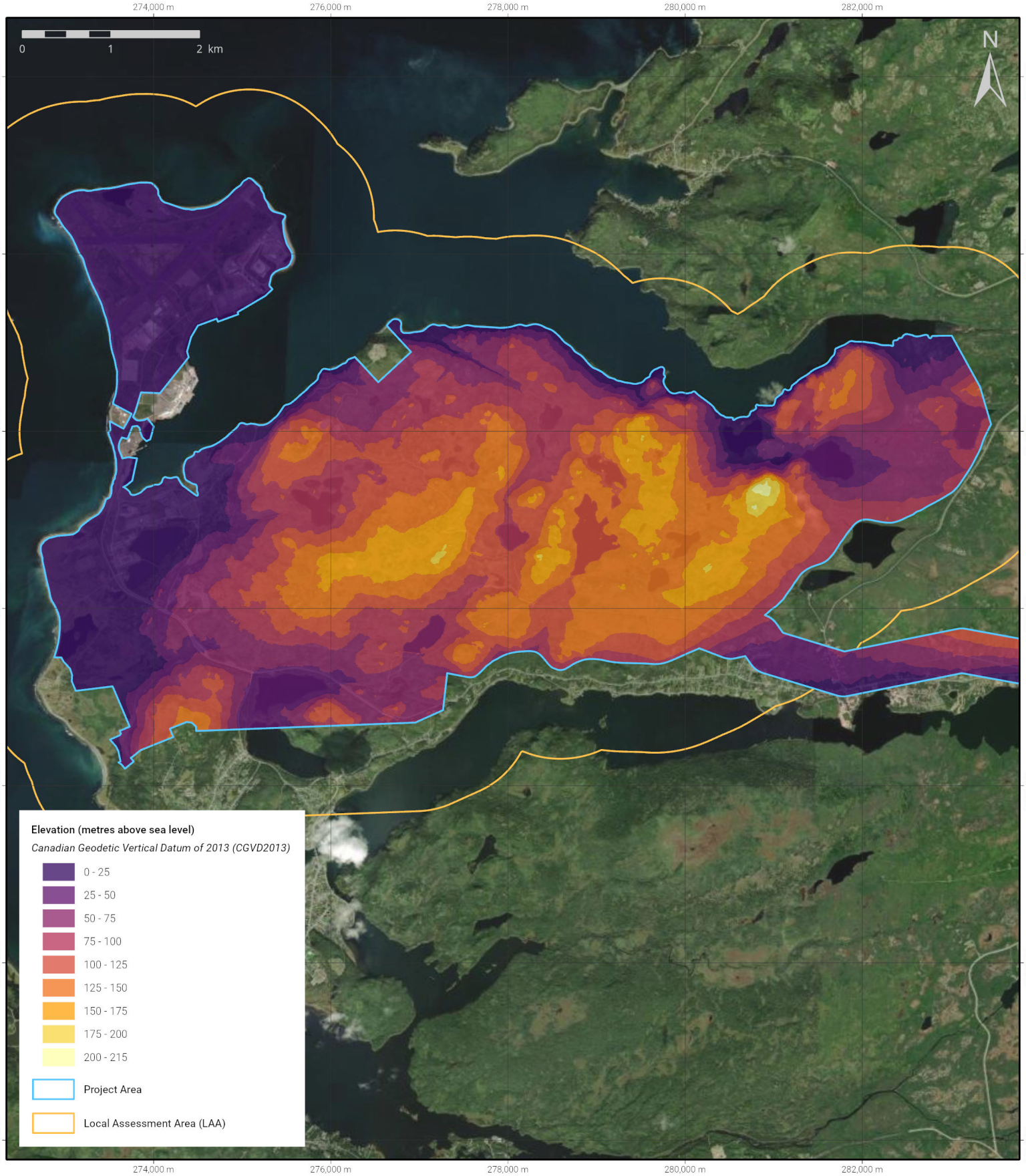
Climate Index	Season	20th Century Climate	Projection: 2041-2070		Projection: 2071-2100	
			Average	Uncertainty	Average	Uncertainty
Daily Mean Temperature (°C)	Winter	-1.0	2.3	1.3	4.3	1.7
	Spring	2.8	5.7	0.8	7.6	1.1
	Summer	13.6	16.6	1.3	18.4	1.8
	Fall	9.3	11.5	1.2	13.5	1.6
Daily Minimum Temperature (°C)	Winter	-3.82	0.00	1.48	2.24	1.86
	Spring	-0.15	3.10	0.67	5.06	1.01
	Summer	10.94	13.84	1.33	15.68	1.89
	Fall	6.68	8.84	1.18	10.91	1.62

Climate Index	Season	20th Century Climate	Projection: 2041-2070		Projection: 2071-2100	
			Average	Uncertainty	Average	Uncertainty
Daily Maximum Temperature (°C)	Winter	1.73	4.55	1.12	6.41	1.53
	Spring	5.73	8.39	1.08	10.10	1.34
	Summer	16.35	19.44	1.29	21.13	1.80
	Fall	11.92	14.17	1.23	16.15	1.62
Number of Frost Days	Winter	72.5	44.3	14.9	22.9	18.7
	Spring	40.5	16.5	4.6	6.0	5.4
	Summer	0.0	0.0	0.0	0.0	0.0
	Fall	6.9	2.2	1.5	0.6	0.7
Maximum Heat Wave Duration (days)	Winter	0.0	0.2	0.2	0.1	0.2
	Spring	0.0	0.3	0.4	0.1	0.2
	Summer	0.0	0.0	0.1	0.1	0.1
	Fall	0.0	0.0	0.0	0.2	0.2
Mean Daily Precipitation (mm)	Winter	3.0	3.9	0.3	4.2	0.4
	Spring	2.1	2.9	0.2	3.1	0.2
	Summer	3.0	2.9	0.4	2.9	0.4
	Fall	3.4	3.7	0.2	3.6	0.3
Mean Precipitation Event Intensity (mm)	Winter	8.5	10.0	0.9	10.7	0.9
	Spring	8.0	8.8	0.3	9.3	0.3
	Summer	10.8	9.9	0.7	10.1	0.7
	Fall	10.8	11.7	0.5	11.9	0.7
Maximum 3-day Precipitation (mm)	Winter	44.0	58.6	7.7	63.6	9.2
	Spring	42.1	51.0	4.1	56.4	4.7
	Summer	63.5	58.6	7.1	63.2	9.3
	Fall	54.2	72.8	7.3	74.2	6.4
Maximum 5-day Precipitation (mm)	Winter	56.5	69.8	7.8	76.4	9.4
	Spring	48.9	60.1	4.1	67.1	4.9
	Summer	71.8	67.1	7.8	73.0	10.8
	Fall	66.3	83.0	7.7	85.3	8.0
Maximum 10-day Precipitation (mm)	Winter	84.8	101.9	10.1	111.6	12.5
	Spring	66.1	84.9	6.2	93.9	5.9
	Summer	91.2	93.9	12.0	98.0	14.0
	Fall	99.0	113.3	7.8	113.2	9.6
Number of Days with 10 mm or more Precipitation	Winter	8.5	11.9	1.0	13.0	1.2
	Spring	5.8	8.6	0.7	9.4	0.6
	Summer	8.9	8.3	0.9	8.3	0.7
	Fall	11.1	10.7	0.6	10.3	1.0

Climate Index	Season	20th Century Climate	Projection: 2041-2070		Projection: 2071-2100	
			Average	Uncertainty	Average	Uncertainty
90th percentile of precipitation events (mm)	Winter	9.0	12.1	1.0	13.6	1.4
	Spring	6.4	8.5	0.5	9.2	0.6
	Summer	8.0	8.0	0.8	7.9	1.1
	Fall	11.5	10.6	0.7	10.3	1.4
Maximum Number of Consecutive Dry Days	Winter	10.8	8.3	0.6	8.1	0.7
	Spring	23.6	11.0	0.6	10.6	0.7
	Summer	11.7	12.0	1.4	12.3	1.3
	Fall	11.6	10.9	1.0	11.0	1.2
Mean Dry Spell Length (days)	Winter	3.0	3.9	0.3	4.2	0.4
	Spring	2.1	2.9	0.2	3.1	0.2
	Summer	3.0	2.9	0.4	2.9	0.4
	Fall	3.4	3.7	0.2	3.6	0.3

It is expected that temperature increases between 4.4 to 5.3°C will occur in Argentia over the next century. This region currently experiences temperatures near 0°C from September to May, thus, rising temperature trends indicate less precipitation in the form of snow and more in the form of rain. Precipitation analyses predict that there will be fewer but heavier snowstorms and more frequent and heavier occurrences of rain throughout the cold season. It is anticipated that the Avalon Peninsula will have a lower number of days with temperatures below freezing, particularly in the fall and spring. There are considerable increases in precipitation event intensity along the south coast; Argentia will see increases in precipitation intensity in the winter, spring, and fall. Projected changes in maximum 3-day, 5-day, and 10-day precipitation as well as the 90th percentile of precipitation events follow regional patterns like those described for mean precipitation intensity. Hazardous events typically occur over several days, during which time reservoirs, soil moisture capacity, and waterbodies may gradually become overloaded and overflow as a result. The greatest changes for consecutive precipitation days for the Avalon Peninsula occur in the winter and are concentrated along the south coast.

Based on Intergovernmental Panel on Climate Change (IPCC) predictions, coastal sea level in Argentia is projected to rise by 40 cm by 2049 and 100+ cm by 2099 (Batterson & Liverman, 2010). Local impacts of crustal rebound (i.e., rising of land mass as ice sheets melt) in Argentia are projected to increase by 2 mm annually. As per Figure 3.1.1-2, areas along the coast and the Argentia Peninsula have the lowest elevations above sea level and will thus be the most vulnerable to sea level rise.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.1 - 2	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Project Area Elevations	NOTES: Elevation data source: Government of Canada - High Resolution Digital Elevation Model (HRDEM) - CanElevation Series	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-009-Rev1

3.1.1.3 GHG Emissions

GHG emissions in Newfoundland and Labrador predominately originate from large industry including mining, oil refining, electricity generation, and offshore petroleum. There are six key GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). Provincial GHG emissions are dominated by CO_2, CH_4 and N_2O; emissions of fluorinated gases (HFCs, PFCs, SF_6) are less abundant.

The **Management of Greenhouse Gas Act, 2016** stipulates that GHG emissions are reported in terms of carbon dioxide equivalents (CO_2e), allowing emissions from all GHGs to be accurately compared. Emissions are converted to units of CO_2e using global warming potentials (GWPs); GWP is an index to measure the amount of energy a GHG will absorb relative to CO_2 over a given period. In accordance with the Act, industrial facilities are required to report emissions to the Newfoundland and Labrador Department of Environment and Climate Change (NL DECC) if annual emissions reach or exceed 15,000 tonnes (t) of CO_2e. Provincial GHG emission data for the 2022 reporting year is provided in Table 3.1.1-4.

There are no large industrial facilities in the Project Area. The nearest large industrial facility, and hence emission source, to the Project is the Long Harbour Hydromet Nickel Processing Facility operated by Vale Newfoundland and Labrador (Vale) approximately 20 km from the Project Area. In 2022, the Long Harbour Hydromet Nickel Processing Facility emitted 50,240 tonnes of CO_2e; accounting for approximately 2% of provincial GHG emissions (Newfoundland and Labrador Department of Environment and Climate Change, n.d.). Other sources of GHGs near the Project are considered negligible or transient in nature (e.g., Marine Atlantic Ferry and POA operations).

Table 3.1.1-4 Provincial GHG Emissions 2022.

Facility	Location	Operator	Approximate Distance from Project (km)	Greenhouse Gas Emissions (tonnes CO_2e) excluding biomass				
				CO_2	CH_4	N_2O	Other[1]	Total
Long Harbour Operations	Long Harbour	Vale Newfoundland and Labrador	20	48,818	39	1,383	0	50,240
Braya Renewable Fuels	Come by Chance	Braya Renewable Fuels (Newfoundland) LP	50	43,542	882	660	0	48,083
Holyrood Thermal Generating Station	Holyrood	Newfoundland and Labrador Hydro	70	651,767	172	3,866	0	655,805
Holyrood Gas Turbine	Holyrood	Newfoundland and Labrador Hydro	70	1,904	2	85	0	1,992
Canada Fluorspar Inc	St. Lawrence	Canada Fluorspar Inc	120	3,274	7	127	0	3,408
Corner Brook Pulp and Paper	Corner Brook	Kruger Inc.	350	32,418	34	287	321	33,061
Iron Ore Company of Canada	Labrador City	Rio Tinto - Energy and Minerals	>1,000	815,297	490	7,718	0	823,505
Tacora Resources	Wabush	Tacora Resources, Inc	>1,000	109,187	112	1,819	0	111,118
Voisey's Bay Mine Site	Voisey’s Bay	Vale Newfoundland and Labrador	>1,000	142,503	178	6,387	0	149,070
Tata Steel Mineral Canada	Schefferville (Québec)	Tata Steel Mineral Canada	>1,000	36,936	46	1,651	0	38,633
Hibernia GBS	Offshore	HMDC Ltd.	-[2]	441,204	11,772	2,798	0	455,774
Hebron GBS	Offshore	ExxonMobil Canada Ltd.	-[2]	418,124	10,446	3,015	0	431,586
SeaRose FPSO	Offshore	Cenovus Energy Inc.	-[2]	299,399	17,238	1,860	0	318,497
West Hercules	Offshore	Equinor Canada Ltd.	-[2]	16,633	23	662	0	17,318

[1]Other includes hydrofluorocarbons, perfluorinated compounds, sulfur hexafluoride.
[2]Approximate distances for offshore industrial facilities not calculated.

3.1.1.4 Air Quality

Ambient air quality in the province is generally good – episodes of diminished air quality are rare and typically a result of long-range transport of pollutants (e.g., smoke from forest fires in other regions) or industrial emissions (Newfoundland and Labrador Department of Environment and Climate Change, 2023). While long-range transport of pollutants and industrial emissions are considered major sources, ambient air quality can also be impacted on a regional scale by minor sources including vehicular traffic and woodstove use. Regardless of source, quality of ambient air is assessed via comparison to provincial and federal standards; NL Air Quality Standards (NL AQS) and Canadian Ambient Air Quality Standards (CAAQS; established by the Canadian Council of Ministers of the Environment (CCME)), respectively.

Air quality in Newfoundland and Labrador is monitored using the National Air Pollution Surveillance (NAPS) network, a cooperative initiative by Environment and Climate Change Canada (ECCC) and the Newfoundland and Labrador Department of Environment and Climate Change (NL DECC). As part of the NAPS network, the NL DECC manages and runs six monitoring stations. In addition to the NAPS network, NL DECC manages the industrial monitoring network (IMN) for which major industrial operations in NL monitor air quality near their operations for select pollutants. The NAPS network and IMN focus on the following air contaminants (Environment and Climate Change Canada, 2022; Newfoundland and Labrador Department of Environment and Climate Change, 2023):

- Particulate matter less than 2.5 microns ($PM_{2.5}$);
- Particulate matter less than 10 microns (PM_{10});
- Ozone (O_3);
- Nitric oxide (NO);
- Nitrogen dioxide (NO_2);
- Oxides of nitrogen (NO_x);
- Carbon monoxide (CO); and
- Sulfur dioxide (SO_2).

Data collected from NAPS and IMN stations are summarized by the NL DECC in annual ambient air monitoring reports, which present statistics that are key indicators of air quality. Such statistics are compared to air quality standards prescribed by the provincial **Air Pollution Control Regulations, 2022**. There are no ambient air quality monitoring stations in the Project Area, nor are there any large industry emission sources. The closest ambient air quality monitoring (AAQM) stations are in Long Harbour. The two stations in Long Harbour, operated under the IMN by Vale, monitor $PM_{2.5}$, PM_{10} and NO_x/NO_2. Since regional air quality does not vary significantly in the province, the NAPS monitoring station in Mount Pearl, located approximately 90 km northeast of the Project, was used to supplement the desktop assessment of air quality in the Project Area. Ambient levels of SO_2, NO_x/NO_2, CO, O_3, $PM_{2.5}$ and PM_{10} are monitored at the AAQM station in Mount Pearl.

There were no exceedances of the NL AQS for SO_2, $PM_{2.5}$, PM_{10}, NO_2, and CO at the AAQM stations in Mount Pearl and Long Harbour between 2020 and 2022 (Newfoundland and Labrador Department of Environment and Climate Change, 2021, 2023). The 8-hour ambient levels of O_3 in Mount Pearl exceeded the NL AQS in 2020 (one exceedance) and 2021 (13 exceedances). A summary of the maximum concentrations detected between 2020 and 2022 at the AAQM stations in Mount Pearl and Long Harbour are provided in Table 3.1.1-5.

Table 3.1.1-5 Ambient Air Quality Monitoring Results – Maximum Concentrations (2020-2022).

Air Contaminant	Units of Concentration	Averaging Time	Maximum Concentration (2020-2022)			NL AQS
			Mount Pearl (NAPS)	Long Harbour (IMN)		
				Community Centre (AM1)	Access Road (AM3)	
CO	ppb	1 hour	1,700	--[1]	--[1]	30,582
		8 hour	500	--[1]	--[1]	13,107
$PM_{2.5}$	$\mu g \cdot m^{-3}$	24-hour	16	25.0	23.7	25
		1-year	5.1	5.3	5.0	8.8
PM_{10}	$\mu g \cdot m^{-3}$	24 hour	28.2	29.9	29.2	50
O_3	ppb	1-hour	54.3	--[1]	--[1]	82
		8-hour	49.0	--[1]	--[1]	44
NO_2	ppb	1-hour	40.3	14.3	9.3[2]	213
		24 hour	11.7	4.3	2.8[2]	106
		1-year	1.1	1.1	--[3]	53
SO_2	ppb	1-hour	8.7	--[1]	--[1]	344
		3 hour	6.6	--[1]	--[1]	229
		24 hour	2.2	--[1]	--[1]	115
		1-year	0.3	--[1]	--[1]	23

NOTES
ppb=parts per billion; $\mu g \cdot m^{-3}$ = micrograms per cubic metre
[1] Parameter not measured.
[2] Based on limited data.
[3] Insufficient data to calculate annual average.

Table 3.1.1-5 illustrates that maximum concentrations detected across a three-year period are generally significantly lower than NL AQS, apart from $PM_{2.5}$ in Long Harbour and O_3 in Mount Pearl. Elevated concentrations of $PM_{2.5}$ at Long Harbour AAQM stations are likely a result of ongoing industrial operations in the area.

In the absence of an AAQM station in the Study Area, a baseline ambient air quality survey was conducted in the summer of 2023 to characterize background concentrations of air contaminants of potential concern of the Project. Such air contaminants included $PM_{2.5}$, total suspended particulate (TSP), metals, ammonia (NH_3), NO_2 and SO_2. Ambient concentrations of $PM_{2.5}$, TSP and metals were determined by collecting size-selective samples via particle samplers on pre-weighed filter media over a discrete time frame (i.e., 72-hours). Ambient concentrations of NH_3, NO_2 and SO_2 were determined via a

month-long deployment of passive samplers that contain species-specific sorbent to collect gases and vapours through a permeative or diffusive process. To facilitate comparison with NL AQS, 72-hour and monthly concentrations were converted to 24-hour concentrations using methodology set out in the Air Dispersion Modelling Guideline for Ontario (Ontario Ministry of the Environment and Climate Change, 2017).

Results of the baseline ambient air quality survey are summarized in Tables 3.1.1-6 and 3.1.1-7. Sampling was conducted at two locations and were surveyed in duplicate: one in a residential area on Power Street in Dunville and another in a mixed-use area near the POA and a seasonal camping area (Sunset RV Park) in Argentia. Rationale for baseline sample location selection is detailed in Appendix A (Atmospheric Environment Baseline Study). A single set of passive samplers (i.e., one for each gaseous species) were deployed at each location in Dunville (also referred to as Power Street) and Argentia (also referred to as Port Authority).

Table 3.1.1-6 Baseline Ambient Air Quality Survey Results – $PM_{2.5}$, TSP and Metals.

Sampling Details			Monitoring Results (µg·m^{-3})						
			Particulate Matter		Total Metals				
Averaging Period	Site	Date	$PM_{2.5}$	TSP	Copper (Cu)	Lead (Pb)	Nickel (Ni)	Vanadium (V)	Zinc (Zn)
24-hour*	Power Street	July 14-17	3.71	38.4	0.0014	ND	0.0034	0.00086	0.011
		July 17-20	5.07	15.6	0.0013	ND	0.0011	0.00078	0.016
	Port Authority	July 20-23	2.52	9.47	0.0016	ND	0.0016	0.00058	ND
		July 23-26	4.35	16.2	0.0045	0.00067	0.0099	0.00078	0.012
NL AQS			25	120	50	2	2	2	120

NOTES:
µg·m^{-3}=micrograms per cubic metre; ND=not detected
*Results converted to 24-hour exposure for comparison NL AQS.

Table 3.1.1-7 Baseline Ambient Air Quality Survey Results – NH_3, NO_2 and SO_2.

Sampling Details		Monitoring Results (ppb)		
Exposure Period	Site	Ammonia (NH_3)	Nitrogen dioxide (NO_2)	Sulfur dioxide (SO_2)
24-hour	Power Street	0.8	0.5	0.3
	Port Authority	0.3	0.3	0.3
NL AQS		144	106	115

NOTES
ppb=parts per billion
*Results converted to 24-hour exposure for comparison with NL AQS.

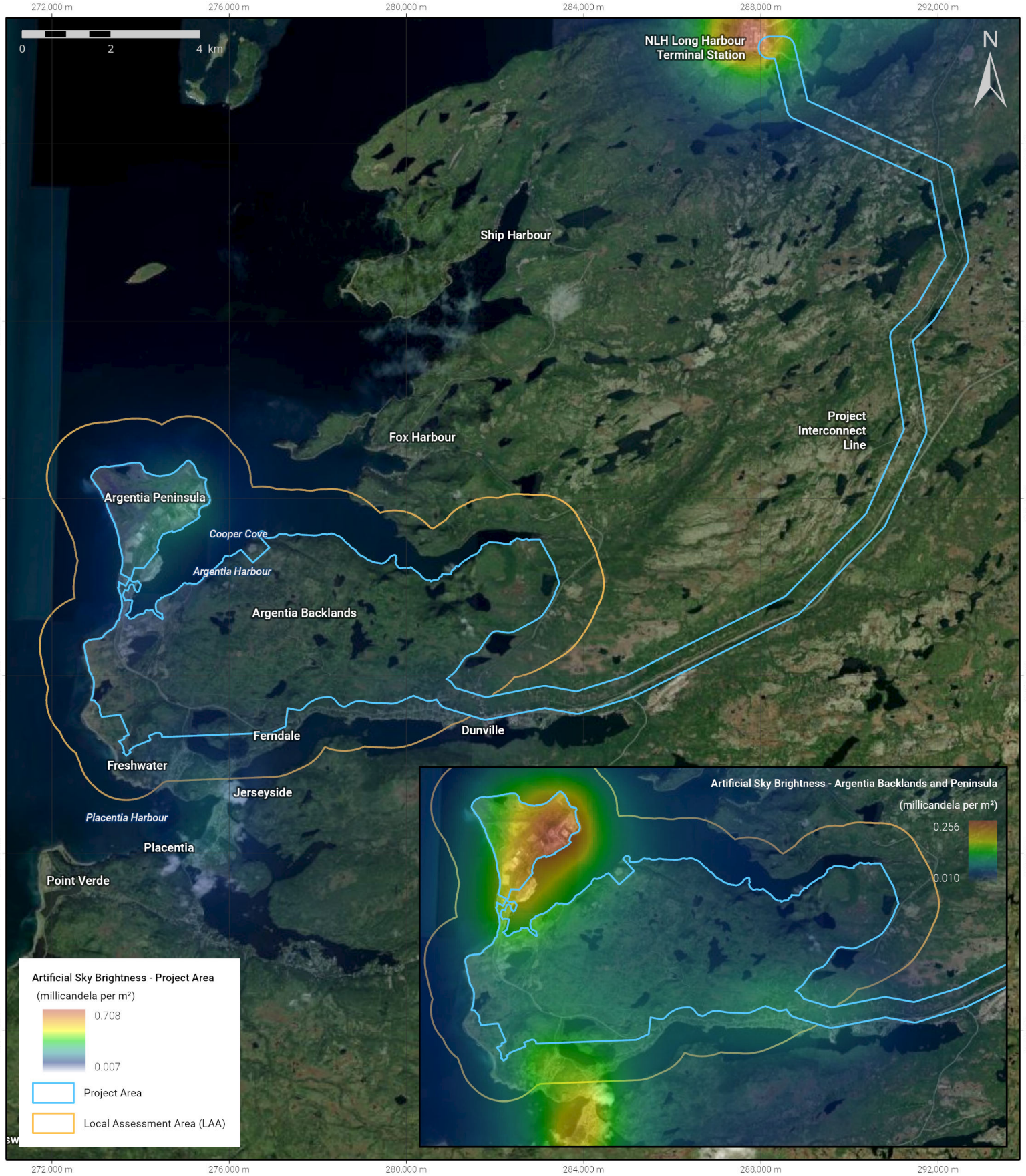
Consistent with AAQM station data in the region, concentrations of air contaminants measured in the baseline ambient air quality survey were significantly lower than NL AQS.

3.1.1.5 Light

The existing ambient light environment of the Project, located in a rural area, is categorized as E2 (low district brightness areas) by the Institution of Lighting Engineers (ILE) (The Institution of Lighting Engineers, 2005). Guidance from the ILE was applied as there are currently no regulations in NL related to light from industrial operations.

Regional levels of ambient light were further assessed using modelling data and satellite observations of artificial light (Falchi *et al*., 2016a, 2016b). The presence of artificial light can cause artificial skyglow, the most visible negative effect of light pollution. Artificial skyglow occurs when clouds are illuminated by nighttime light sources on the Earth's surface. It is the cumulative effect of all lights either emitting or reflecting from the Earth's surface upward plus emissions of atmospheric photochemical activity. Artificial brightness of the Project Area, as classified by the New World Atlas of Artificial Sky Brightness, ranges from 55.7 to 445 microcandela per square metre (µcd·m^{-2}) (Falchi *et al*., 2016a, 2016b). Total brightness of the Project Area ranges from 0.017 to 0.651 millicandela per square metre (mcd·m^{-2}), or 17 to 651 µcd·m^{-2}. Ambient light levels in the Project Area can be further classified using the Bortle scale, which uses nine levels to measure night sky brightness in a particular location (Bortle, 2001). According to the Bortle scale, night sky brightness in the Project Area is classified as rural sky to suburban sky (i.e., Class 3 to 5). The highest incidence of artificial light within the Project Area occurs on the Argentia Peninsula, the industrial hub of the area, followed by the industrial and residential areas of Argentia, Placentia and Dunville (Figure 3.1.1-3).

Baseline studies of ambient light were not conducted due to the siting of Project infrastructure. The Argentia Green Fuels Facility will be constructed in the area of highest incidence of artificial light. The onshore Argentia Wind Facility will be constructed on POA Property at sufficient setback from sensitive receptors, and Project infrastructure will be equipped with the minimum amount of lighting required to meet Transport Canada standards.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.1 - 3	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Artificial Sky Brightness	NOTES: Artificial Sky Brightness sourced from New World Atlas Dataset: Falchi et al., 2016a, 2016b	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-010-Rev0

3.1.1.6 Noise

Ambient noise levels in the Project Area are a culmination of both biogenic (e.g., birds, mammals, wave breaking, wind) and anthropogenic (e.g., vehicular traffic, heavy equipment, earthworks, blasting) sources. Biogenic sources of noise are intermittent while noise generated by ongoing construction and industrial activities are more continuous, and thereby substantive. Such sources are concentrated on or near the Argentia Peninsula, which due to regional topography, does not significantly impact regional noise levels.

Ambient noise levels in the Project Area are considered to be classified as quiet rural to urban residential (Health Canada, 2017). A baseline noise assessment was conducted to support this classification. Ambient noise levels were measured at four monitoring locations: one at the closest sensitive receptor to Project infrastructure noise in Dunville, NL, and three near other potential receptors in the surrounding communities of Freshwater, Ferndale and Fox Harbour, NL. Rationale for monitoring location selection is detailed in Appendix A (Atmospheric Environment Baseline Study). Baseline measurements were used to calculate daytime sound pressure levels (L_d), nighttime sound pressure levels (L_n) and day-night average sound pressure levels (L_{dn}) in terms of A-weighted decibels (dBA); units that reflect frequencies most audible to the human ear. Daytime values were calculated between 07:00 and 23:00, and nighttime between 23:00 and 07:00. Baseline noise levels are summarized in Table 3.1.1-8.

Table 3.1.1-8 Baseline Noise Levels.

Monitoring Location		Monitoring Period*	Measured Noise Levels (dBA)		
			Day; L_d	Night; L_n	Day-Night; L_{dn}
M1	Freshwater, NL	December 1-17, 2023	37	36	43
M2	Ferndale, NL	December 1-17, 2023	42	35	43
M3	Dunville, NL	July 20-26, 2023	52	34	50
M4	Fox Harbour, NL	December 1-17, 2023	61	51	61
*Indicates total period; measurements at individual locations spanned two to six days.					

Baseline values of L_{dn} ranged from 43-61 dBA, which corresponds to a quiet rural (<45 dBA) to urban residential (58-62) community type (qualitative description) according to Health Canada's *Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise* (Health Canada, 2017).

In addition to ambient noise levels, the presence of low frequency noise (LFN) was assessed. Originating from both biogenic and anthropogenic sources, LFN is noise with frequency content in the range of 16 to 200 hertz (Hz). LFN is quantified by subtracting concurrent measurements of A- and C-weighted sound pressure levels (i.e., in units of C-weighted decibels (dBC)); a difference greater than 20 decibels (dB) indicates the presence of LFN (Health Canada, 2017; Nova Scotia Environment and Climate Change, 2023). The presence of LFN, though intermittently detected, was confirmed at all monitoring locations during the baseline noise assessment. Since the region is subject to high winds and wave breaking, it is

likely that biogenic LFN is hindering the detection of anthropogenic LFN, if present (Alberta Energy Regulator, 2023).

3.1.1.7 Vibration

Ambient levels of vibration in the Project Area are low; vibrations occur intermittently based on ongoing construction and industrial activities in the region. Such activities include earthworks, blasting, and movement of heavy equipment. Natural sources of vibration such as volcanic occurrences and seismic activities (i.e., those caused by movement of tectonic plates), both onshore and offshore, are negligible.

Baseline levels of vibration were not measured due to the siting of Project infrastructure. Vibration effects arising from the Construction and Operations and Maintenance phases are not anticipated to impact sensitive receptors since minimum setback distances will be the greater of 3.0 times the turbine blade tip height or 600 m. A setback distance of this magnitude will ensure alignment with the Federal-Provincial-Territorial (FPT) Committee on Health and the Environment on Health and the Environment, which recommends a minimum setback distance of 550 m (FPT Committee on Health and the Environment Working Group on Wind Turbine Noise, 2012).

3.1.2 Aquatic Environment

3.1.2.1 Aquatic Environment Introduction

The Aquatic Environment chapter has been developed in consideration of recommendations provided in Section 3.1.2 of the 'Environmental Assessment Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects' (NL DECC, 2023). The chapter is focused on the following components:

- Groundwater Resources
- Surface Water Resources
- Freshwater Environment
- Freshwater Fisheries
- Marine Environment
- Marine Fisheries and Aquaculture

The content of the Aquatic Environment chapter has been developed based on both field data, as collected in the Aquatic Environment Baseline Study in 2023 (Appendix B1), and publicly available desktop information, reports, and on-line data resources. Additionally, a Source Water Hydrology Report (Appendix C1) was prepared based on publicly available desktop information.

This section of the report specifically describes components of the Aquatic Environment within the RAA, LAA and Project Area associated with the Argentia Green Fuels Facility, wind turbine locations, access roads and Project interconnect lines.

3.1.2.2 Water Resources

Groundwater Resources

There are no public groundwater supply wells located in the Town of Placentia. There are 13 drilled wells, all of which are volcanic bedrock groundwater supply wells. The surficial geology of the Project Area is primarily shaped by the latest glaciation period, the late Wisconsin, resulting in a till veneer covering most of the Project Area (AMEC, 2013).

Bedrock exposed or beneath the thin layer of glacial till in the Argentia Backlands area is composed of extrusive igneous rocks associated with the Bull Arm Formation with little or no primary permeability, resulting in a low to moderate groundwater yield (Newfoundland and Labrador Geoscience Atlas, 2024). The Argentia terrace, an industrially impacted area, consist of younger clastic sedimentary rocks associated with the Big Head Formation (King, 1988). Due to the age and composition of this rock unit, it is characterized by having a low to moderate hydrological yield (Geoscience Atlas; NLDIET, n.d.).

Overall, the thin surficial unit and the aged volcanic and sedimentary bedrock make for a shallow groundwater system very sensitive to surface water supply in the lakes and rivers. Groundwater has little influence on the overall water balance in the region because of its limited capacity. No groundwater is anticipated to be used.

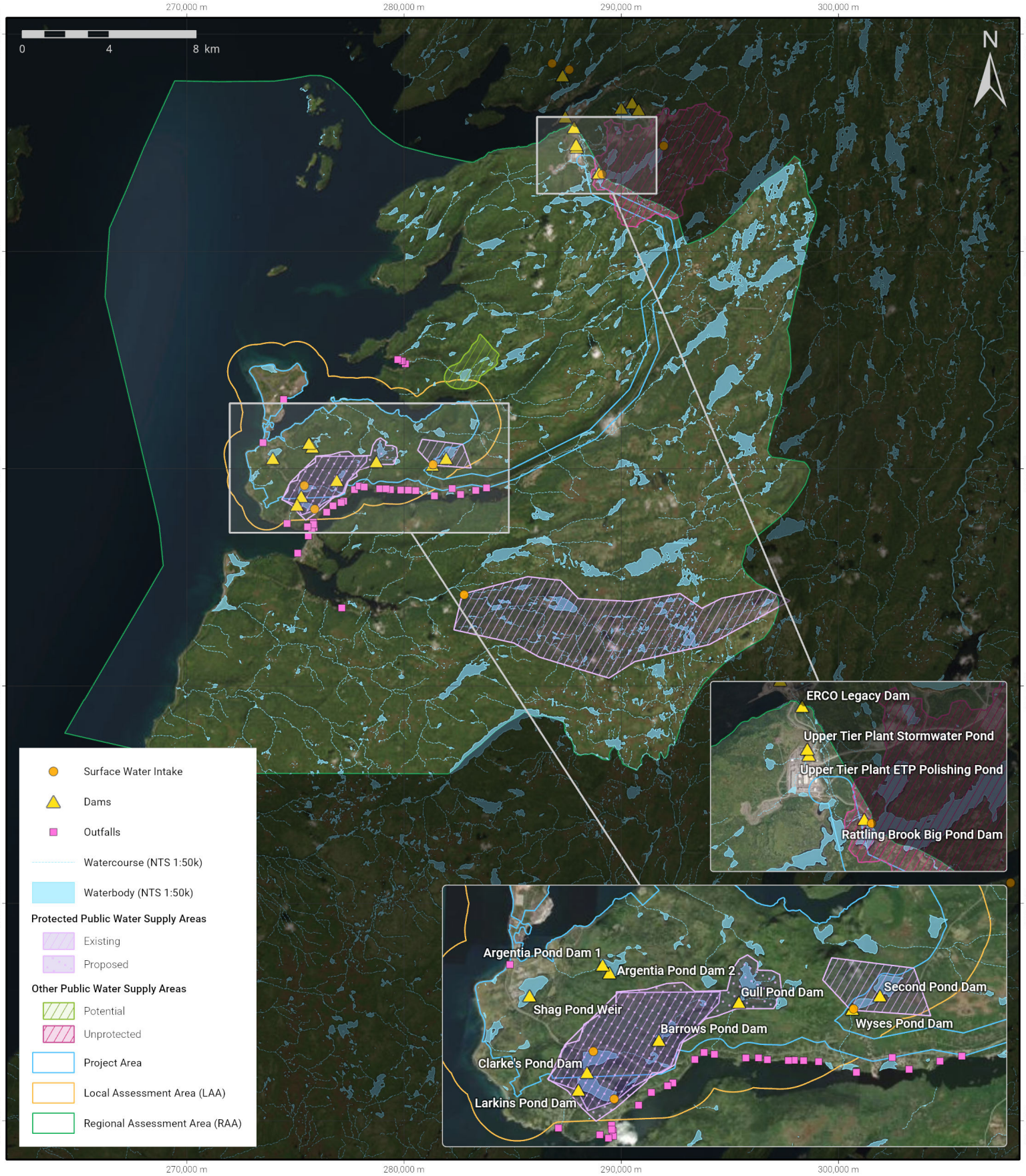
Surface Water Resources

Surface water is represented in the region by several ponds and tributaries (Figure 3.1.2-1). There are nine dam regulated ponds in the Project Area, three of which are protected public water supply areas (PPWSA) with their associated intakes. Clarke’s Pond and Larkins Pond form Placentia’s operational water sources, with a watershed expansion area for Clarke’s Pond consisting of Barrows Pond (also referred to as Barrons Pond), Gull Pond, and an inactive water source of Argentia Pond (PEC, 2024). Argentia Pond might also be known locally as Arch Pond (Argentia/Arch Pond). The Project Area also includes a portion of the Unprotected Rattling Brook Big Pond Public Water Supply Area. The LAA includes a portion of the Potential Fox Harbour Pond Public Water Supply Area. There are two industrial outfalls in Argentia and 25 municipal outfalls in Placentia, which discharge to the ocean.

The Town of Placentia's PPWSA is presently comprised of four active water supplies namely Clarke’s Pond, Larkin’s Pond, Barrons Pond, and Gull Pond and three inactive supplies, Wyses Little Pond/Wyses Big Pond, Argentia/Arch Pond and Southeast Brook. The Clarke’s Pond water supply currently services the communities of Freshwater, Argentia (including the POA), and Dunville. Clarke’s Pond has piped

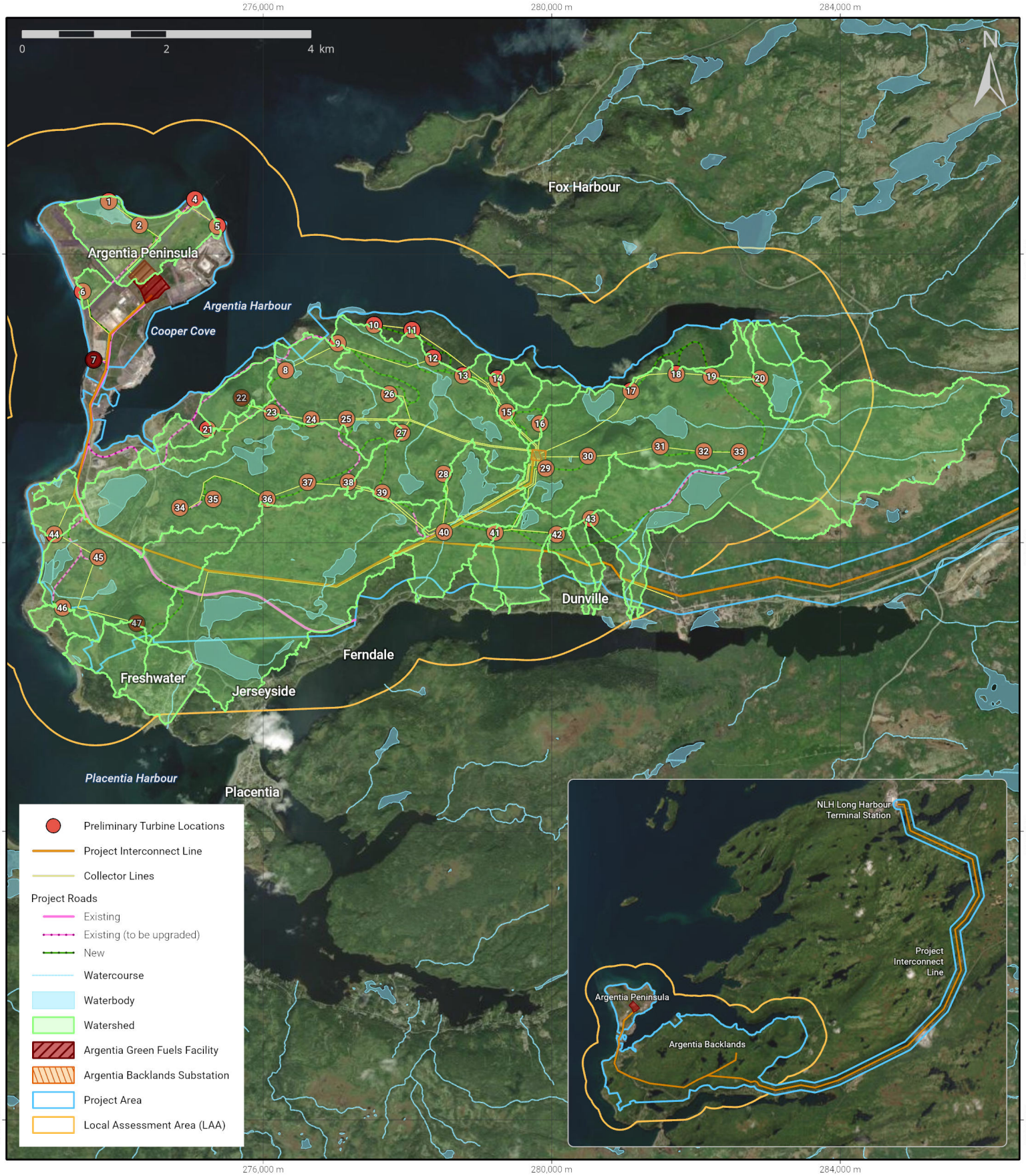
connections to allow for inflow from Barrows Pond and Gull Pond (PEC, 2024). The Larkins Pond water supply currently services Jerseyside, Ferndale, Placentia Proper, and Southeast Placentia (PEC, 2024). It is expected that the total water requirements for the Project (13.7 L/s) can be met by the Town of Placentia's municipal system.

Watersheds within the Argentia Backlands have been delineated in conjunction with watercourses mapped on NTS 1:50,000 scale maps (Figure 3.1.2-2). In Placentia, historical flooding has been triggered by high tides and winds, large rainfall events, storm surge, and wave runup; flood mapping has been delineated by 1:20-year and 1:100-year annual exceedance probability (AEP) floods for current climate and climate change conditions on Figure 3.1.2-3 to 3.1.2-6 (KGS Group, 2022).



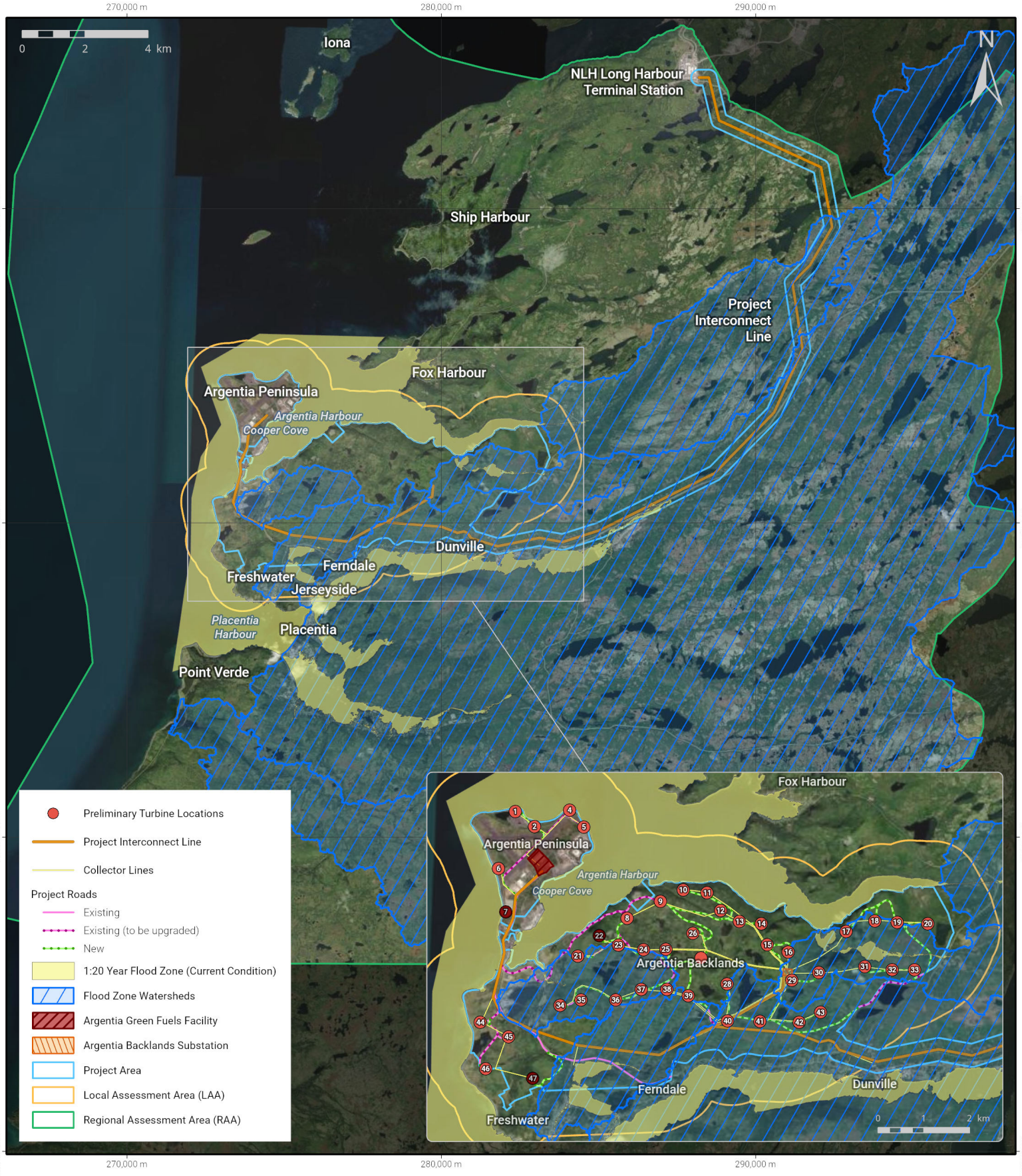
Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Surface Water Resources in the Project and Assessment Areas	NOTES: Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series. Surface Water Resource data sourced from NL Government's Water Resources Portal.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-011-Rev1



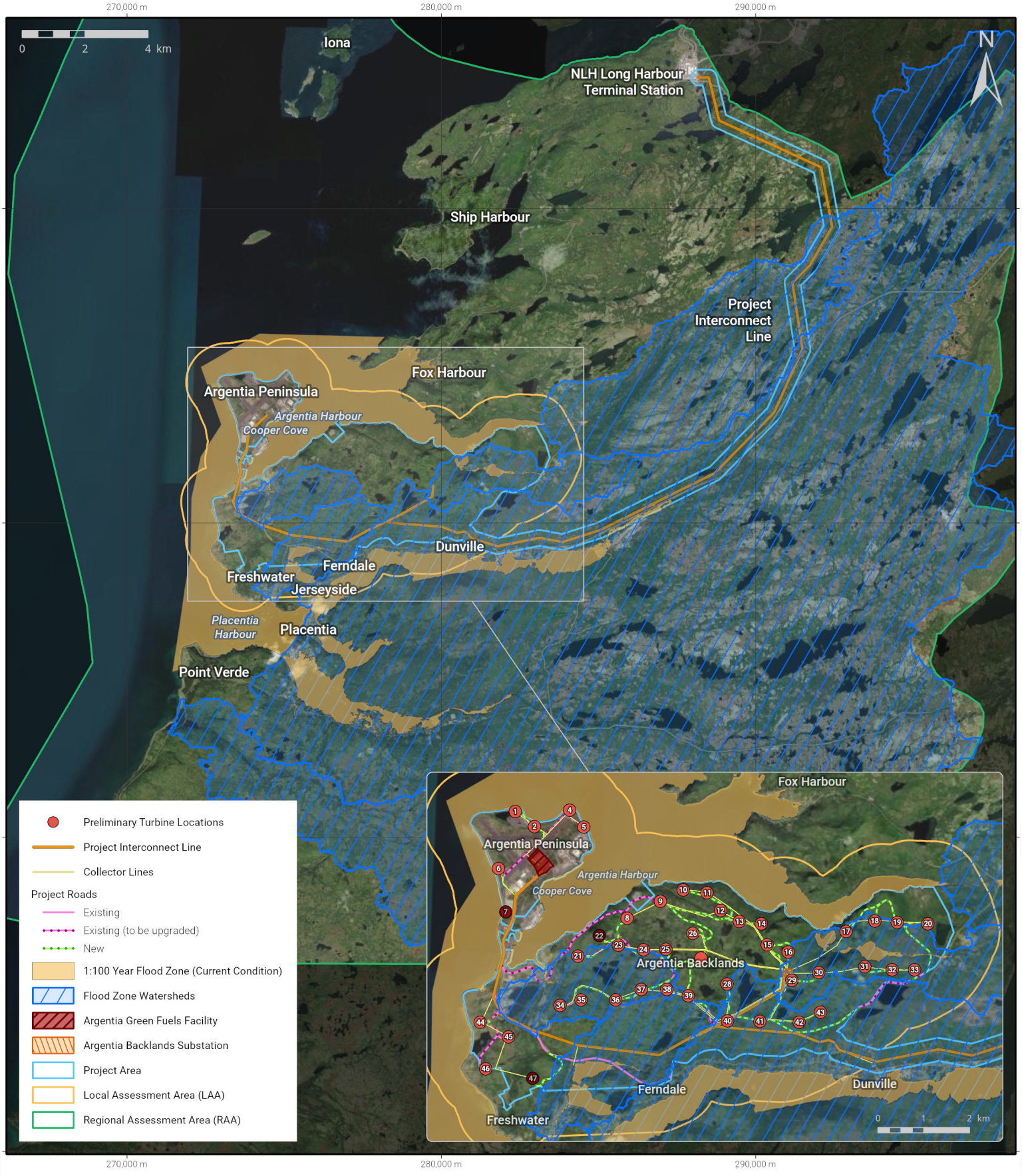
Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 2	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/28
	FIGURE TITLE: Watersheds in the Argentia Backlands	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change. Watershed delineation derived from NRCan HRDEM Digital Terrain Model	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-160-Rev1



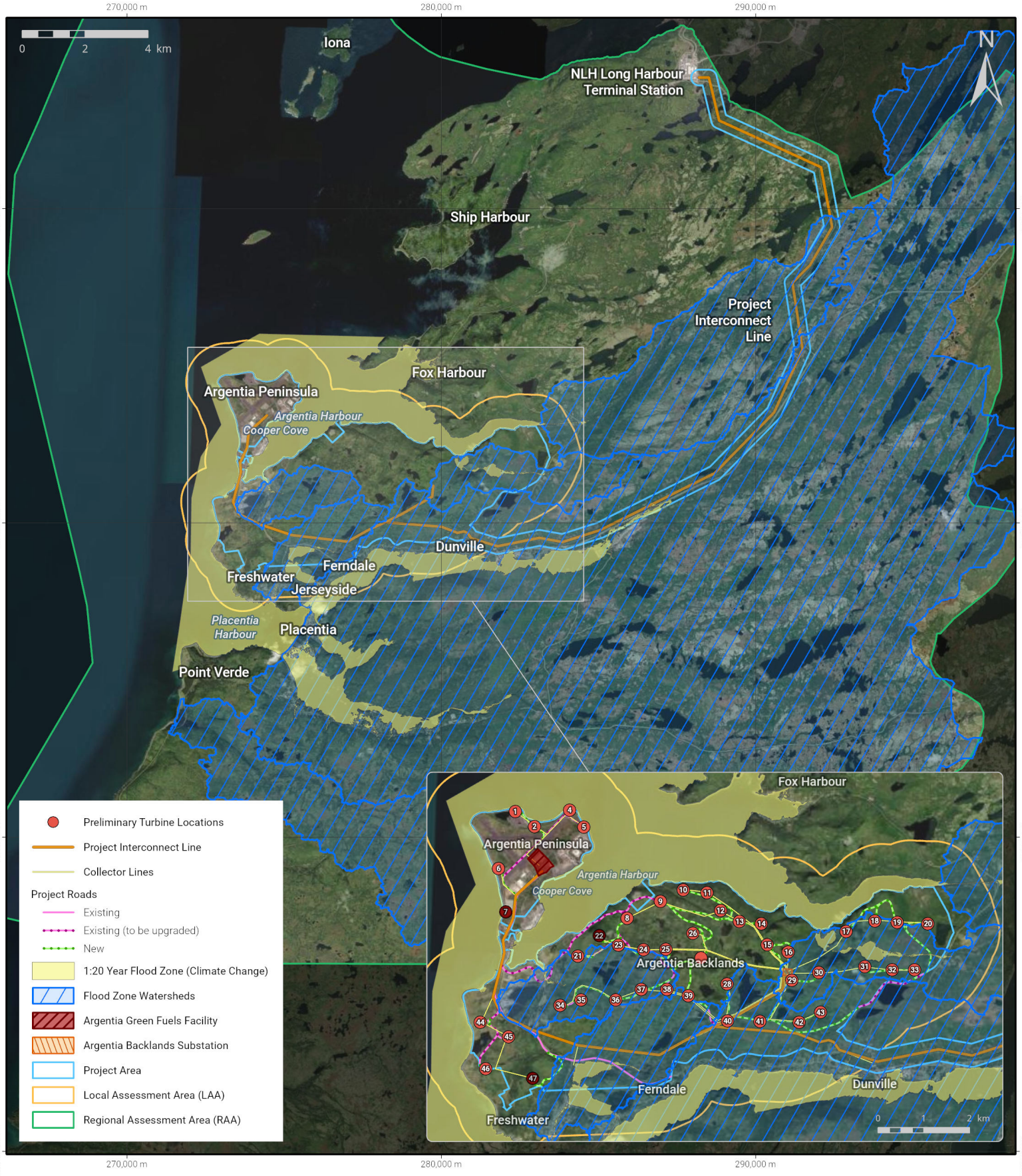
Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 3	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/28
	FIGURE TITLE: 1:20 AEP (Current Conditions) Floodplains in the Project and Assessment Areas	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change. Flood Mapping data sourced from NL Water Resources Division	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-161-Rev0



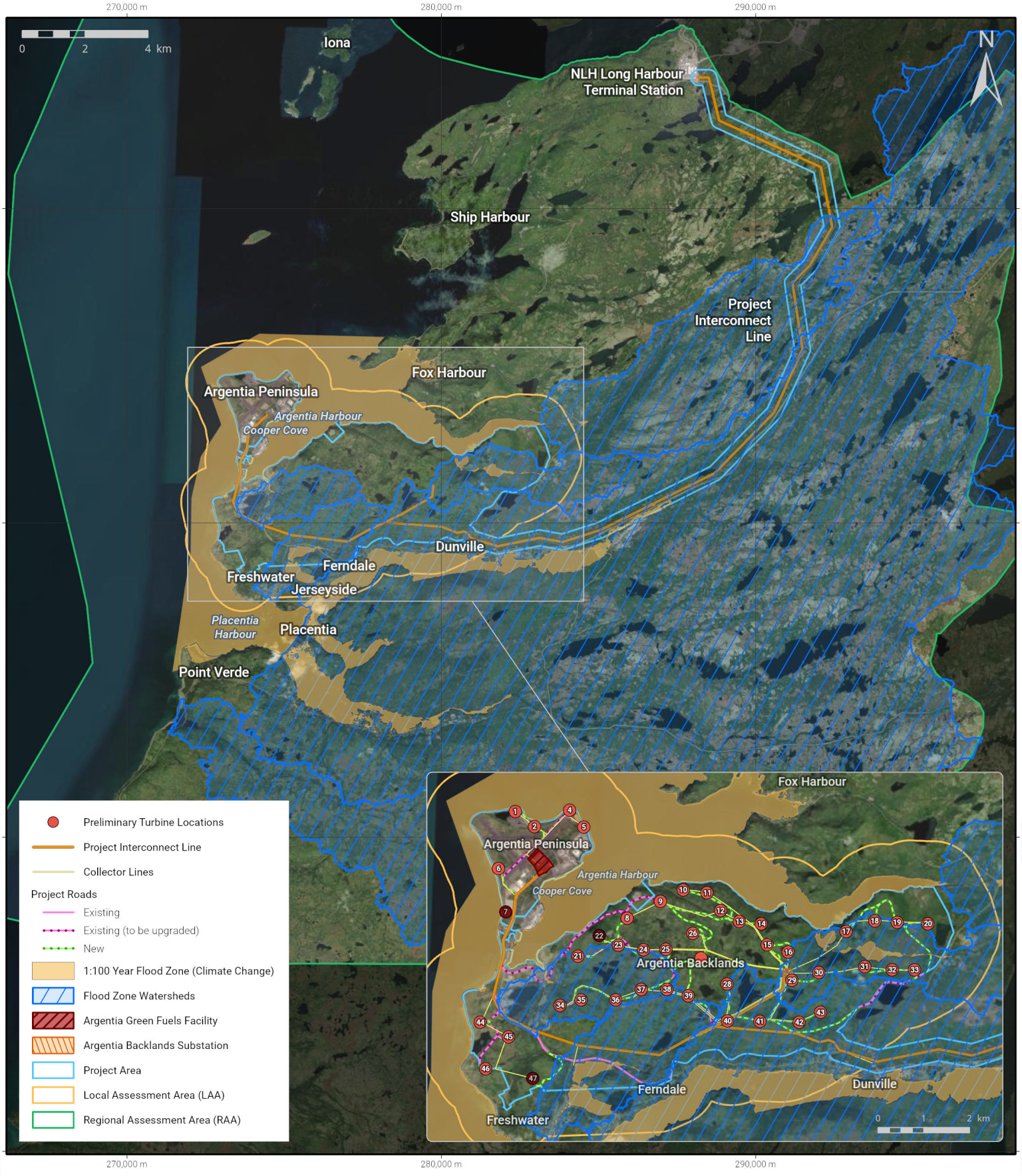
Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 4	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/28
	FIGURE TITLE: 1:100 AEP (Current Conditions) Floodplains in the Project and Assessment Areas	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change. Flood Mapping data sourced from NL Water Resources Division	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-162-Rev0



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 5	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/28
	FIGURE TITLE: 1:20 AEP (Climate Change) Floodplains in the Project and Assessment Areas	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change. Flood Mapping data sourced from NL Water Resources Division	REVIEWED BY: CBourke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBourke	sem

SEM MAP ID: 238-005-GIS-163-Rev0



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 6	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/28
	FIGURE TITLE: 1:100 AEP (Climate Change) Floodplains in the Project and Assessment Areas	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change. Flood Mapping data sourced from NL Water Resources Division	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-164-Rev0

Hydrology

An alternative water supply has been identified as Shalloway Ponds located approximately six km east of the POA, with a watershed area of 8.3 km². A flow duration analysis determined that the Shalloway Ponds are more than adequate to supply 100% of the process water required for the Project without considering storage (CPL, 2023); however, there is no existing water distribution infrastructure at this location.

Hydrologic conditions were evaluated for the RAA by using data from the Water Survey of Canada (WSC, n.d.). Regional streamflow monitoring stations with historic information were selected to characterize regional hydrologic conditions (Table 3.1.2-1).

Table 3.1.2-1 Water Survey of Canada Stations used in Regional Hydrologic Analysis.

Station ID	Station Name	Drainage Area (km²)	Years of Record	Period of Record
02ZK002	Northeast River Near Placentia	89.6	45	1979 to 2023
02ZK003	Little Barachois River near Placentia	37.2	41	1983 to 2023
02ZK004	Little Salmonier River near North Harbour	104	41	1983 to 2023
02ZK006	Rattling Brook below Bridge	32.7	17	2007 to 2023

The regional hydrology was analyzed using historic flow data from nearby WSC stations to represent the streamflow characteristics at the Project site. Based on a literature review, a runoff coefficient (i.e., the fraction of precipitation that appears as runoff) is suggested to be 80% (NLDEL, 1992) and 81% (AMEC, 2013).

Monthly flow patterns were analyzed based on data from nearby WSC stations with drainage areas less than 250 km². Flow patterns were analyzed on a percentile basis to establish minimum, mean, and maximum monthly flow rates and have been expressed as unit flow rates (L/s/km², Table 3.1.2-2). The average monthly unit flow rates are higher than average in November, December, January, February, and April. The flow rates recede during the summer period of June, July, and August (Figure 3.1.2-7 to 3.1.2-9). The lowest unit flow rate occurs in August and the 50th percentile August unit flow rate is 51% lower than the annual average unit flow rate for the regional watersheds.

Table 3.1.2-2 Monthly Unit Flow Rates.

WSC Station	Drainage Area (km²)	Unit Flow Rate (L/s/km²)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean Annual Unit Flow	Annual Runoff (mm/year)
02ZK002 (2000 to 2019)	89.6	5th Percentile	16.8	25.8	27.0	34.8	17.5	10.6	7.9	5.6	11.0	18.4	28.8	30.2	36.3	614
		50th Percentile	53.9	53.2	58.6	68.4	39.0	28.3	26.2	20.9	30.4	44.7	53.2	53.4	44.1	1,392
		95th Percentile	84.7	123.6	103.9	116.2	76.4	59.7	51.8	37.4	59.3	85.0	80.3	78.1	55.3	2,505
02ZK003 (1983 to 2019)	37.2	5th Percentile	17.3	19.0	27.0	28.7	13.7	12.3	9.4	7.3	8.9	17.4	24.0	25.8	35.5	554
		50th Percentile	50.0	51.2	56.8	62.8	33.2	27.5	23.6	21.0	29.7	41.2	50.4	50.0	41.4	1,305
		95th Percentile	88.7	97.7	125.7	119.8	74.7	58.8	47.8	43.2	62.2	68.1	86.0	74.7	49.7	2,486
02ZK004	104.0	5th Percentile	18.0	25.5	32.4	37.3	13.2	9.0	7.0	6.0	9.2	20.6	35.1	31.5	40.6	642
		50th Percentile	59.5	58.5	66.5	79.7	41.5	29.6	24.5	20.0	35.9	51.0	64.9	64.4	49.6	1,564
		95th Percentile	102.8	117.6	124.7	138.2	100.3	76.4	50.3	43.3	83.7	90.7	101.1	98.9	61.4	2,959
02ZK006 (2007 to 2022)	32.7	5th Percentile	18.1	22.9	26.2	32.2	13.1	11.4	9.1	7.6	9.6	15.8	25.2	30.9	31.4	583
		50th Percentile	46.3	51.1	44.7	55.1	31.2	28.6	25.4	23.9	30.7	36.7	49.0	54.3	39.7	1,251
		95th Percentile	84.5	97.0	64.4	91.0	55.8	58.5	47.0	49.4	73.8	67.9	83.2	83.3	48.0	2,243
WSC Station Average		5th Percentile	17.6	23.3	28.1	33.3	14.4	10.8	8.3	6.6	9.7	18.0	28.3	29.6	19.0	598
		50th Percentile	52.4	53.5	56.7	66.5	36.2	28.5	24.9	21.5	31.7	43.4	54.4	55.5	43.8	1,378
		95th Percentile	90.2	109.0	104.7	116.3	76.8	63.4	49.2	43.3	69.7	77.9	87.7	83.7	81.0	2,548

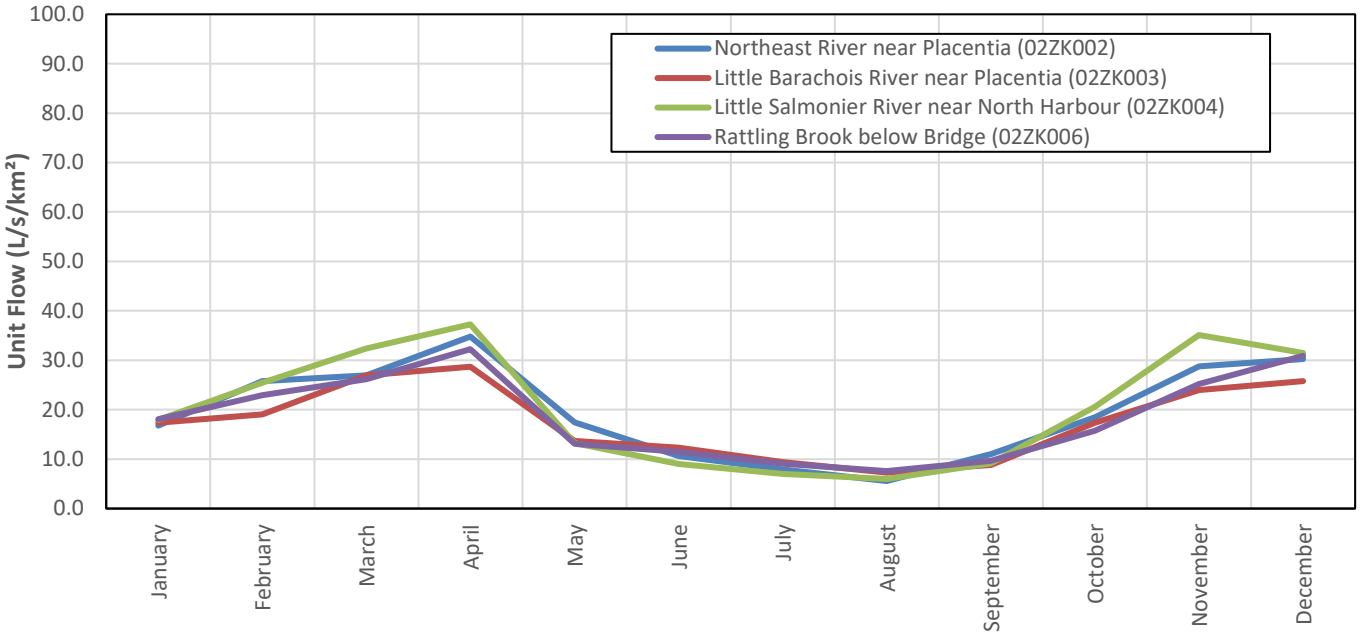


Figure 3.1.2-7 5th Percentile Monthly Unit Flow for Regional Watersheds.

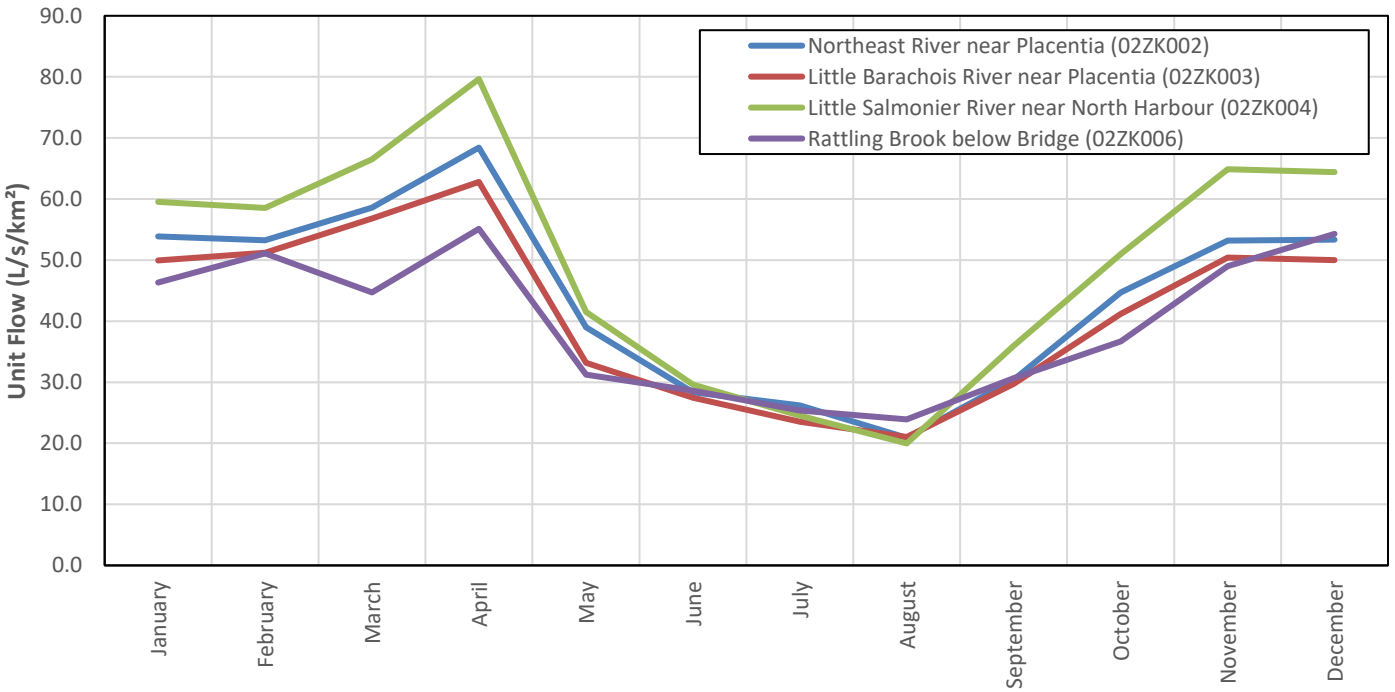


Figure 3.1.2-8 50th Percentile Monthly Unit Flow for Regional Watersheds.

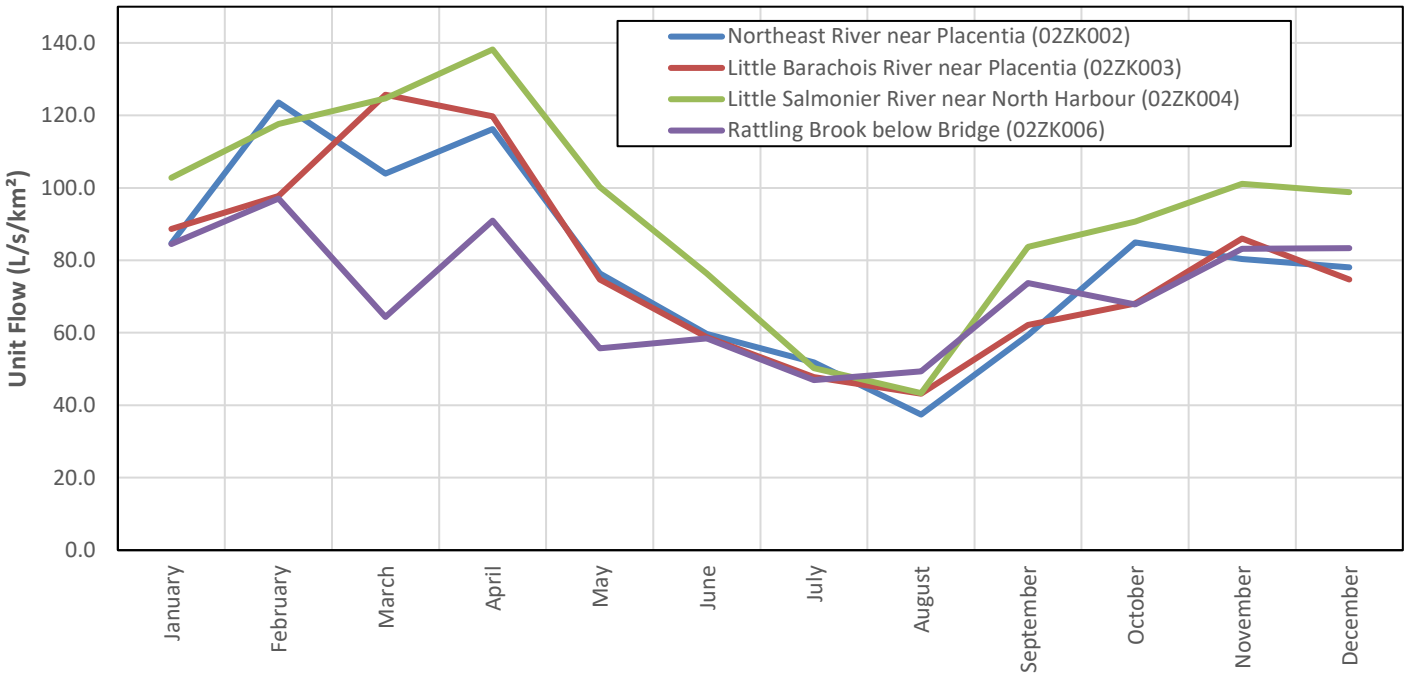


Figure 3.1.2-9 95th Percentile Monthly Unit Flow for Regional Watersheds.

Protected Public Water Supply Area Water Quality

A comprehensive baseline evaluation was conducted on the ponds within the PPWSA. The purpose of this evaluation was to characterize the quality of the proposed source water intended for the Argentia Green Fuels Facility. This evaluation aimed to provide a detailed understanding of the existing surface water conditions using publicly available data from the Water Resources Management Division (WRMD) and laboratory chemical analysis results. Public water supply and representative watershed ponds were assessed. To ascertain adherence to quality standards as outlined by the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (CEQG) (CCME CEQG, n.d.), surface water samples were analyzed for total metals, inorganic parameters, calculated chemical parameters, petroleum hydrocarbons, and volatile organic compounds.

Surface water samples were collected from the PPWSA and watershed boundary ponds in May 2023 and October 2023. Metals concentrations were predominantly below the Reportable Detection Limit (RDL). In May and October, antimony, arsenic, beryllium, bismuth, boron, molybdenum, selenium, silver, thallium, tin, and uranium concentrations were undetected in all samples. In May, cobalt, lead, nickel, phosphorus, vanadium, and zinc concentrations were undetected in all samples. Laboratory analysis results for the PWS areas were compared to water quality guidelines for the protection of aquatic life. No Canadian Council of Ministers of the Environment Canadian Environmental Quality Guidelines (CCME CEQG) exist for freshwater aquatic life for the following metals: antimony, beryllium, bismuth, chromium,

cobalt, tin, vanadium, and zinc, although concentrations of these metals were largely undetected in all samples. While barium, calcium, magnesium, manganese, potassium, sodium, strontium, and titanium were detected in nearly all samples, there are no guidance values set by the CCME CEQG for these metals. Boron, molybdenum, nickel, selenium, silver, thallium, and uranium concentrations were substantially less than the CCME CEQG in all samples analyzed in both May and October. Cadmium concentrations were significantly lower than the CCME CEQG in all samples analyzed. Aluminium concentrations exceeded the recommended limit set by the CCME CEQG (0.005/0.1 mg/L) in seven samples in May and three samples in October. Copper concentrations exceeded the CCME CEQG (0.002 mg/L) in one sample in May and two samples in October. Iron concentrations exceeded the CCME CEQG (0.3 mg/L) threshold in two samples in May and three samples in October. There was one sample in October where the lead concentration surpassed the CCME CEQG (0.001 mg/L).

Water samples were analyzed for inorganic and calculated chemical parameters in samples collected from the PPWSA and watershed boundary ponds in May 2023 and October 2023. Chloride concentrations in surface water samples were found to range from 7.6 to 21.0 mg/L in May and 5.7 to 18.0 mg/L in October. All measured chloride levels were within the acceptable limits established by the CCME CEQG for the protection of aquatic life. Laboratory pH measurements indicated values ranging from 5.00 to 7.05 in May and 5.10 to 7.58 in October. It is important to note that the CCME CEQG for the protection of aquatic life recommend a range between 6.5 and 9.0. Some pH values recorded in both May and October were less than the pH guideline minimum. Nitrate concentrations were calculated to range from <0.050 to 0.072 mg/L. Nitrate was detected at Clarke's Pond and Gull Pond in May, and at Clarke's Pond, Gull Pond, and Pond 4G in October. Water samples exhibited low nitrate levels with concentrations significantly lower than the CCME CEQG limit. The analytical results for several key water quality parameters – including alkalinity, colour, ammonia nitrogen, total suspended solids, turbidity, conductivity, calculated total dissolved solids, and hardness – are thoroughly discussed in the Aquatic Baseline Study Report (Appendix B1). Despite the detailed analysis, it is important to note that water quality guidelines do not provide specific guidance values for these particular inorganic and chemical parameters. As such, while these laboratory results offer valuable insight into the overall water quality and characteristics of the sampled waterbodies, they cannot be compared to CCME CEQG standards for the protection of aquatic life.

Water samples collected from the PPWSA, and watershed boundary ponds were analyzed for total petroleum hydrocarbons (TPH) and volatile organic compounds (VOC) in May 2023. Results are reported for benzene, toluene, ethylbenzene, total xylenes, C6-C10, >C10-C16, >C16-C21, >C21-C32 hydrocarbons, and modified TPH. Hydrocarbon concentrations in all water samples were predominantly below the RDLs. The duplicate sample collected at Hickey's Pond was the only exception, with >C21-C32 hydrocarbons and modified TPH detected at very low concentrations.

3.1.2.3 Freshwater Environment Introduction

Freshwater fish and fish habitat information required to support the Registration was acquired using publicly available desktop information and reports, augmented by a detailed *in situ* aquatic baseline study completed in 2023 (Appendix B1). The field baseline study focused on fish and fish habitats within the Project Area and with potential interactions with the Project components.

The entire watershed of the Argentia Peninsula and Argentia Backlands is located within the Southeastern Barrens Subregion of the Maritime Barrens Ecoregion. Hundreds of lakes, streams and ponds were created by the glacial gouging of the Earth's surface (PSPC, 2019), offering a suitable environment for aquatic life in Argentia Backlands. Aquatic organisms found in the Argentia Backlands are a subset of the potential species composition of the Southeastern Barrens Subregion of the Maritime Barrens Ecoregion. Multiple aquatic organisms (e.g., plankton, benthic invertebrates, and fish) are found in the Ecoregion, while there are no freshwater aquatic reptiles and only four species of amphibians that occur in Newfoundland.

3.1.2.4 Freshwater Fish and Fish Habitat

The following section discusses potential fish-bearing streams and waterbodies comprised in the aquatic environment surrounding areas of interest that may interact with planned access roads, collector systems, turbine bases, and Project interconnect line.

Argentia Peninsula Aquatic Habitat

The Argentia Peninsula has one waterbody, named *The Pond*. *The Pond* will be infilled as part of the ongoing Cenovus West White Rose Extension project prior to the planned installation of the wind turbines for the Project. *The Pond* is 23.2 ha in size, with a mean and maximum water depth of 7 m and 14 m, respectively (Husky Energy, 2012). It contains brackish water, with probable seawater intrusion from the bay, as well as from waves and spray during storm or spring tide events. Groundwater is thought to enter through the southeast end of *The Pond*. The substrate varied from mostly gravel in the northwest area to predominately sand and silt with a high clay fraction. Total Organic Carbon (TOC) in the sediment ranged from 72 to 179 g/kg and redox values indicated that some areas of *The Pond* were anoxic. An investigation of water and sediment contamination in *The Pond* found exceedances of fluoranthene, pyrene, Total PCBs, copper, and various total petroleum hydrocarbon fractions in sediment samples (Husky Energy, 2012). Mercury exceedances were reported in water samples. Aquatic plants and freshwater invertebrates typical of freshwater ponds in the area were not present in *The Pond*, and only threespine stickleback were captured. DFO subsequently determined that *The Pond* did not constitute productive fish habitat (DFO Letter to Husky, dated October 2, 2012). No other freshwater waterbodies or watercourses were identified on the Argentia Peninsula.

As mentioned in section 2.3.2.1, the wind turbine's foundation clearing area will be approximately 100 m X 75m. There are six potential wind turbine sites on the Argentia Peninsula for the proposed Project (proposed wind turbines 1, 2, 4, 5, 6 and 7). Five of the six wind turbine 100 m foundation clearing buffer zones encounter the marine coastline delimitation of the Argentia Port Lands area (proposed wind turbines 1, 4, 5, 6 and 7). One of those five wind turbine foundation clearing areas overlaps *The Pond* while also encountering the marine coastline (proposed wind turbine number 1). None of the proposed Argentia Peninsula wind turbine center points are within 60 m of a waterbody in accordance with the NTS 1:50,000 scale maps; with the exception of the proximity of wind turbine 1 to *The Pond*. None of the waterbodies (marine or freshwater) adjacent to the wind turbines on the Argentia Peninsula cover more than one-third of the 100 m buffer zone according to imagery, allowing at least two-thirds of practical space in the 100 m buffer zone.

The proposed connector and interconnect line systems have sections in proximity to the marine coastline, especially at the narrow of the Argentia Peninsula (Figure 2.3-1). Although some sections of the proposed connector and interconnect line systems are in the vicinity of the marine coastline of the Argentia Peninsula, none of them are near surface freshwater sources except a single-end collector line approximately 75 m from *The Pond*.

Argentia Backlands and Project Area Aquatic Habitat

The aquatic habitat assessments were conducted on 63 watercourses/waterbodies in the LAA. A total of 55 watercourse and six waterbody crossings have the potential to interact with access roads, electrical infrastructure, wind turbine clearing areas, and other Project components. In addition, two watercourses were assessed from pond outlets in the PPWSA. Of those 63, 17 freshwater habitats (27%) were assessed in a field study, which comprise of 15 watercourses and two waterbodies. A total of 46 (73%) were assessed through desktop analysis, which comprise of 42 watercourses and 4 waterbodies. Further pre-construction surveys will be conducted on definitive watercourse and waterbody crossings to assess the aquatic environment (e.g. Fish and Fish Habitat) in relation to those Project components as further commitments.

The majority of the 57 watercourse channels characterized (42 desktop study and 15 field study) were within a channel width of 5m, primarily dominated by coarse substrates and surrounded by mixed riparian vegetation composed of the dominate Ecotype mature coniferous forest, followed by coniferous scrub and regenerating coniferous forest. The slopes associated with the crossings were estimated between 0 to 21% (mean of 3.8%). From the 57 watercourse, 35 streams (61%) were determined as fish-bearing habitat or potential critical fish habitat. Two waterbodies were assessed in the field while 4 were assessed uniquely through desktop analysis for a total of six crossings involving waterbodies. Of the six waterbodies, three waterbodies were characterized as bog, and three others varied in size considerably. Waterbody shoreline substrate type was primarily dominated by fine substrates with surrounding vegetation composed of the dominate Ecotype wetland and mature coniferous forest, followed by areas

of coniferous scrub. Neither of the two waterbodies assessed in the field were fish-bearing habitat. Only two ponds located near Collector Lines and the Interconnect Line were found to be potential fish habitat based on the desktop analysis (Appendix B1).

The baseline field study demonstrated that the freshwater environment of Argentia Backlands is conducive to critical life events for salmonids, depending on their life stages. Nine watercourses were considered fish-bearing habitat for salmonid, of which eight were successfully fished and one assessed visually in the field. A salmonid critical habitat analysis was conducted on those eight, with flow velocity, depth and substrate type for main indicators for critical life events (e.g. overwintering). The analysis of potential critical habitats at the proposed crossing sites revealed that spawning and rearing/nursing are the two life events with the highest likelihood of occurring near these crossings, in alignment with species-specific site preferences and temporal requirements. The findings of potential critical salmonid habitat are consistent with most small undisturbed streams in NL.

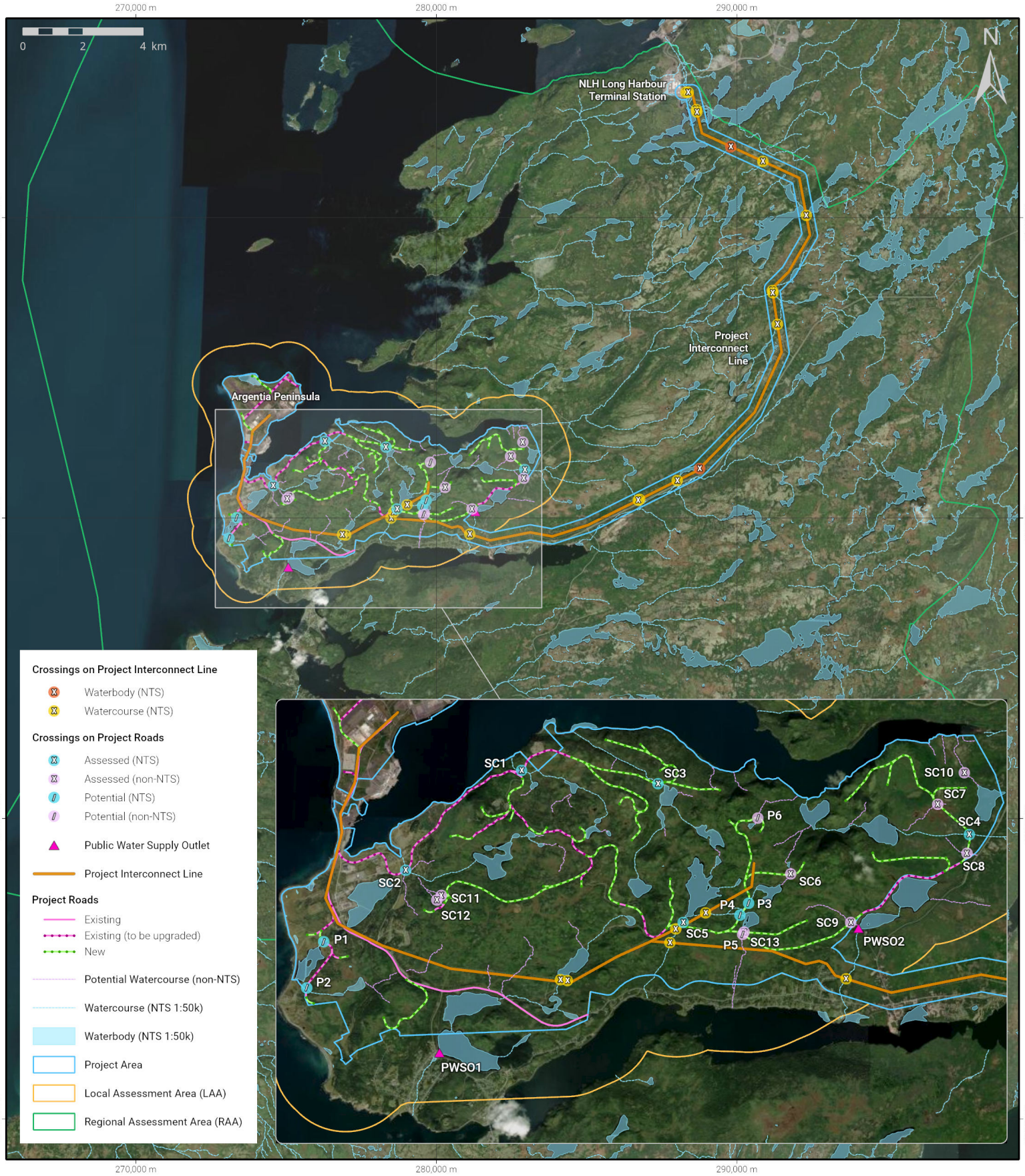
There were 21 potential crossings (19 streams and 2 waterbodies) identified with the proposed access roads (Figure 3.1.2-10). Of the 19 streams, 13 streams were assessed in the field (SC1-SC13). Further watercourses were identified as potential crossings (P1- P6) supplementary to stream crossings studied in the field. Of the 19 watercourses, nine were identified as fish-bearing habitats. The two waterbodies were identified as not fish-bearing habitat based on field assessment. Pre-construction surveys will be conducted on watercourse and waterbody crossings to assess the aquatic environment (e.g. Fish and Fish Habitat) in relation to Project components like access roads (Appendix B1).

The two outlets of PPWS ponds were studied for fish and fish habitat, including Wyse's Little Pond (PWSO2) and Larkin's Pond Outlets (PWSO1), which were categorized respectively as an inactive and active supply, respectively. Both outlets were characterized as fish-bearing habitat based on the field study (Appendix B1).

The Collector Line and Interconnect Line water crossings were assessed through desktop analysis. There were 19 potential crossings (17 streams and 2 waterbodies) associated with the collector system assessed in the desktop analysis. Of the 17 watercourses, 12 were determined as potentially fish-bearing. One of the waterbodies was determined as fish-bearing habitat. There were also 20 potential crossings (18 streams and 2 waterbodies) associated with the Project Interconnect Line to the Long Harbour Terminal Station (Appendix B1). Crossings associated with the collector system and Project Interconnect Line were assessed via a desktop analysis in the Aquatic Baseline Study.

Minimal interaction between the aquatic environment and wind turbines is expected. As mentioned in Section 2.3.2.1, the wind turbine foundation clearing area will be approximately 100 m X 75m. Using a 100 m radius buffer zone adjacent to the wind turbine foundation, there are no watercourse or waterbody identified when referencing the NTS 1:50,000 scale maps for the Argentia Backlands, except at a single

location (proposed wind turbine 14). The high-water mark of a single stream was identified at approximately 80 m from the center of the proposed location of wind turbine 14. The desktop analysis demonstrates that the channel can be characterized with discontinuous overland flow and is not likely fish-bearing. In addition to the clearing areas for the wind turbine foundations, designed construction laydown areas, including building and excavating material piles, are to be determined and will be located to avoid adverse effects on the aquatic environment.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 10	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Potential Water Crossings in the Project Area	NOTES: Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-012-Rev1

Argentia Backlands Habitat Description

Part of the Argentia Backlands is associated with the shoreline of Argentia Harbour. No major rivers drain into the Argentia Harbour area, although a small stream flows from Argentia/Arch Pond to Argentia Harbour (Husky Energy, 2012). The stream is 2.4 to 3 m wide, fast-flowing and well-vegetated, with extensive riparian habitat on both sides. Argentia/Arch Pond is a popular fishing area, and brook trout are reported regularly; however, the outflow stream is not known to be used for fishing. The stream terminates in Salmon Cove at the southeast corner of Argentia Harbour.

From the different types of infrastructure mentioned (i.e. access roads, collector system, wind turbine foundations and Project Interconnect and Gen-Tie Lines), the access road crossings were of interest for the characterization of fish and fish habitat due to their sizable footprint on the aquatic environment.

Table 3.1.2-3 provides the habitat type and stream characterization of 11 steams associated with the access roads (n=9) (i.e. SC1, SC2, SC3, SC4, SC5-2, SC6, SC7, SC10, and SC13), and PPWS outlets (n=2) (i.e. Larkins Pond Outlet-PWSO1 and Wyses little Pond Outlet-PWSO2) identified during the 2023 Aquatic Baseline Study. Pools were the most frequent mesohabitat type present in eight of 11 streams assessed, followed by steady and run habitats in seven and six streams, respectively, while riffles were present in five streams, and rapids were identified in two streams. The most abundant mesohabitat type was steady followed by pool, representing on average 35% and 25% of the total stream habitat assessed, respectively. The streams varied in width from 0.74 m to 4.7 m, while average stream depth ranged from 0.17 m to 0.66 m and total discharge ranged from 0.001 m^3/s to 0.173 m^3/s.

Table 3.1.2-3 Summary of Habitat Types and Stream Characteristics, 2023.

Stream ID	Habitat Type (%)					Characteristics and flow		
	Run	Steady	Riffle	Pool	Rapids	Width (m)	Max Depth (m)	Discharge (m^3/s)
SC1	0	10	0	5	85	4.15	0.37	0.082
SC2	25	0	25	0	50	4.70	0.17	0.027
SC3	0	0	50	50	0	4.20	0.38	0.011
SC4	50	0	20	30	0	3.55	0.32	0.048
SC5	6.7	60	0	33	0	3.26	-	-
SC6	0	40	30	30	0	1.10	0.26	0.003
SC7	0	50	0	50	0	1.23	0.68	0.002
SC10	35	0	0	65	0	0.91	0.21	0.004
SC13	0	100	0	0	0	0.74	0.19	0.0008
PWS01	10	90	0	0	0	2.6	0.30	0.007
PWS02	10	50	30	10	0	2.90	0.30	0.161
Min	**0**	**0**	**0**	**0**	**0**	**0.74**	**0.17**	**0.0008**
Max	**50**	**100**	**50**	**65**	**85**	**4.70**	**0.66**	**0.161**
Mean	**14**	**36**	**14**	**25**	**12**	**2.67**	**0.33**	**0.035**

Habitat surveys for streams SC8, SC9, SC11 and SC12 were not performed as these sites were deemed as not permanent fish habitat. Stream flow measurements were not completed in SC5 due to standing water at the site.

Boulders were the most frequent substrate type, being present in seven of 11 streams assessed, followed by cobbles and rubble habitats in seven and six streams, respectively. On average, clay was the most encountered type of substrate with 34 % of the overall streams assessed, followed by boulders and rubbles with 16 % and 11 %, respectively.

The vegetation types (habitat ecotype) in the vicinity of the watercourses and waterbodies studied were principally characterized with regenerating coniferous forest, with many sparse areas comprised of coniferous scrubs, mature coniferous forest and wetlands (Section 3.1.3). Riparian vegetation in the Argentia Backlands exhibits considerable variability in species composition and abundance across different study sites (SC1-13, and PWS01-02). Spatially dominate species include mountain alder (green alder), black spruce, balsam fir, graminoids including grass-like plants such sedges (*Carex spp*.), and various other shrubs and moss species, each showed site specific prevalence. Certain species such as sphagnum moss, dryopteris fern, and sweet gale were consistently observed over the vast majority of the sites studied. Based on the observations across the sites assessed in the baseline studies, the most recorded riparian vegetation appears to be graminoids (plant-like grass like sedge), which were noted in at least 50% of the study sites, indicating their widespread presence across riparian zones of the Backlands. On the other hand, leatherleaf (*Chamaedaphne calyculata*) and *Kalmia spp.* (including *Kalmia angustifolia*, commonly known as sheep laurel) were among the least commonly observed riparian vegetation types. They were noted in fewer instances and usually in trace amounts (Appendix B1).

Argentia Backlands Water Quality

In-situ water quality was assessed in all 11 streams studied in summer 2023, which revealed the range of temperature (°C), dissolved oxygen (%), pH, and Conductivity (µS/cm) of streams studied in the Backlands. The temperature of the streams ranged from 9.3 to 21.1°C (mean of 15.8°C), dissolved oxygen ranged from 50% to 98.4% (mean of 87.8%), pH ranged from 4.8 to 8.3 (mean of 6.5), while the conductivity of the streams ranged from 33.7 to 119.5 µS/cm (mean of 67.1 µS/cm). *In-situ* water quality assessed in two waterbodies revealed surface water temperature between 20.5°C and 21.1°C, dissolved oxygen saturation varied from 73.9% to 96.9%, pH ranged from 6.8 and 8.3, while conductivity ranged from 57.9 to 65 µS/cm.

Analytic water quality was assessed in the 11 streams studied. Key parameters were examined in a laboratory setting and the result were as follows: the sum of nitrate + nitrite was detected at five sites and ranged from 0.06 to 0.25 mg/L (mean of 0.13 mg/L), while nitrate was not detected at any site; turbidity ranged from 0.4 to 14 NTU and total alkalinity ranged from 2.9 to 21.0 mg/L (mean of 10.7 mg/L) among streams.

Metals were assessed in 11 streams studied. Antimony, beryllium, bismuth, molybdenum, nickel, phosphorus, selenium, silver, thallium, tin, uranium, and vanadium concentrations were undetected. Voron, cadmium, chromium, cobalt, copper, lead, and titanium concentrations were detected in nine of the streams studied. Aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium concentrations were detected in all streams. There were seven instances (i.e., SC4, SC5-2, SC6, SC7, SC13, PWSO1 and PWSO2) where aluminum concentrations exceeded CCME CEQG. The concentration of copper in streams was equal to or higher than the CCME CEQG in three instances (i.e., SC1, SC13 and PWSO1) and in one instance in the waterbody crossing WBC1. There were seven instances (i.e., SC4, SC5-2, SC6, SC7, SC13, PWSO1 and PWSO2) where iron concentrations exceeded CCME CEQG. There was one instance (i.e., SC13) where lead concentrations exceeded CCME CEQG. There was one instance (i.e. SC6) where manganese concentration exceeded the CCME CEQG.

Freshwater Fish

Fish species in the Project Area and with the potential to occur in the RAA and LAA are discussed below. Fish species reported across the Northeastern inland region of Placentia Bay (e.g. surroundings of Argentia, Long Harbour and Chapel Arm) include Arctic char, brook trout, brown trout (sea trout), rainbow smelt, American eel, Atlantic salmon/ouananiche, and stickleback sp. (i.e. blackspotted, threespine and ninespine sticklebacks) (NLDEC, n.d.; AMEC, 2007; PSPC, 2019). Fish community compositions in the Northeastern inland region comprise diadromous (i.e. catadromous and anadromous) and landlocked (freshwater resident) populations.

Four scheduled salmon rivers are located in the RAA, and one of them, Northeast River, shares boundaries with the LAA. The headwaters of Northeast River are formed by Camp Fire Pond, Big Gull Pond, Branch Pond, Station Pond, Mickeys Pond, Junction Pond and Rhodies Pond. All these ponds drain into Fitzgerald's Pond, which flows into the Northeast River (PSPC, 2019). Reported fish species in the Northeast River include Atlantic salmon, Arctic char, American eel, brown trout, brook trout, rainbow smelt, and threespine/ninespine stickleback (NLDEC, n.d.; PSPC, 2019). These species could be expected to be occasional or common in the LAA and RAA.

Table 3.1.2-4 provides a list of fish species reported in the Northeastern inland region of Placentia Bay and the Avalon Peninsula with their potential to occur in the RAA. Commonly found fish species are based on their presence during the 2023 baseline study, while occasionally found fish species are based on presence in adjacent rivers (i.e. Northeast River). Other species of fish are categorized as rare and unlikely to be found in the LAA or RAA.

Table 3.1.2-4 Freshwater Fish Species with the Potential to Occur in the LAA.

Finfish	*Species Name*	Potential Occurrence in LAA
Catadromous Fish		
American eel	*Anguilla rostrata*	Occasional
Anadromous Fish		
Atlantic salmon (South NL Pop.)	*Salmo salar*	Occasional
Atlantic sturgeon (Maritimes Pop.)	*Acipenser oxyrinchus*	Rare
Brown trout (Sea trout)	*Salmo trutta*	Occasional
Rainbow smelt	*Osmerus mordax*	Occasional
Freshwater		
Arctic char (landlocked)	*Salvelinus alpinus*	Rare to Occasional
Brook trout	*Salvalinus fontinalis*	Common
Banded killifish (NL Pop.)	*Fundulus diaphanus*	Rare
Mummichog	*Fundulus heteroclitus*	Rare
Ouananiche (landlocked salmon)	*Salmo salar*	Common
Rainbow trout	*Oncorhynchus mykiss*	Rare
Blackspotted stickleback,	*Gasterosteus wheatlandi*	Rare
Ninespine stickleback,	*Pungitius pungitius*	Rare to Occasional
Threespine stickleback,	*Gasterosteus aculaeatus*	Common

Fish were captured during the baseline study at seven stream crossings (including Gull Pond outlet), none of the waterbodies, and one PPWSA outlet. Brook trout were present at every stream site (n=7), while only a few streams contained ouananiche (n=2) and threespine stickleback (n=2). A total of 68 fish were captured from the Argentia Backlands, including 38 brook trout (56%), 21 ouananiche (31%) and nine threespine stickleback (13%) (Appendix B1). Of the 38 brook trout, 31 were aged with a scale sample. The age varied from YOY to 3+ averaging 1+, which was also the most common age class. The

Atlantic salmon captured were assumed to be ouananiche as large bodied, anadromous populations do not normally become established in small streams. Additionally, several of the streams had very high gradients as they neared the marine environment, and it is likely there were barriers to upstream migration. American eel was not captured during surveys but were observed during the 2023 baseline field studies. More information on the species captured or observed during the baseline studies are provided below.

The American eel in NL was designated "threatened" in 2012 (COSEWIC, 2012) and has been listed under the provincial **Endangered Species Act** as vulnerable. This catadromous species spends most of its life in freshwater and estuaries (brackish) but migrates to sea to spawn once sexual maturation is complete (Scott and Crossman, 1998). Bradbury *et al*. (1999) indicated that eels typically begin their spawning down-stream migration in late summer and fall throughout much of eastern Canada. Scruton *et al*. (1997) reported that downstream migration of eels in Newfoundland generally occurs between mid-August and mid-October. American eels spawn in the Sargasso Sea with peak spawning occurring in mid-winter between January and March. Young eels (elvers) begin their upstream migration in most areas of insular Newfoundland in early June to mid-August (Bradbury *et al*., 1999; Scruton *et al*., 1997). Grant and Lee (2004) indicated that up-stream migrating elvers tend to be bottom dwellers, hiding in burrows, snags, plant masses, under rocks or any other type of shelter, including burrowing directly into the substrate, and that soft, undisturbed bottom sediments provide critical shelter for migration. The habitat preferences of American eel indicate that freshwaters within the Project Area potentially provide overwintering, feeding and migratory habitats.

Atlantic salmon in Newfoundland exist in both anadromous (sea-run) and landlocked forms (ouananiche) (Smith, 1988). There is substantial variance in the timing of the upstream spawning migration in insular Newfoundland, ranging from May to September (Porter, 1975; Scruton *et al*., 1997). Newfoundland's anadromous populations of Atlantic salmon typically spawn in a stream characterizing a clean, well-aerated, gravel bottom riffle upstream of a pool (Scott and Scott, 1988; Smith, 1988; Gibson, 1993; Stanley and Trial, 1995; Scott and Crossman, 1998) between mid-October to mid-November (Scruton *et al*., 1997). Adults may return immediately to sea after spawning or overwinter in freshwater habitats, before migrating to sea in the spring (Gruenefeld, 1988; Smith, 1988). Eggs incubate over winter (Smith, 1988) for four or five months (Porter, 1975; Scruton *et al*., 1997). Hatching usually occurs between mid-April and early May in Newfoundland (Porter, 1975; Scruton *et al*., 1997). Downstream migration of over-wintering adults occurs in May and June (Porter, 1975). Young Atlantic salmon after hatching, might remain within the substrate for several weeks (Randall, 1982), before moving to other habitats. Juveniles going to sea began to migrate downstream as smolt in the spring (May and June) (Porter, 1975; Scott and Scott, 1988; Scott and Crossman, 1998). Anadromous Atlantic salmon would be expected to be common in scheduled salmon rivers within the RAA.

There are well-established populations of landlocked Atlantic salmon, or ouananiche, in many of the inland Newfoundland waters (Grant and Lee, 2004). The ouananiche life history is comparable to sea-run Atlantic salmon, except adults remain in freshwater. Freshwater populations spawn along rocky lake shorelines in insular Newfoundland (Scott and Crossman, 1964; Cowan and Baggs 1988; Scruton *et al*., 1997) or migrate into tributary streams (Scott and Crossman 1964; 1998; Hutchings 1986; Einarsson *et al*., 1990) in moving water, usually above outlet streams and near the mouths of inlet streams (Scruton *et al*., 1996). Ouananiche most often spawns in Newfoundland between late September to early November (Leggett, 1965; Lee, 1971; Beak Consultants Ltd., 1981; Scruton et al., 1996, 1997), and the eggs hatch between early April and mid-June (Scruton *et al*., 1997). Ouananiche often return to the lake shortly after stream-spawning (Warner and Havey, 1985; Scruton *et al*., 1996, 1997) while some take up residence in tributary pools before returning to the lake the following spring (Scott and Crossman, 1964; Havey and Warner, 1970). Ouananiche will overwinter in both the deep warmer waters of ice-covered lakes as well as in the fast-flowing ice-free waters of inlets and outlets (Scruton *et al*., 1997). Grant and Lee (2004) and Bradbury *et al*. (1999) reported that ouananiche young-of-the-year (YoY) and juveniles usually reside in stream riffle 'nursery' areas before moving into lakes after two to three years. Ouananiche would be expected to be common in streams and waterbodies within the LAA and RAA.

Threespine sticklebacks are relatively broadly distributed throughout most of Newfoundland and are most likely to be found in ponds or streams flowing through wetlands with fine substrates, among other habitats (Grant and Lee, 2004; Scott and Crossman, 1998). This euryhaline species is tolerant of marine, brackish and freshwater environments, occupying mainly shallow waters in still or relatively slow-flowing zones (Scott and Crossman, 1998). Anadromous populations undergo a spring (May-June) spawning upstream migration into fresh or brackish water, with spawning generally occurring in June or July (Scott and Crossman, 1998). Some anadromous threespine sticklebacks leave the streams and/or estuaries and move into saltwater in the fall to overwinter (Coady and Power, 1973). Freshwater threespine stickleback resident populations also undergo migration in the spring (May-June) from deep to shallow waters of lakes or larger rivers into smaller, slower streams or backwaters (Scott and Scott, 1988; Scott and Crossman, 1998). Landlocked threespine sticklebacks spawn mainly in June and July (Scott and Scott, 1988). Grant and Lee (2004) indicated incubation varies by location from seven to 40 days, depending on the temperature. Males provide parental care during incubation up to when young are still in the vicinity of the nest (about two weeks after hatching) (Scott and Scott, 1988; Scott and Crossman, 1998), at the end of summer (early September). Threespine stickleback would be expected to be common in streams and waterbodies within the LAA and RAA.

Brook trout, also known as speckled trout, exists in both anadromous and landlocked form in Newfoundland. This fish is widely distributed in insular Newfoundland and usually utilizes lakes, ponds and tributaries for spawning, overwintering, and feeding. They may spend one or two months feeding at sea in relatively shallow water, close to their natal stream, while others spend their entire life in freshwater (Scott and Scott, 1988). Anadromous and freshwater residents generally have similar life histories.

Migratory activities between both environments (freshwater and marine) can occur throughout the year (O'Connell, 1982), however, peak downstream migration of brook trout typically occurs in May or June, while upstream spawning migrations for both forms occur in July in Newfoundland. Brook trout normally spawns in shallow, gravel-bottomed streams and occasionally within the shorelines of lakes between late September and early November (Bradbury *et al*., 1999). Eggs incubate in the substrate over winter and hatch between April and mid-June (Baggs, 1989; Scruton *et al*., 1997). Brook trout would be expected to be the most common and widely distributed species in streams and waterbodies within the LAA and RAA.

Freshwater Plankton

Planktonic species occurring in the Project Area freshwater habitats are discussed below.

A baseline assessment of the phytoplankton and zooplankton community was conducted in one waterbody as a potential road crossing site. Phytoplankton were categorized in four size fractions (1-10, 10.1-20, 20.1-64, >64 µm) and had a mean biomass of 36, 308, 2,860, and 285 mg/m^3, respectively, which represented 1.0%, 8.8%, 82.0%, and 8.2% of the community, respectively. *Euastrum* (Class: Chlorophyceae) was the largest single genus (1802 mg/m^3), and represented 51.6% of the phytoplankton community, followed by two diatoms, *Frustulia* (681 mg/m^3) and *Stauroneis* (218 mg/m^3), which represented 19.5% and 6.2% of the community, respectively.

The mean zooplankton biomass (µg/m^3) for each major taxonomic group of Copepods, Cladocerans, and Rotifers was 0.66, 1.84, and 0.03 mg/m^3, respectively, which represented 26.2%, 72.5%, and 1.3% of the zooplankton community. *Bosmina* was the largest single genus with a biomass of 0.77 mg/m^3 followed by *Polyphemus* as a group (0.67 mg/m^3) and the genus *Streblocerus* (0.38 mg/m^3), both Cladocerans, followed closely by Cyclopoid (nauplii) as a group (0.32 mg/m^3) within the Copepods.

Planktonic organisms with the potential to occur in the LAA, RAA and along the Project Interconnect and Gen-Tie Lines toward Long Harbour, are expected to have a similar species composition as freshwaters in the Project Area due to having adjacent watersheds.

Freshwater Benthic Invertebrates

The benthic invertebrate species occurring in the Project Area freshwater habitats are discussed below.

Streams and waterbodies in the Argentia Backlands had an average richness of 48 benthic taxa across all samples, with Ephemeroptera (31.1%), Diptera (24.5%) and Coleoptera (12.7%) representing the major taxonomic groups, with an average density of 2,531 individuals/m^2. Simpson’s Diversity and Evenness Indexes were calculated at 0.723 and 1.457, respectively.

Benthic organisms with the potential to occur in the LAA, RAA and along the Project Interconnect and Gen-Tie Lines toward Long Harbour are expected to have a similar species composition as freshwaters in the Project Area due to adjacency of watersheds.

Freshwater Amphibians

Amphibian species occurring in Newfoundland are discussed below.

Four species, including American Toad (*Anaxyrus americanus*), Mink Frog (*Lithobates septentrionalis*), Green Frog (*Lithobates clamitans*) and Wood Frog (*Rana sylvatica*) are found in insular Newfoundland, and they all are considered exotic (NLDFFA, 2005.; NatureWatch, 2024). American Toads are mostly terrestrial and inhabit freshwaters only during the breeding season and as larvae. Toad breeding occurs in warm, shallow ponds, streams, river margins, and even large puddles and roadside ditches. The Mink Frog prefers large, cold, permanent ponds, lakes and slow-moving rivers with abundant vegetation. The Green Frog is mostly found in or near shallow, permanent waterbodies such as springs, swamps, brooks, and edges of ponds, or lakes. The Wood Frog prefers moist woodlands and vernal woodland pools (NatureWatch, 2024). The Green Frog is the most abundant amphibian in Newfoundland (NLDFFA, 2011). General status assessments have categorized the four species as exotic and secure in Newfoundland (NLDFFA, 2005.).

No amphibians were captured or observed during the 2023 baseline study when conducting fish surveys or habitat assessments. Amphibians are not expected to be common in the LAA, RAA, and along the Project Interconnect Line toward Long Harbour due to the lack of presence in the Project Area and considering adjacency to watersheds in the Project Area.

3.1.2.5 Freshwater Fisheries

Commercial, recreational, and Indigenous fisheries activities may occur near or within the RAA. There is potential for commercial freshwater fisheries for American eel and rainbow smelt. Species potentially fished recreationally or under communal Food, Social or Ceremonial (FSC) licences, as issued by DFO, within the RAA include American eel, Arctic char, Atlantic salmon, ouananiche, brook trout and rainbow smelt.

Freshwater Commercial Fisheries

The province of NL is not reported in the Freshwater Commercial Fisheries Landings data maintained by DFO (DFO, 2023), however, commercial fisheries data for Atlantic salmon, rainbow smelt, and American eel, are reported in the Seafisheries Commercial Landings data (DFO, 2022). No commercial Atlantic salmon and rainbow smelt fisheries landings (quantity or value) were reported for Newfoundland from 2014 to 2021 (DFO, 2022a). Rainbow smelt are not under moratorium in Newfoundland, however, there are no new commercial licences available and previously issued commercial smelt licences are site

specific (DFO, 2024). Commercial smelt fishing has the potential to occur near the RAA if a licence condition allows it. There has been no commercial salmon fishing in Newfoundland since the 1992 moratorium with all commercial fisheries closed due to declines in stock abundance (DFO, 2020).

The American eel fishery is primarily targeted at both the yellow and silver eel life stages (DFO, 2023a). Commercial American eel fisheries in NL reported relatively small and variable landings between 2014 and 2021, ranging from 22 MT (2019) to 53 MT (2018), over the period from 2014 to 2019, averaging 36.5 MT. The commercial eel fishery did not meet the confidentiality requirements in 2020 and 2021, and no landings were reported (DFO, 2022a). American eel landings have decreased considerably since peak harvests in the early 1990s (e.g., 147 MT in 1990, NLDEC, 2010). Commercial American eel fisheries are generally concentrated at the mouths of rivers. The opening dates for the commercial eel fishery in 2022 were July 1 (eel pot) and August 15 (fyke nets), with a closing date of October 31 (DFO, 2022b). No new commercial eel licences are being issued (DFO, 2024); consequently, the number of licences has decreased.

It is not expected that commercial freshwater fisheries will occur at a significant level within the RAA. There is a moratorium on commercial fishing for Atlantic salmon and it is unlikely that moratorium would ever be lifted. Rainbow smelt are not represented in the commercial freshwater or marine fisheries landings for NL. American eel has been included in the province's commercial marine fishery landings over the last few decades. A total of 154 commercial eel licences were issued in 2009 of which only 40 licensed fishermen reported sales, with most reported landings from NAFO Division 4R (NLDEC, 2012). No new commercial licenses are being issued for eels.

Freshwater Indigenous Fisheries

Licenses for Indigenous fisheries for FSC purposes are issued by DFO under the Aboriginal Communal Fishing Licences Regulations. This type of licence allows the licence holder to catch what is needed for themselves and/or their community for FSC purposes (DFO, 2022c). A communal FSC licence allows Indigenous harvesters the right to fish for FSC purposes over all other fishery uses, and it takes priority after conservation purposes (DFO, 2022d). The restrictions for fish species and size, along with the locations fished, are specified in the licence conditions.

No established First Nation is located within the RAA. The Miawpukek First Nation and the Qalipu Mi’kmaq First Nation are located in insular Newfoundland. The Miawpukek (Miawpukek Mi’kamawey Mawi’omi) community is the closest First Nation group to the RAA. The Samiajij Miawpukek reserve is located in Conne River, adjacent to Bay d’Espoir on the south coast of the island of Newfoundland, and they hold a FSC for various species. Miawpukek First Nation holds a FSC communal salmon fishing licence but has opted not to harvest salmon under this licence since 1997 due to conservation concerns (DFO, 2022d). Indigenous fishers also have access to salmon for FSC purposes through the recreational fishery (DFO, 2020).

The Miawpukek First Nation has a FSC license for Atlantic salmon and American eel and these species are known to occur in the RAA. It is, however, unlikely that a substantial Indigenous fishery would occur within the RAA given the distance from the Samiajij Miawpukek reserve in Conne River, which is situated approximately 140km northwest of the RAA.

Freshwater Recreational Fisheries

The freshwater recreational fishery in NL is governed through the federal **Fisheries Act** and its regulations (**Fishery (General) Regulations** and the **Newfoundland and Labrador Fishery Regulations**) and the **NL Wild Life Act** and its' associated regulations. DFO is responsible for the management of Atlantic salmon fisheries in NL, while the provincial Department of Fisheries, Forestry and Agriculture (formerly Fisheries and Land Resources, Wildlife Division), is responsible for the issuance of licences for inland fisheries (DFO, 2020). Atlantic salmon licenses are required for residents and non-residents in NL, while trout and other recreational fish licenses are only required for non-residents. The regulations govern daily and yearly quotas, possession limits, and length limit for species fished in inland and tidal waters.

No outfitters are located within the RAA (Gov. NL, n.d.). Recreational license holders would have access to scheduled salmon rivers within and near the RAA. Four scheduled salmon rivers, listed on Schedule 1 of the Newfoundland and Labrador Fishery Regulations, are found within the RAA (Table 3.1.2-5). American eels are also fished recreationally (NLDEC, 2010; DFO, 2023a); however, in 2011, all licenses were within the Bay St. George/Port aux Port Bay area (NLDEC, 2012). No new recreational eel licences are being issued (DFO, 2024), consequently the number of licences has decreased over time.

Recreational fisheries take place in the RAA for Atlantic salmon, brook (speckled) trout, Arctic char, rainbow smelt, ouananiche (landlocked Atlantic salmon) and other species. The entire island of Newfoundland is in Trout Angling Zone 1, which includes the RAA, which regulates fishing for brook trout, brown trout, rainbow trout, rainbow smelt, and ouananiche. The recreational fishery for Atlantic salmon is managed through a system of scheduled salmon rivers and Salmon Fishing Areas (SFAs) with angling requirements (e.g. fly fishing only, barbless hooks, catch and release) specified for each scheduled river.

Scheduled salmon rivers found in the RAA within SFA 10 include Northeast River (Placentia) up to the southern half of Big Gull Pond (unscheduled pond) and the entire length of Southeast River (Placentia) and Great Barasway. Portions of the upper watershed of the Little Salmonier River, St. Mary's Bay (SFA 9) are also included in the RAA. Part of the Northeast River watershed is within the LAA, specifically the Project Interconnect Line corridor to Long Harbour. A considerable section of the Project Interconnect Line is adjacent to the Northeast River (Placentia), with the Route100 as a physical barrier. Although proposed infrastructure may be located in the vicinity of this scheduled river and cross paths with the Northeast River's tributary system, none of the proposed project components are planned to cross the main channel.

Each scheduled salmon river in the RAA is Class 2 and has a salmon retention limit of one fish and a catch-and-release limit of three fish per season (Table 3.1.2-5) (DFO, 2023b).

Table 3.1.2-5 Scheduled Salmon Rivers within the RAA

Salmon Scheduled Rivers	SFA	Class
Northeast River, Placentia	10	2
Southeast (South East) River (Placentia) and tributary streams	10	2
Great Barasway	10	2
Little Salmonier River, St. Mary's Bay	9	2
Source: Anglers' Guide 2023-2024 (DFO, 2023b)		

Table 3.1.2-6 provides a summary of the catches of Atlantic salmon in the recreational fishery from 2010 to 2016. The total salmon counts for Northeast River for 2022 and 2023 were considerably lower than the yearly average from pre-moratorium of 1984 to 2021.

Table 3.1.2-6 Number of Small (<63 cm) and Large (≥63 cm) Atlantic Salmon Retained (Ret.) and Released (Rel.) on Scheduled Salmon Rivers in SFA 10 in 2010 to 2016.

Scheduled Salmon River	Small Salmon		Large Salmon		Total Salmon		
	Ret.	Rel.	Ret.	Rel.	Ret.	Rel.	Total
Great Barasway	5	4	0	1	5	5	10
Southeast River	91	119	0	32	91	151	242
Northeast River	131	130	0	19	131	148	280

The only DFO fishway in the RAA is on the Northeast River and Table 3.1.2-7 summarizes the salmon count passing through this fishway, including the average count before and after the salmon moratorium of 1992. The count in 2021, 2022 and 2023 averaged 457 fish, which is lower than the average since the moratorium as well as pre-moratorium, however, DFO considers the salmon stock as healthy (DFO, 2022e).

Table 3.1.2-7 Salmon Fishway Counts for Northeast River.

Total/Average Salmon					
2023 (Total)	2022 (Total)	2021 (Total)	2016-2021 (Average)	Moratorium 1992-2021 (Average)	Pre-Moratorium 1984-1991 (Average)
383	425	563	558	689	520
Source: Atlantic Salmon Fishway Counts (DFO, 2023c).					

The prevailing recreational species captured in freshwater in NL was brook trout according to the 2015 Survey of Recreational Fishing in Canada (DFO, 2019). The recreational fishery for brook trout in NL has continually produced some of the highest resident participation rates, on a per capita basis, of any similar fisheries in Canada (Clarke and Perry, 2014). Residents do not require a license to participate in the recreational fishery, consequently data are not collected on recreational catches.

It is expected that recreational freshwater fisheries will continue to occur at a significant level within the RAA. Recreational fishing is mainly focussed on brook trout, and to a lesser extent, on ouananiche and rainbow smelt, while anadromous Atlantic salmon are fished in the four scheduled salmon rivers. Recreational fishing for American eel has the potential to occur in the RAA although no more new licences are being issued.

3.1.2.6 Freshwater Sensitive Time Periods and Working Windows

This section summarizes the sensitive times of the year that fish populations are likely to be present and potentially vulnerable in the Project Area. Periods associated with important life history events (e.g. migrations, spawning and nursery) of brook trout, threespine stickleback, Atlantic salmon, both anadromous populations and ouananiche, and American eel are provided in Table 3.1.2-8. These species are considered important owing to their likely presence in the RAA based on baseline study results and professional opinion.

Catadromous (e.g., American eel) and anadromous (e.g., Atlantic salmon, brook trout, threespine stickleback) forms of fish have more extensive migration patterns than freshwater resident populations. Sexually mature catadromous American eels undergo downstream migration from mid-August to mid-October. Young American eels migrate upstream from early June to mid-August, with August being the peak for migratory events. Anadromous Atlantic salmon and brook trout migration patterns extend from May to September, with a concentration of downstream migration in the spring (May and June) and upstream migration in summer and early fall (July to September). Threespine stickleback has an upstream spawning migration in the spring (May and June) and downstream migration throughout the fall (September and October). Migratory activities between both environments (freshwater and marine) can occur throughout the year, however, peak downstream migration of brook trout typically occurs in May or June, while upstream spawning migrations for both forms occur in July (O'Connell, 1982). Ouananiche and resident brook trout have a relatively limited migration compared to anadromous forms; they usually intensify their movement upstream before spawning. Ouananiche migration occurs throughout the summer and fall, with a high occurrence the two months before the peak of spawning (October).

Table 3.1.2-8 Summary of Sensitive Time Associated with Freshwater Fish Species of Interest in the Regional Assessment Area.

Species	Life History Sensitive Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Peak Activity
Freshwater Environment														10
Brook trout (anadromous and landlocked)	Migrating	1	1	1	2	7	7	8	10	8	1	1	1	9
	Spawning	0	0	0	0	0	0	0	1	5	10	5	0	8
	Incubation, Hatching	2	3	4	10	10	7	0	0	0	0	0	2	7
Threespine stickleback (anadromous and landlocked)	Migrating	0	0	0	1	10	10	1	2	8	7	1	0	6
	Spawning	0	0	0	0	1	10	10	1	0	0	0	0	5
	Egg incubation, Hatching	0	0	0	0	0	3	8	7	3	0	0	0	4
Atlantic salmon (anadromous)	Migrating	0	0	0	1	10	10	9	9	8	0	4	4	3
	Spawning	0	0	0	0	0	0	0	0	1	10	10	1	2
	Incubation, Hatching	3	3	3	10	8	1	0	0	0	0	2	3	1
Atlantic salmon (Ouananiche)	Migrating	0	0	0	0	0	0	1	5	5	4	3	3	0
	Spawning	0	0	0	0	0	0	0	0	5	10	7	0	
	Incubation, Hatching	1	1	1	10	10	7	1	0	0	0	1	1	
American eel (Catadromous)	Migrating	0	0	0	0	1	7	8	10	8	5	1	0	

American eel spawn in the open ocean (Sargasso Sea), while for both forms (anadromous and landlocked) of brook trout and Atlantic salmon spawning events occur in the fall and peak in October. Anadromous and landlocked threespine stickleback spawn between June and July.

Brook trout and Atlantic salmon eggs incubate over winter in streams or lakes and hatch in the spring (April and May), while threespine stickleback egg incubation lasts less than 40 days and hatching occurs in summertime.

The Argentia Backlands streams and waterbodies potentially provide migratory, spawning, nursery, rearing, and feeding habitats for these four species of fish. Brook trout and ouananiche in these streams and waterbodies are likely resident and are not from anadromous stock. The Project's freshwater components will interact with 13 stream crossings, two waterbodies (bogs), and one potential water supply pond (Gull Pond). Stream crossings are expected to be affected the most during the Construction Phase (e.g., temporary watercourse perturbations including erosion, deposition of fines, addition of culverts, fording during Project Interconnect Line installation), while the Operation and Maintenance Phase and Decommissioning and Rehabilitation Phase are expected to have lesser effect (e.g. transportation, maintenance).

Brook trout and ouananiche migration and spawning are particularly important considering their confirmed presence during baseline studies. Habitat alteration of salmon and trout streams, including near pond's outlets and shorelines, should be avoided during the spawning period (September 1- November 30). Perturbation of trout, salmon, and eel migrations at stream crossings during spring and summer should also be avoided from May to September. Threespine stickleback most often migrate and spawn in the spring and summer so a similar avoidance period (May - September) should be considered. DFO recommends not carrying out in-water work in tributaries and headwaters of rivers on the island of Newfoundland from October 1 to May 31 (spawning, incubating and hatching period). It is therefore likely that most instream work will be conducted between May 31 and September 1 and mitigation measures (e.g., such as a fish relocation plan), may need to be implemented during this period to minimize interference with fish migration and rearing.

3.1.2.7 Freshwater Conservation Concern

Freshwater Species at Risk and/or Species of Conservation Concern

Species listed under the **Species at Risk Act** (SARA) Schedule 1 are legally protected under Section 32(1), which states; "no person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, and endangered species, or a threatened species." SARA species are ranked as extirpated, endangered, threatened and of special concern. Prohibitions of NL ESA, 2002, Section 16, states; "a person shall not disturb, harass, injure, or kill an individual of a species designated

as threatened, endangered or extirpated." The NL ESA designates species as extirpated, threatened, endangered, vulnerable, data deficient, or not at risk.

Information used to characterize the species of interest in the RAA and LAA. included publicly available literature and information provided by the Atlantic Canada Conservation Data Centre (AC CDC). A request for information from the AC CDC was made in 2023 for the Project Area and up to 5 km surrounding the Argentia Backlands. Supporting documentation also included Committee on the Status of Endangered Wildlife in Canada (COSEWIC) reports.

Two aquatic species have been designated by COSEWIC, or under SARA and/or NL ESA, that may occur in the RAA, include American eel and Atlantic salmon (South NL population) (Table 3.1.2-9). Banded killifish, Atlantic sturgeon and mummichog also have designation under these conservation legislations (Table 3.1.2-9), however, their occurrence within the RAA is extremely unlikely. The South Newfoundland population of Atlantic salmon are anadromous species, and their freshwater habitats provide spawning, nursery, rearing and migratory routes, while marine waters provide feeding, additional rearing and migratory corridor for maturation (COSEWIC, 2010). A key limiting factor for the Atlantic salmon population is the accessibility to migratory corridors while other threats include poor freshwater and marine survival, climate change, interception in other fisheries, poaching, migration barriers, land use practices, and many others (COSEWIC, 2010). The presence of Atlantic salmon in the RAA is expected in marine/coastal areas and freshwater scheduled salmon rivers. The baseline study for this Project showed the presence of landlocked salmon in two stream crossings in the Argentia Backlands of the Project Area (Appendix B1).

The American eel is part of a panmictic stock, meaning that individuals from the entire range for the species come together to reproduce as a single breeding population (Atlantic States Marine Fisheries Commission (ASMFC, n.d.). This catadromous species migrates downstream in late summer or autumn to marine waters and undertakes an extensive migration to the Sargasso Sea to spawn (COSEWIC, 2012). Glass eels (young eels) drift toward the continental shelf to eventually proceed into inshore waters and some young eels migrate upstream to freshwater habitats, while others remain in brackish or salt waters (COSEWIC, 2012). A key limiting factor for the American eel is the accessibility to migratory corridors while other threats include changing oceanic and regional coastal currents, climate change, migration barriers, hydroelectric dams and turbines, poor water quality, contamination, and interception in other fisheries (COSEWIC, 2010). American eel has the potential to occur within the LAA, particularly in the lower reaches of streams that are interconnected to the shore.

Table 3.1.2-9 Aquatic Species at Risk and/or Species of Conservation Concern.

Common Name	*Species Name*	IUCN Red List[1]	COSEWIC Status	SARA Status	NL ESA Status	Occurrence in LAA
Atlantic Salmon (South Newfoundland Pop.)	*Salmo salar*	Near Threatened	Threatened	Not Listed*	Not Listed	Occasional
American Eel	*Anguilla rostrata*	Endangered	Threatened	Not Listed*	Vulnerable	Occasional
Banded Killifish (Newfoundland Pop.)	*Fundulus diaphanus*	Least Concern	Special Concern	Special Concern	Vulnerable	Rare/None
Atlantic Sturgeon (Maritimes Pop.)	*Acipenser oxyrinchus*	Vulnerable	Threatened	Not Listed*	Not Listed	Rare/None
Mummichog	*Fundulus heteroclitus*	Least Concern	Not Listed	Not Listed	Vulnerable	Rare/None

Sources: IUCN websites (2024), COSEWIC website (2023); DFO (2019); NL ESA (2002); SARA websites (2024); LGL (2019).

Notes: 'NL' = Newfoundland and Labrador. 'Pop.' = population(s), 'Not Listed*' = Represent species not on the Species at Risk Acts (SARA) list, although under consideration for addition in Schedule 1 of SARA;

1' = IUCN Red List referred to the global specie, if not specified

Freshwater Habitats of Conservation Concern

No critical habitats (as defined by SARA or NL ESA) for these species were identified in the RAA.

Spawning habitats are important for reproduction and recruitment for salmonid populations and spawning locations and suitable spawning substrates are considered potentially limiting to fish production. No discrete spawning habitats were documented during the baseline survey in 2023. Riffles and runs accounted for 14% and 13% of the habitats surveyed, respectively, while gravels accounted for 8% of the substrate types. It is likely that in small streams like those that occur in the Argentia Backlands spawning habitats/substrates would be distributed in patches rather than as discrete reaches.

Spawning areas would also be important for maintaining salmon populations in the four scheduled salmon rivers in the RAA. Porter (1975) documented considerable evidence of spawning in these rivers, such as redds (i.e. sites selected by females for laying eggs). However, the geographical location of the spawning activity was not provided. Vale Newfoundland and Labrador Ltd. created large reaches of spawning habitat on the Northeast River, in the Placentia Junction, Fitzgerald's Pond and Northeast Arm reaches, as compensation for habitat losses related to the Long Harbour Commercial Nickel Processing Plant.

3.1.2.8 Marine Environment Introduction

The marine fish and fish habitat characteristics of the LAA and RAA are discussed in this section to consider potential interactions with the marine footprint of the Project. The marine component of the LAA is in Placentia Bay, which is part of the Placentia Bay/Grand Banks (PBGB) Large Oceans Management Area (LOMA) Integrated Management Plan (DFO, 2012; DFO, 2012a). The PBGB LOMA, now known as the PBGB Integrated Management Area (PBGB IMA) is a large management area of approximately 550,000 km^2. Placentia Bay is one of the two coastal management areas present in the PBGB LOMA, the other being the Coast of Bays (DFO, 2012a). Placentia Bay is home to various living organisms and communities forming complex trophic levels and food webs from primary producers to apex predators.

3.1.2.9 Marine Geology and Geomorphology

The following section will discuss the Placentia Bay marine geology, geomorphology, and to an extent, the geology associated with the marine components of the RAA and LAA.

Placentia Bay is located on the south coast of the island of Newfoundland and is bounded on the west by the Burin Peninsula, on the east by the Avalon Peninsula and to the north by the isthmus of Avalon. Placentia Bay stretches over 125 kilometres in a southwest-northeast direction, with the mouth of the bay approximately 145 km wide, covering an approximate area of 5,000 square kilometres. The Bay is characterized by well-defined channels that can reach water depths of 430 m, and by islands, shoals, reefs and banks, with an overall average depth of 125 m. At Argentia, depths to the northeast are in the 10 to 18 m range and within approximately 2 km of the shore to the east, depths are approximately 20 m, while

within approximately 5 km depths exceed 100 m. The seabed surrounding the Argentia area and the LAA is considered relatively shallow (<20 m) (Navionics, n.d.).

The lack of a sill at the mouth of Placentia Bay allows for the unrestricted exchange of water from the Atlantic Ocean into the outer bay, while three main islands restrict the water exchange between the inner and outer bays (MacIsaac *et al*., 2023). Placentia Bay is a glacially modified basin that has a complex glacial history, having been affected by ice draining from both the Burin and Avalon Peninsulas, and the seabed of the Placentia Bay shows some remarkable topography. The underlying bedrock is a combination of Late Proterozoic submarine and non-marine volcanic and sedimentary rocks (Shaw *et al*., 2015). Seabed features on the eastern side of Placentia Bay include landforms indicative of glacially modified terrain including drumlins and mega-flutes are common. Seafloor surficial sediments vary from coarse-grained glacial deposits in the nearshore to fine-grained sediments near the centre of the bay. Most sediments on the eastern part of the bay and the upper channels contain thick sediments from the Quaternary, with glaciomarine sediments that have been then overlayed by postglacial mud.

Placentia Bay has an irregular coastline, containing many smaller bays, inlets, a combination of small and large islands, rocky headlands and platforms, and many sand gravel flat beaches. The Bay falls within DFO's Coastal Management Area due to its heavy use by recreational, commercial, and even industrial traffic (DFO, 2012). Placentia Bay is separated into an inner bay and an outer bay, with the inner bay which containing three large islands: Red Island, Long Island and Merasheen Island. These islands divide the inner bay into three north-trending channels, the Western, Central and Eastern channels, which combine in the middle of the Bay. The Eastern Channel is the most extensively used in the area as the main shipping lane (DFO, 2012).

Argentia Harbour comprises two basins, the inner Argentia Harbour basin and the outer Argentia Harbour basin. These basins reach maximum water depths of 30 and 58 m, respectively, and are separated by a shoal, with a minimum water depth of approximately 15 m, that extends eastward into the harbour (Husky Energy, 2012). Glacial sediments of the shoal are overlain by a mid-Holocene wave-formed spit composed of pebble-cobble gravel, and the spit has been dredged to a water depth of approximately 8.5 m. The seabed surrounding the Argentia Peninsula was further modified in the late 1990s by dredging, spoil dumping, cable-laying and anchor dragging. A variety of anthropogenic material and debris has also been placed or deposited on the seabed since World War II, associated with the military base on the Argentia Peninsula, including wharves, piers, seaplane slipways and ammunition handling berths.

The shores of Placentia Bay have been primarily shaped by extensive wind and waves from weather systems, and by the seasonal ice cover (MacIsacc *et al*., 2023). Landforms along the coastline fall into five different categories:

1. Flats with mostly sand to gravel flatlands which tend to be wide and have low relief;
2. Steep shallow beaches of gravel to boulder size;
3. Sandy bars connecting smaller islands (called tombolos);
4. Lagoons; and
5. Estuaries.

3.1.2.10 Physical Oceanography

The following sections provide an overview of relevant aspects of the physical oceanography in Placentia Bay and the RAA. Much of the material in this section is taken from MacIsaac *et al.* (2023), LGL (2018) and references within, and Husky Energy (2012) and references within.

Tides

Table 3.1.2-10 shows the tides reported by the Canadian Hydrography Service (CHS, 2022) for Station 0835 (Argentia Harbour), in the LAA and RAA. Station 0815 (at the head of the bay at Come by Chance), and Station 0760 (Burin on the southwest coast of Placentia Bay) (MacIsaac *et al*., 2023). Tides within Placentia Bay are semi-diurnal, meaning there are two high tides and two low tides each lunar day. The mean tidal range reported by the Canadian Hydrographic Services was 1.5 to 1.6 m. The tidal signal generally propagates from northeast to southwest, taking approximately a quarter-hour to traverse the bay.

Table 3.1.2-10 Summary of Tidal Range (Canadian Hydrographic Services, 2022)

Station	Mean Water Level (m)	Range	
		Mean Tide	Large Tide
0835 Argentia	1.4	1.6	2.7
0815 Come By Chance	1.4	1.6	2.4
0760 Burin	1.2	1.5	2.3

Currents

Circulation in Placentia Bay is a general cyclonic circulation during spring and summer, with waters entering by the eastern shore and leaving by the western shore, forming a counterclockwise open gyre in the bay, mostly during the period from April to June (Husky Energy, 2012). These surface circulation patterns and speeds are primarily affected by local wind patterns. The prominent southwest winds during much of the year account for the counterclockwise near-surface currents (MacIsaac *et al*., 2023). There is

seasonality in the general circulation pattern, with stronger inshore currents present during fall and weaker currents present during spring and summer.

Currents are observed to be the fastest at the Placentia Bay mouth, averaging 19 cm/s in June and July to 29 cm/s in November with upper limit speeds ranging from 135 cm/s in February to 178 cm/s in November. Mean surface currents at the Pilot Boarding Station (PBS), located near Argentia Peninsula and nearest to the RAA, were approximately 22 cm/s with an upper limit of 33 cm/s in December and 48 cm/s in September (MacIsaac *et al*., 2023). Current speeds were significantly reduced in the inner parts of the bay. Surface current speeds at Come by Chance were significantly lower with 8 cm/sec for majority of the year with an upper limit ranging from 11 cm/s in July to 23 cm/s in September (MacIsaac *et al*., 2023).

Placentia Bay experiences a predominantly southwest to west flow of air mass throughout the year. West to northwest winds, prevalent during the winter, shift to counterclockwise during March and April, resulting in a predominant southwest wind by summer. Winds shift slightly as autumn approaches, becoming predominantly westerly again by late fall and into winter. Mean wind speeds tend to be at their lowest during summer months and highest during the tropical cyclone season. Seasonal average and maximum average wind speeds for Placentia Bay are provided in Table 3.1.2-11.

Table 3.1.2-11 Seasonal and Maximum Average Wind Speeds in Placentia Bay (LGL, 2018).

Season	Average Wind Speed		Maximum Average Wind Speed	
	m/s	km/hr	m/s	km/hr
Spring	8 – 9	29 – 32	27.5 – 30	99 – 108
Summer	6 – 7	22 – 25	25 – 27.5	90 – 99
Fall	8 – 9	29 – 32	30 – 32.5	108 – 117
Winter	10 – 11	36 – 40	25 – 27.5	90 – 99

The upper portion of Placentia Bay, particularly from Rushoon on the Burin Peninsula to near Placentia on the Avalon Peninsula is susceptible to frequent storm surges and seiches due to the bay's wedge-shaped geometry and large islands at the head of the bay (Husky Energy, 2012). Storm surges associated with very low-pressure storm systems passing through the region and strong winds blowing over the water surface results in high water levels that can cause severe flooding for low-lying coastal regions. The Town of Placentia is considered to have a high hazard (medium frequency, high severity) for storm surge risk, in part due to its low elevation (Husky Energy, 2012).

Southeastern Newfoundland is located along the major storm track route and can experience storms including hurricanes and tropical storms between August and October. Cyclones move over colder waters and transform into fast-moving extra-tropical cyclones, producing large waves and hurricane force winds. The most intense storms generally approach from the south, feeding off the contrasting temperatures of

the Labrador Current and Gulf Stream. Fifty-three tropical storms have passed through the Placentia Bay region between 1961 and 2015, five of which were Category 1, two were Category 2 and one was Category 3.

Wave heights in Placentia Bay are lowest in the spring and summer, and largest in winter. Waves are most frequently from the southwest and this is true for all months of the year near Red Island and for the mouth of Placentia Bay. Minimum monthly mean wave heights range from 0.2 m in June and July to 1.3 m from May through August at the mouth of Placentia Bay. Monthly means from April through September are 1.0 m or less near Red Island. Maximum monthly mean wave heights range from 1.6 m in December near Red Island to 2.4 m, also in December, at the mouth of Placentia Bay. Maximum wave heights range from 4.2 m in June to 8.2 m in March near Red Island. Wave conditions in Argentia Harbour, due to its sheltered location, would be considerably less than the open water Red Island values.

Placentia Bay shows a marked seasonal cycle with a strong stratification during the summer, with relatively warm and fresh water standing above colder and saltier waters, a more mixed system in fall and an almost completely mixed water column during the winter and spring (Husky Energy, 2012). The summer period also shows a marked intrusion of deep and salty water entering in the bay and present from June through October. The mean salinity average per month is consistent and measured at approximately 32 psu. Salinity measures during the 2023 Baseline, ranged from 30.06 and 32.10 psu, with a slight variation due to surface water runoff from Argentia Peninsula (Appendix B1). Saltier water is denser and is near the bottom in the water column. This layer is more consistent all year but can extend higher up the water column in the fall, which correlates to a period of mixing within the entire water column. The mixing continues into the winter months (January to May) when the water column will have a near uniform salinity of 31 psu (MacIsaac *et al*., 2023).

The water column in outer Placentia Bay is relatively mixed and uniform in the winter and spring before a strong thermocline forms during summer. The thermocline can persist from June to October with a mean monthly temperature range of 10 – 14°C that generally penetrates to 20 m. The water column is highly mixed from the end of December until May, with a mean monthly temperature of 2°C from the surface to 140 m and near zero below that (Stantec, 2012). Baseline data from 2023 in Argentia Harbour also demonstrated a thermocline in the water column from August through the end of November, with a similar temperature range (Appendix B1). The temperature of the water column at two marine stations ranged from well mixed (17.9°C to 4.4°C) in the last week of August to relatively uniform (5.5°C to 4.5°C) in the second week of December.

Marine Geophysical Considerations

Sea ice is present in southeastern Newfoundland from late winter and early spring, right before or during iceberg season. Pack ice presence in Placentia Bay is variable from year to year and most sea ice within

the bay is formed off southern Labrador and drifts south to enter the bay mid-February. Ice can be present in Placentia Bay between mid-February until mid-April, however, the bay is generally not completely covered by ice. Most of the ice is considered new ice, where the thickness is less than 10 cm, but there are some areas that can be 15 cm or more, while pack ice can range in thickness from 30 to 120 cm (LGL, 2007). Argentia Harbour is considered an ice-free, your-round access, however, sea ice might be present to an extent in the marine and coastal areas of the LAA and RAA between February and April.

Placentia Bay records show low iceberg numbers due to the southern location, warmer temperatures, orientation, and circulation of the bay (Colbourne *et al*., 2016). Icebergs were recorded in Placentia Bay in seven of the 30 years between 1974 and 2003 and a total of 30 icebergs were recorded in this period (Husky Energy, 2012).

Catto et al. (1999) have defined five regions in Placentia Bay based on shoreline biological communities and two of these regions, the Cape Shore (Cape St. Mary's to northern tip of the Argentia peninsula) and Northeast Placentia Bay (Argentia Harbour to North Harbour), are within the RAA.

The Cape Shore is dominated by northward-flowing ocean currents, which occasionally carry pack ice into the bay. Summer sea temperatures remain relatively low throughout July and August, and winds are usually oriented onshore, especially during spring and summer. The shorelines are subjected to heavy surf, especially in smaller coves with shallow water depths. Fog is pervasive and has a major influence on shore biology. The coastline is mostly erosional in nature in most areas, with erosion occurring slowly along bedrock shores and rapidly along raised glacio-marine terraces. Some of these shorelines contain substantial proportions of sand and silt, and clay is present in offshore areas. Seawater clarity is reduced by surf-suspended sediment. Erosion of this type of material is a controlling factor for many biological communities. This region has the lowest biological diversity within Placentia Bay, but productivity is high, due to the high concentrations of nutrients carried by upwelling waters off Cape St. Mary's.

Northeast Placentia Bay has similar north-flowing currents, but the shores are much more protected from surf and ice erosion by the highly convoluted and indented nature of the coast, with many shoals, headlands and small islands. Pack ice which can be carried northwards into the outer part of Placentia Bay but seldom is transported north of Argentia. The diversity of species is higher than in the Cape Shore region but is still relatively low. Zonation of perennial species occurs within protected habitats, such as embayments and sheltered coves. Productivity is relatively high due to nutrients and phytoplankton carried into the region but is less than in the Cape Shore region.

Catto et al. (1999) have identified the major controlling factors for biological productivity and communities in Placentia Bay as: pack ice scour, landfast ice, substrate size, fog, temperature, seawater chemistry, and anthropogenic effects. These would be in addition to the major influence of tides, winds, waves, and water currents. Anthropogenic effects can include sewage and fish wastes, and construction of wharves,

breakwaters, causeways, roads, and garbage disposal areas all which alienate numerous shores. Fishing activities can have a major effect on shorelines, as well as on the species directly fished. Placentia Bay has several major industrial sites including the Come-by-Chance oil refinery, the Marystown shipyard, the former phosphorus plant in Long Harbour, and the former Argentia Naval Base. Aquaculture is becoming a major industry in the bay with potential for adverse anthropogenic effects.

Dispersion Study

A dispersion study using near-field modeling was conducted to evaluate the marine effluent discharge in Argentia Harbour (Appendix B2). The study assessed whether the concentration of parameters of potential concern adhere to the ambient seawater quality standards as outlined by the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (CEQG) at the periphery of the mixing zone (CCME CEQG, 2003.).

The near-field modeling used a 3D dilution mixing model to determine the mixing zone of parameters of potential concern (i.e. temperature and salinity) from the sub-surface marine effluent. According to the ambient seawater quality standards as outlined by the CCME CEQG at the periphery of the mixing zone (CCME CEQG, 2003.), an effluent mixing zone reaching a temperature difference of 1°C and Salinity change of 10% from the ambient seawater would comply with the guidelines.

Ambient condition data obtained during the marine baseline study (i.e., CTD and temperature profiling; Appendix B1 and B2), along with predicted effluent discharge parameters and historical oceanographic data, were incorporated into the near-field modeling. The dilution mixing model was comprised of a conservative current speed (5 cm/s) based on historical data from the four moorings currents on the East coast of Placentia Bay. Four scenarios were considered for the near-field modeling (i.e. summer conditions with and without currents and winter conditions with and without currents). Thus, four simulations were created.

The marine water quality guidelines established by CCME for temperature and salinity were consistently met at close proximity to the discharge source across all examined scenarios. The key findings from the simulations are summarized as follows:

1) Summer Scenario without Current:
    - Temperature change reduced to below 1°C within 7 seconds, at a distance of 1.20 m from the source.
    - Salinity change reduced to below 10% of the ambient value (31.2 PSU) within 9 seconds, at a distance of 1.53 m from the source.
    - Upon surfacing, ambient temperature and salinity changes were 0.15°C and 0.59 PSU, respectively, equivalent to 1.88% of the ambient salinity.
2) Summer Scenario with Current:

- Temperature change reduced to below 1°C within 5 seconds, at a distance of 0.77 m from the source.
- Salinity change reduced to below 10% of the ambient value (31.2 PSU) within 6 seconds, at a distance of 0.90 m from the source.
- Upon surfacing, ambient temperature and salinity changes were 0.05°C and 0.21 PSU, respectively, equivalent to 0.68% of the ambient salinity.

3) Winter Scenario without Current:

- Temperature change reduced to below 1°C within 12 seconds, at a distance of 2.04 m from the source.
- Salinity change reduced to below 10% of the ambient value (32.0 PSU) within 8 seconds, at a distance of 1.39 m from the source.
- Upon surfacing, ambient temperature and salinity changes were 0.28°C and 0.58 PSU, respectively, equivalent to 1.83% of the ambient salinity.

4) Winter Scenario with Current:

- Temperature change reduced to below 1°C within 8 seconds, at a distance of 1.19 m from the source.
- Salinity change reduced to below 10% of the ambient value (32.0 PSU) within 6 seconds, at a distance of 0.91 m from the source.
- Upon surfacing, ambient temperature and salinity changes were 0.10°C and 0.22 PSU, respectively, equivalent to 0.68% of the ambient salinity.

The scenario presented the greatest challenge for mixing and dispersion occurred under winter ambient conditions without current, where the temperature guideline was met at a distance of 2.04 m from the source, and the salinity guideline was met at 1.39 m from the source.

3.1.2.11 Marine Water Quality

The following section presents an overview of the water quality that was assessed during the 2023 marine baseline at two stations (i.e. marine station 1-MS1 and marine station 2-MS2). The averages of subsurface and mid-water column samples were similar between the two marine stations MS1 and MS2 in the summer of 2023 (Appendix B1).

Within Argentia Harbour, mean TOC ranged from 0.90 mg/L (MS1) to 1.3 mg/L (MS2), and mean TSS from 5.0 mg/L (MS1) to 4.4 mg/L (MS2). Average pH was near neutral at both sites with values at MS1 and MS2 calculated as 7.82 and 7.85, respectively. Mean turbidity had a narrow range of 0.19 NTU (MS1) to 0.14 NTU (MS2). Ammonia was not detected at MS1, however, it was measured at MS2-WS3 (0.085 mg/L), while the sum of nitrate + nitrite was not detected at MS2, however, it was detected at MS1-WS5 (0.06 mg/L).

Mean chlorophyll ‘a’ was comparable between sites and ranged from 0.93 µg/L (MS1) to 1.16 µg/L (MS2) (acidification), and from 0.68 µg/L (MS1) to 0.76 µg/L (non-acidification) (MS2). Chlorophyll ‘a’

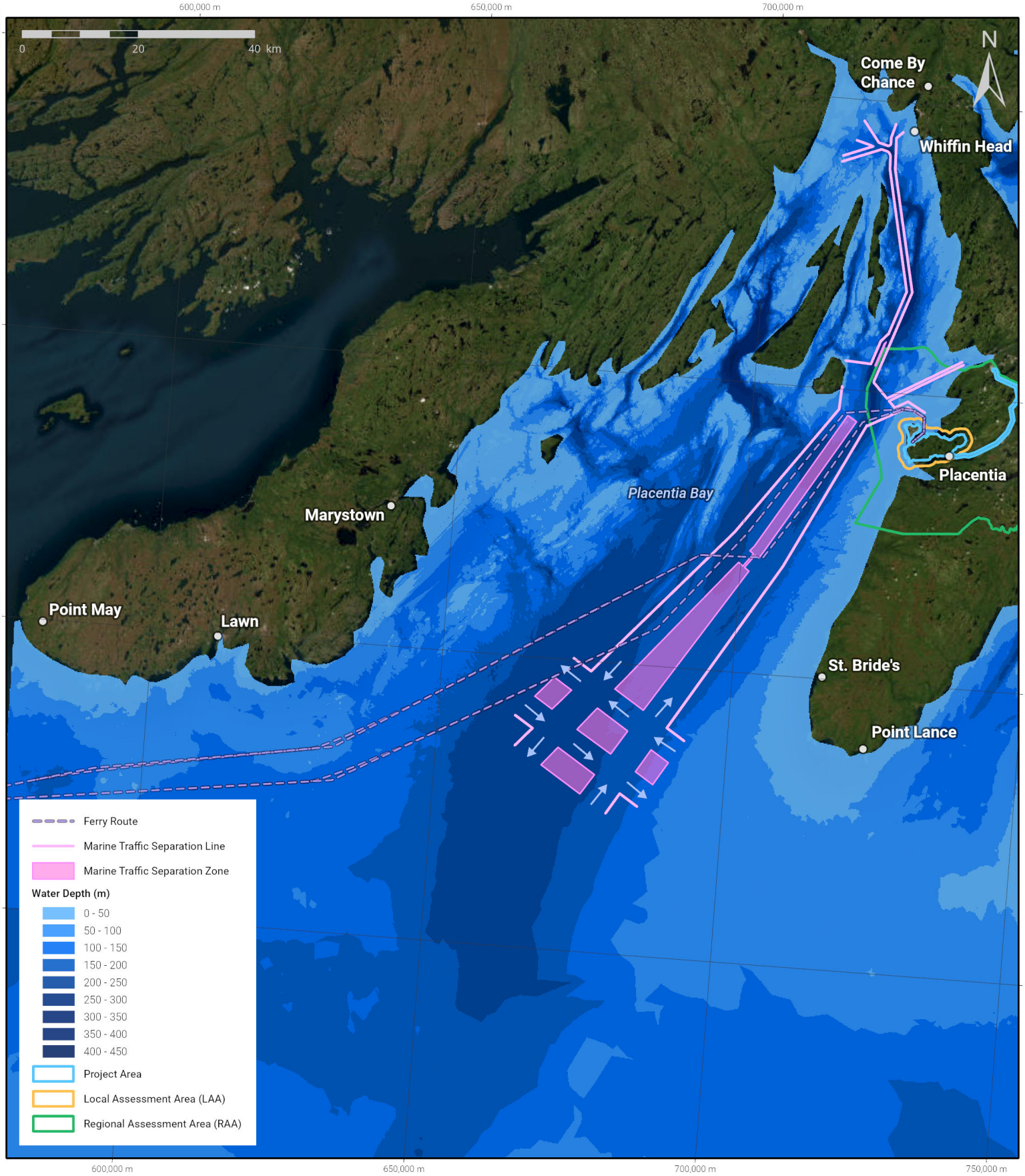
concentration at the subsurface in both stations was higher than the mid water and near bottom samples. Secchi depth was measured at 3.5 m for MS1 and 4 m for MS2.

3.1.2.12 Marine Navigation

The following section presents an overview of marine navigation in Placentia Bay, and within the RAA and LAA. Marine routes and marine traffic density in Placentia Bay and RAA are discussed below, followed by a projection for the Argentia Harbour marine traffic.

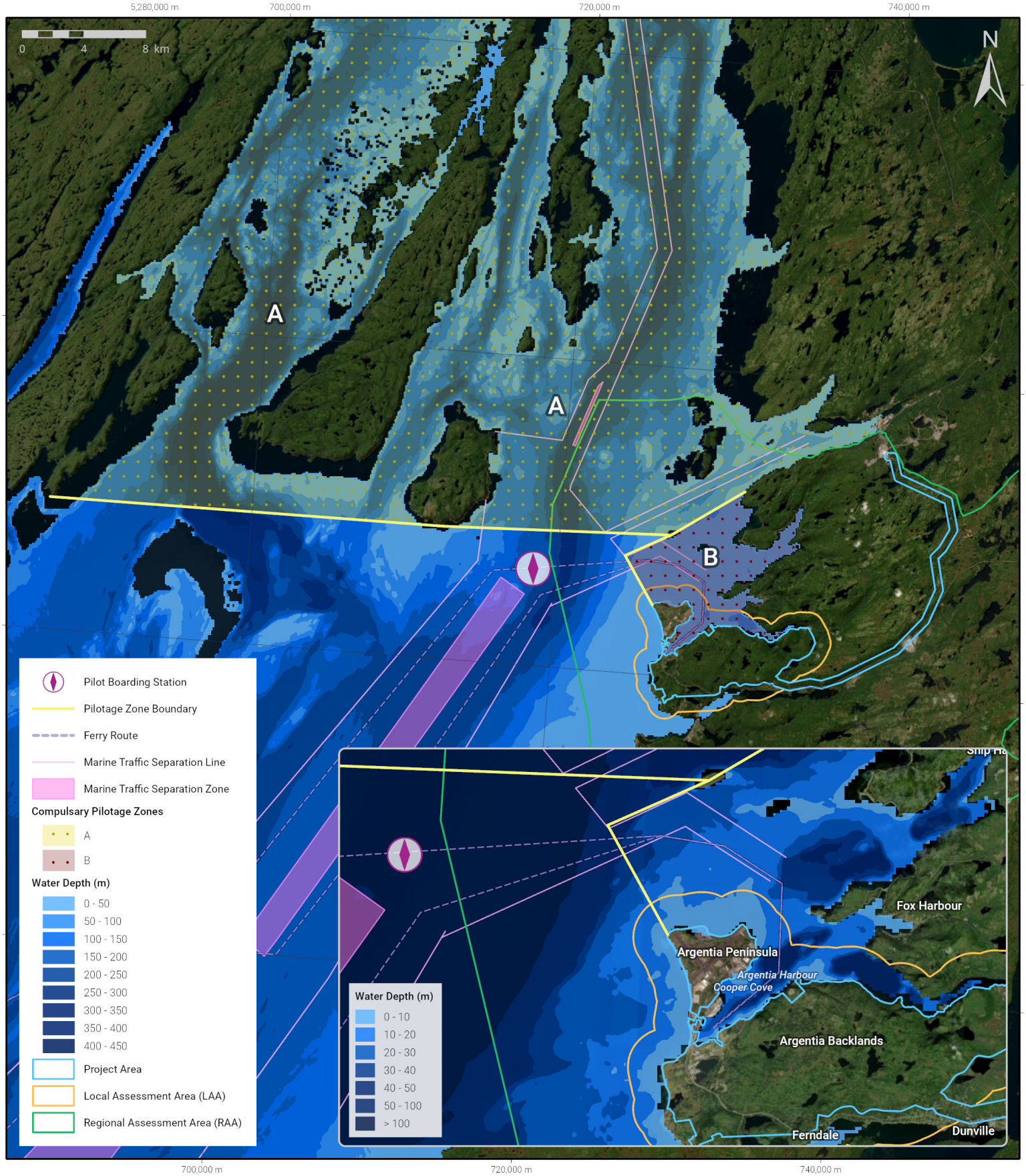
The main shipping lanes in Placentia Bay are represented by two-way routes that pass through the deep water of the Eastern Channel between Long Island and the Avalon Peninsula (Figure 3.1.2-11). Vessels more than 20 m in length entering the bay must report to the Canadian Coast Guard's Marine Communications and Traffic Services (MCTS). Marine traffic using those routes in Placentia Bay consists of tankers, ferries, containers and bulk carriers, cargo ships and fishing vessels (DFO, 2008). The major ports in Placentia Bay include Come by Chance, Whiffen Head, Argentia, Marystown and Long Harbour, according to the National Centre of Expertise on Maritime Pilotage.

Figure 3.1.2-12 provides the navigation corridors in Placentia Bay, and near Argentia Peninsula and harbour. Placentia Bay is designated as a compulsory pilotage area under the Atlantic Pilotage Authority (APA, n.d.). There are two registered pilot areas (zones) past the Pilot Boarding Station (PBA); one being Placentia Bay – Zone A (North of the PBA) and the other Argentia – Zone B (East of PBA).



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 11	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Shipping Lanes in Placentia Bay	NOTES: Depths sourced from Canadian Hydrographic Service (CHS) Non-Navigational (NONNA) bathymetric data. Traffic routes sourced from CHS/Department of Fisheries and Oceans (DFO) on Government of Canada's Open Data Portal.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-020-Rev1



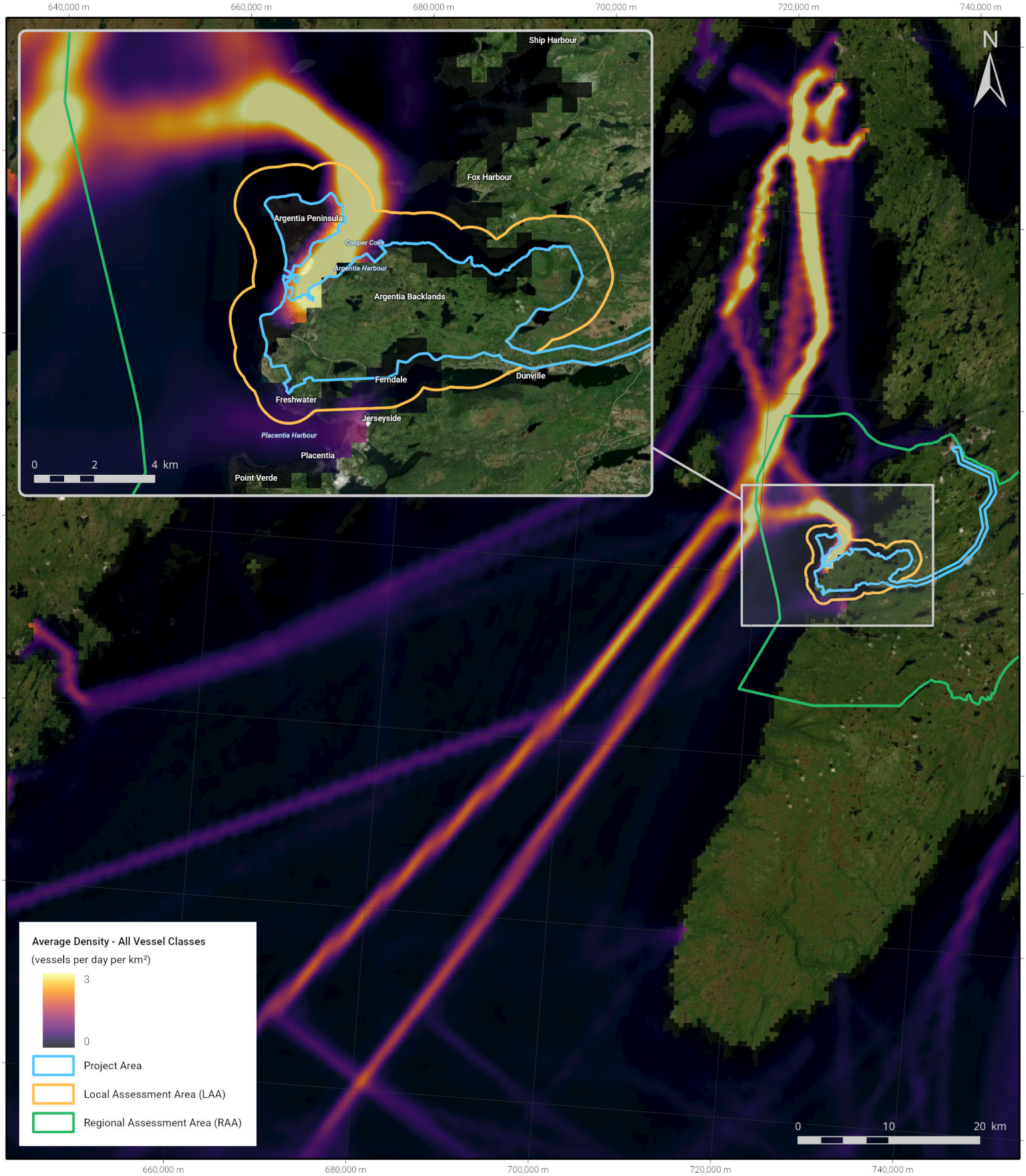
Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 12	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Navigation Corridors Near Argentia	NOTES: Depths sourced from CHS Non-Navigational (NONNA) bathymetric data. Traffic routes sourced from CHS/DFO on Government of Canada's Open Data Portal. Compulsory Pilotage Area data sourced from Atlantic Pilotage Authority webpage.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-018-Rev1

Figure 3.1.2-13 shows the marine traffic density in Placentia Bay in 2022 (DFO, 2023i). The information provided in the marine traffic density map originates from the Automatic Identification System. This global system uses shipborne equipment to remotely track vessel identification and positional information. The tracking system is typically required on all vessel classes of 300 gross tonnage or more on an international voyage, of 500 gross tonnage or more not on an international voyage, and passenger ships of all sizes.

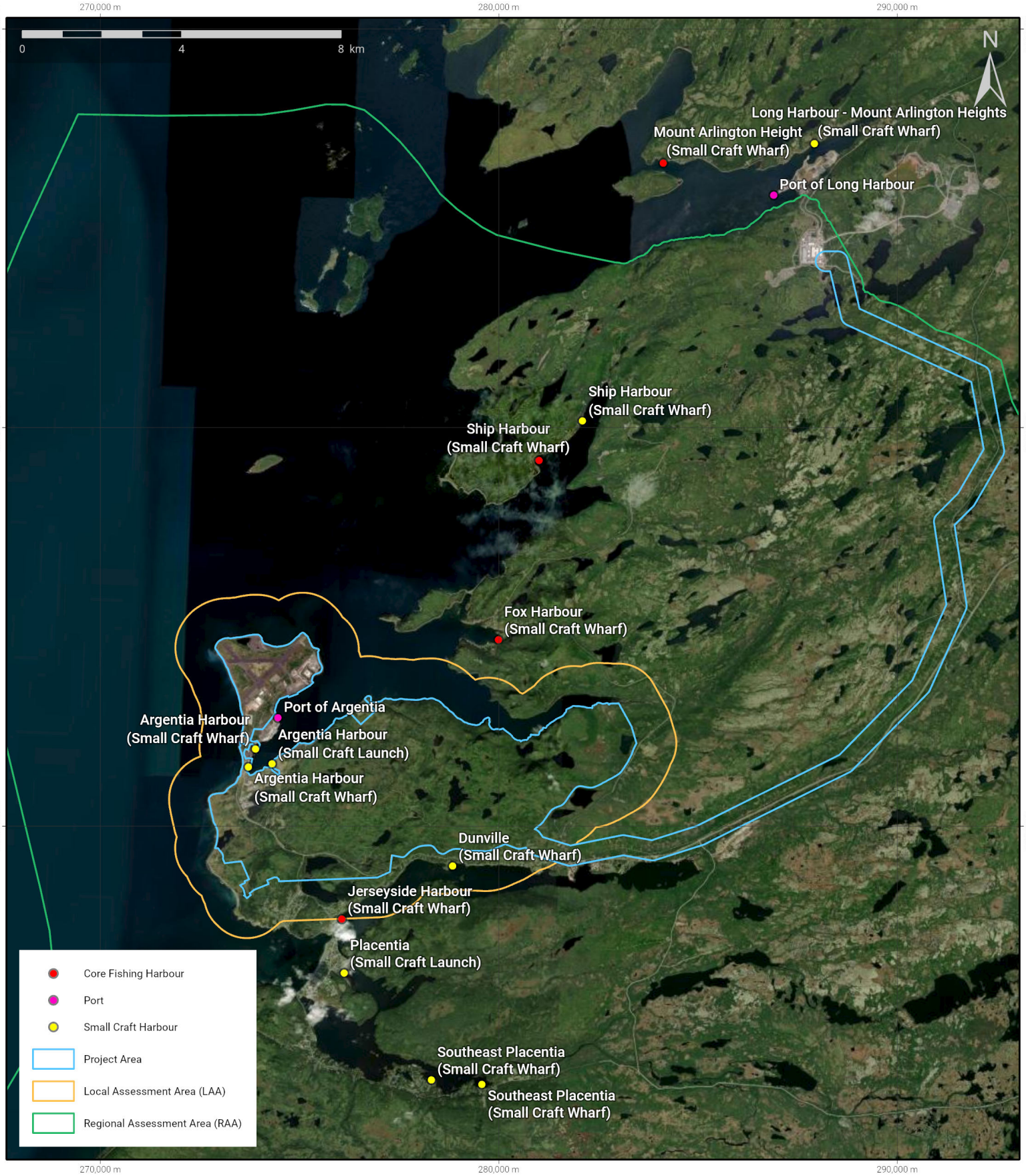
The colour coding illustrates the traffic density of average vessels per day per square kilometre in 2022. It is apparent that there was a high density of marine traffic for the Argentia Harbour area and within the LAA, with approximately three vessels per day/km^2 navigating in the harbour.

Figure 3.1.2-14 provides the small craft harbours (i.e. core fishing harbours) situated within and near the RAA. Additional potential adjacent embarkation sites for small crafts are specified in the figure (i.e. wharves and launch sites), where small recreational boats, small fishing vessels or leisure embarkation devices can assess waters and eventually navigate in the waters surrounding the RAA or LAA. The core fishing harbours in the RAA include Ship Harbour, Fox Harbour and Jeseyside/Placentia Harbour. Two main ports are situated within the RAA including the POA and Long Harbour.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 13	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Marine Traffic Density in Placentia Bay	NOTES: Density map produced from Automatic Identification System (AIS) data published by Fisheries and Oceans (DFO) on Government of Canada's Open Data Portal.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-019-Rev1



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 14	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: J. Crocker	DATE: 24/07/28
	FIGURE TITLE: Small Craft Harbours and Adjacent Embarkation Sites	NOTES:	REVIEWED BY: CBourke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBourke	sem

SEM MAP ID: 238-005-GIS-041-Rev1

Table 3.1.2-12 provides the variation in marine traffic recorded by the POA Authority, which corresponds to the vessel numbers entering the harbour and docking at the POA between 2013 and 2022. The lowest number was recorded in February 2013 (n=6), while the lowest monthly average number of vessels recorded for the year was in 2015 (mean of 11.42). The highest number of vessels recorded was in April 2017 (n=34), while the lowest monthly average of vessels recorded for the year was in 2020 (mean of 18.08). A seasonal variation in vessel traffic is apparent, and the yearly number of vessels at the POA overall has been increasing during this period, although the number of vessels decreased in 2021 and 2022 after peaking in 2020 (Port of Argentia- Marine Traffic Vessel Report; Dillon, 2023).

A total of 1,736 vessels were recorded by the POA between 2013 and 2022 (Table 3.1.2-12). The yearly total of vessels recorded was the lowest in 2015 (n=137), while the highest number of total vessels recorded was in 2020 (n=217). The average number of yearly vessels for that time period was 173.6 vessels per year.

Table 3.1.2-12 Variations of Marine Traffic Vessel (N), Port of Argentia, 2013-2022.

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Sum	Mean
2013	15	6	13	15	17	11	9	10	15	17	10	12	150	13
2014	9	7	12	12	12	15	11	15	21	13	10	9	146	12
2015	7	8	9	12	13	11	12	13	14	12	14	12	137	11
2016	12	14	15	22	14	14	12	14	15	15	15	11	173	14
2017	14	19	14	34	20	14	15	12	9	13	13	11	188	16
2018	7	8	12	18	18	14	14	10	17	16	15	9	158	13
2019	14	10	15	16	19	15	19	22	13	17	19	18	197	16
2020	14	18	22	16	29	22	16	19	17	16	15	13	217	18
2021	16	12	14	12	18	17	17	20	16	18	9	12	181	15
2022	15	14	14	18	24	12	17	16	16	16	11	16	189	16

Notes: Monthly minimums are highlighted in lighter gray, while monthly maximums are highlighted in darker gray.

The POA and Placentia Bay provide navigable waterways with for a variety of purposes, from leisure to commercial activities. The POA features deep-water docking wharves, this allows the POA to accommodate considerably larger vessels and heavy-lift shipments from an array of current industries, including the Marystown Shipyard, Cow Head Fabrication Facility, Argentia Ferry Terminal, North Atlantic Refining Limited, Vale Inco, and Newfoundland Transhipment Ltd (Dillon, 2023). The POA is accessed year-round, supporting present and future commercial activities that are expected to grow in the coming years, including welcoming investment from renewable energy.

Cargo ships supporting Project construction will require appropriate certification and approval to work in Canadian and Newfoundland waters. National and international ships navigating in Canadian waters are subject to the legislations and regulations under the **Canadian Navigable Waters Act, Canada Shipping Act,** 2001, and **Transportation of Dangerous Goods Act**, among other Regulations and Legislations.

Communication systems will be required to allow contact between marine vessels and shore bases. A Canadian Coast Guard Marine Communications and Traffic Services (CCG-MCTS) broadcasts from the Placentia centre. The MCTS centres offer free services relevant to navigation in Placentia Bay, including:

- Messages pertaining to weather or ice conditions and forecasts;
- Messages concerning aids to navigation;
- Eastern Canada Vessel Traffic Services Zone (WCAREG) messages;
- Messages reporting pollution; and,
- Radio-medical messages.

3.1.2.13 Marine Biosecurity

Marine biosecurity is the management of socio-economic and environmental risks associated with introducing and spreading marine pests and diseases from exogenous sources. Newfoundland faces imminent threats to its marine biodiversity and ecosystems from unwanted pests and diseases. Aquatic invasive species (AIS) are one of the largest marine biosecurity risks Newfoundland ports face and are relevant to marine traffic associated with Project construction and operation.

The AIS Regulations (2015) operate under the **Fisheries Act** with the purpose of protecting Canadian waterbodies by preventing the spread and introduction of AIS into Canadian waters and managing them once introduced. These regulations, paired with relevant federal, provincial, and territorial legislations, create management tools to deal with the threat of AIS. They prohibit actions such as importation, possession, transportation, release, and introduction of AIS (DFO, 2019a). The key pathways of AIS introduction or spread are shipping, recreational and commercial boating, use of live bait, aquarium and water garden trade, live food for human consumption, unauthorized importation, and diversions of canals and waterbodies (DFO, 2018).

Shipping vessels are a major pathway of introduction and spread of AIS relevant to the Project. They can carry AIS in their cargo, hulls (i.e., biofouling), and ballast water. Ballast water and biofouling actions can also accidentally introduce and spread pathogens into Canadian waters (DFO, 2022f).

The **Ballast Water Regulations** (SOR/2021-120) came into force in Canada on June 23, 2021. These regulations operate under the **Canada Shipping Act** (2001) and **Fisheries Act** and strengthen Canada's ability to protect its environment and economy from AIS (TC, 2019). Transport Canada is the regulatory body that regulates ballast water management, which is critical in preventing the arrival of aquatic invasive species. These regulations apply to vessels if they are designed or constructed to carry ballast water and include Canadian vessels everywhere; vessels that are not Canadian and are in waters under Canadian jurisdiction, such as international ships navigating in Canadian waters (TC, 2021). Vessels carrying ballast

water that enter or navigate within the Placentia Bay or waterbodies within the Project RAA, they will be subject to complying with the ballast water regulations.

Argentia Renewables will follow recommended best practices and guidelines to help mitigate the potential spread of AIS. Any shipping vessels will be inspected for biofouling of Vase tunicate, European green crab and other AIS. Best practices that will be implemented to prevent the introduction and spread of AIS include:

- AIS awareness in waters frequented;
- Taking precautions with respect to vessel traffic and gear movement between affected and unaffected areas to prevent introductions and spread;
- Clean, drain and dry gear and ropes to prevent movement between areas by avoiding transportation of water from one location to another;
- Routine vessel maintenance (i.e. cleaning the hull and using antifouling paint to prevent biofouling); and
- Identifying and reporting any AIS to DFO.

3.1.2.14 Marine Fish and Fish Habitat

The nearshore environment pertaining to fish and fish habitat in the Argentia area, adjacent to the LAA and RAA, was described in the Husky White Rose Extension Project EA (Husky Energy, 2012), and relevant information is provided below. The habitat components considered included phytoplankton, zooplankton, the water column, invertebrates and benthic habitat. The nearshore adjacent to the harbour was considered to be biologically rich and ecologically important for many fish species that use the area for feeding, migration and spawning and includes productive coastal habitats such as eelgrass beds and salt marsh habitat (Catto *et al.*, 1999).

In the sheltered shallow subtidal habitats, filamentous brown, green and red algae, fucoids and kelp occur, and in deeper nearshore water, patches of kelp and filamentous brown macroalgae occur. Important fish habitat in the nearshore includes eelgrass beds, macroalgal (e.g., rockweed, kelp) beds and capelin spawning beaches (pebble beaches). These habitats provide refugia, spawning grounds, nurseries and food resources for Atlantic cod in particular, as well as a diversity of ichthyoplankton, including cod, cunner, American plaice and capelin.

The benthic communities in Argentia Harbour were dominated by sea stars, sand dollars, and winter flounder, although sea urchins, toad crab, rock crab, hermit crab, mussels, sea scallops, ocean pout,

sculpin, cunner, and whelks were also present (Christian and Lee, 1998). A sand-silt substrate with little algal cover was the dominant habitat in Argentia Harbour at depths greater than 15 m while a steep, rocky slope with bedrock, boulder, and cobble substrate was continuous along the northwestern shore of the harbour in the shallow subtidal areas (JWEL, 1997).

Stantec (2012) observed the following habitat conditions in the inner harbour from the high tide mark to a water depth of 30 m:

- Backshore was comprised of sand dunes with grass and sedge vegetative cover with an elevation of 2 m above sea level;
- Backshore changed abruptly to the foreshore, marked by a sandy beach ridge;
- Intertidal zone composed mostly of sand, with some cobble/gravel mix and trace rubble; and
- Shallow subtidal zone (mean low tide to 30 m depth) was influenced by wave action and substrate consisted mostly of sand and fines, with some rubble/cobble/gravel mix.

Remote-operated vehicle (ROV) surveys found the most common substrate to be sand (86%), followed by cobble (5%), gravel (5%) and mud (4%). The average water depth was 17.5 m, and kelp and sour weed were the dominant species of vegetation at 10% and 3%, respectively. Rockweed was also present on large cobble and boulders, and eelgrass averaged 8% of the macroflora species present and covered 1% of the seafloor area. Other vegetation observed in very low densities included sea colander, smooth cord weed, ribbon weed, and dulse. Macrofaunal species observed included rock crab, snow crab and sea stars. Sea gooseberries were common throughout the water column. Common periwinkle was present but uncommon. The few fish observed included flounder (n=5), longhorn sculpin (n=2), cunner (n=1), and little skate (n=1). Flounder were observed most often on fine substrate.

Marine sediments collected within and outside Argentia Harbour in 1998 by VBNC (2002) found elevated levels of arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, and zinc that exceeded Environment Canada's maximum allowable levels (MALs). Concentration of metals was higher within the harbour than beyond the harbour. Sediment samples within the harbour also had finer sediments and higher total organic levels, both of which would facilitate metal loading of the sediment.

Surface seawater samples collected from Argentia Harbour in 1998 by were found to generally have higher concentrations of metals including cadmium, cobalt, copper, lead, manganese, nickel and zinc than those collected from sites outside the harbour (VBNC, 2002). Cadmium was found to exceed Environment Canada MAL at one station. Higher than average levels of metals were expected in Argentia Harbour, as this area was considered a brownfield site.

The productive Labrador Current and the Gulfstream both influence oceanographic conditions within Placentia Bay and provide rich feeding grounds for marine mammals such as whales, dolphins, porpoises,

and seals, as well as numerous finfish and shellfish species. The area is home to at least 14 groundfish species including Atlantic cod, lumpfish and winter flounder; nine species of pelagic fish including mackerel, herring and capelin; seven species of shellfish including snow crab, lobster and scallop. There are approximately 14 marine mammals and two significant reptiles that seasonally or permanently inhabit Placentia Bay.

Over the past few decades, the biotic marine environment in Argenita harbour has been assessed at multiple occasions. Species composition for flora and fauna biotas were characterised via various methods. The last thorough field surveys were conducted over a decade ago. Thus, additional assessments were necessary to complete a holistic understanding of the marine environment going forward.

The following sections provide an overview of relevant aspects of the marine biological environment in the RAA. Specifically, plankton, invertebrates, finfish, sharks, marine mammals, marine reptiles, invasive species, and other marine organisms. Species at risk or of conservation concern are discussed in the following sections. Table 3.1.2-13 provides an extensive list of aquatic organisms found in Placentia Bay with the potential to occur in the LAA and RAA.

Although the presented desktop information of the marine environment and field study of the plankton and benthic communities were completed to describe the marine fish and fish habitat, there will be potential opportunities for improvement to describe the marine flora and fauna near proposed Project components (i.e. marine effluent). A drop-down camera survey will be completed in future to assess marine habitats associated with the proposed marine effluent upon installation.

Table 3.1.2-13 Marine Organisms with the Potential to Occur in the LAA and RAA.

Marine	*Species Name*	Occurrence in LAA
Finfish		
Pelagic		
Bluefin Tuna (Atlantic Pop.)	*Thunnus thynnus*	Rare
Capelin	*Mallotus villosus*	Occasional
Herring, Atlantic	*Clupea harengus*	Occasional
Lumpfish	*Cyclopterus lumpus*	Rare to Occasional
Mackerel, Atlantic	*Scomber scombrus*	Occasional
Demersal		
Acadian Redfish (Atlantic Pop.)	*Sebastes fasciatus*	Rare
American Plaice (NL Pop.)	*Hippoglossoides platessoides*	Occasional
Arctic Shanny	*Stichaeus punctatus*	Occasional
Atlantic (Striped) Wolffish	*Anarhichas lupus*	Rare
Atlantic Cod (Laurentian North Pop.)	*Gadus morhua*	Common
Atlantic Cod (NL Pop.)	*Gadus morhua*	Occasional
Atlantic Halibut	*Hippoglossus hippoglossus*	Rare
Atlantic Tomcod	*Microgadus tomcod*	Rare to Occasional
Alewife (Gaspereau) *	*Alosa pseudoharengus*	Rare
American Shad *	*Alosa sapidissima*	Rare to Occasional
Cunner	*Tautogolabrus adspersus*	Occasional
Cusk	*Brosme brosme*	Rare
Deepwater Redfish (Gulf of St. Lawrence = Laurentian Channel Pop.)	*Sebastes mentella*	Rare
Eelpout (sp.)	*Lycodes sp. and Zoarces sp.*	Rare
Eelpout (Arctic)	*Lycodes reticulatus*	Rare
Eelpout (Newfoundland)	*Lycodes lavalaei*	Rare
Eelpout (Ocean Pout)	*Zoarces americanus*	Occasional
Grenadier (Roundnose)	*Coryphaenoides rupestris*	Rare
Grenadier (sp)	*Macrouridae (Family)*	Rare
Greenland halibut (Turbot)	*Reinhardtius hippoglossoides*	Rare
Greysole/Witch Flounder	*Glyptocephalus cynoglossus*	Rare
Haddock	*Melanogrammus aeglefinus*	Rare
Monkfish (American angler)	*Lophius americanus*	Rare
Northern Wolffish	*Anarhichas denticulatus*	Rare

Marine	*Species Name*	Occurrence in LAA
Finfish		
Pollock (Atlantic) (Saithe)	*Pollachius virens*	Rare
Radiated Shanny	*Ulvaria subbifurcata*	Rare
Sculpin (sp.) (Atlantic Pop.) *	*Cottidae (Familly)*	Rare
Skate, Little	*Leucoraja erinacea*	Rare
Skate, Winter (Eastern Scotian Shelf – Newfoundland Pop.)	*Leucoraja ocellata*	Rare
Stake, Smooth (Laurentian-Scotian Pop.)	*Malacoraja senta*	Rare
Skate, Thorny	*Amblyraja radiata*	Rare
Spotted Wolffish	*Anarhichas minor*	Rare
White Hake (Atlantic and Northern Gulf of St. Lawrence Pop.)	*Urophycis tenuis*	Rare
Winter Flounder	*Pseudopleuronectes americanus*	Occasional to Common
Wrymouth	*Cryptacanthodes maculatus*	Rare to Occasional
Yellowtail Flounder	*Limanda ferruginea*	Rare to Occasional
Shark		
Atlantic spiny Dogfish	*Squalus acanthias*	Rare
Basking shark (Atlantic Pop.)	*Cetorhinus maximus*	Rare
Blue shark	*Prionace glauca*	Rare
Porbeagle shark	*Lamna nasus*	Rare
Shortfin mako shark (Atlantic Pop.)	*Isurus oxyrinchus*	Rare
White shark (Atlantic Pop.)	*Carcharodon carcharias*	Rare
Invertebrates		
Arthropoda		
American Lobster	*Homarus americanus*	Occasional to Common
Amphipods (sp.)	*Amphipoda (Order)*	Occasional
Barnacles (sp.)	*Cirripedia (Subclass)*	Occasional
Crab (Atlantic Rock)	*Cancer irroratus*	Occasional
Crab (European Green)	*Carcinus maenas*	Occasional
Crab (Hermit)	*Pagurus spp.*	Occasional
Crab (snow/queen)	*Chionoecetes opilio*	Occasional to Common
Crab (Toad)	*Hyas araneus, and Hyas coarctatus*	Occasional
Isopods (sp.)	*Isopoda (Order)*	Occasional
Shrimp (Northern)	*Pandalus borealis*	Occasional
Shrimp (striped)	*Pandalus montagui*	Occasional
Shrimp (Japanese Skeleton)	*Caprella mutica*	Occasional

Marine	*Species Name*	Occurrence in LAA
Invertebrates		
Annelida		
Polychaetes (sp.)	Annelida (Phylum)	Common
Bryozoa		
Bryozoans	Bryozoa (Phylum)	Common
Cnidaria		
Anthozoans (sp) (Soft/Stony Corals and Sea Anemones)	*Cnidaria (Phylum)*	Occasional
Hydrozoans	*Cnidaria (Phylum)*	Occasional
Jellyfish (sp.)	*Cnidaria (Phylum)*	Occasional
Ctenophora		
Comb Jellies (sp.)	*Ctenophora (Plylum)*	Occasional
Sea Gooseberry (Comb Jellies)	*Pleurobrachia pileus*	Occasional
Echinodermata		
Echinoderm (sp.)	*Echinodermata (Phylum)*	Occasional to Common
Brittle Star (sp.)	*Echinodermata (Phylum)*	Occasional
Mud Star	*Ctenodiscus sp.*	Occasional
Sand dollar (sp.)	*Echinodermata (Phylum)*	Occasional
Sea cucumber (sp.)	*Echinodermata (Phylum)*	Occasional
Sea Star (sp.)	*Echinodermata (Phylum)*	Occasional
Ursin (sp.)	*Echinodermata (Phylum)*	Occasional
Mollusca		
Bivalve (sp.)	*Bivalvia (Class)*	Common
American Oyster	*Crassostrea virginica*	Occasional
Clams, Stimpsons surf	*Mactromeris polynyma*	Occasional
Mussel (Blue)	*Mytilus edulis and Mytilus trossulus*	Occasional
Mussel (Northern Horse)	*Modiolus modiolus*	Occasional
Scallop (Islandic)	*Chlamys islandica*	Occasional
Scallop (Sea)	*Placopecten magellanicus*	Occasional
Gastropod (sp.)	*Gastropoda (Class)*	Occasional to Common
Periwinkles (sp.)	*Littorina sp.*	Occasional
Whelk	*Buccinum undatum*	Occasional
Squid (sp.)	*Cephalopoda (Class)*	Rare
Squid (Illex/shortfin)	*Illex illecebrosus*	Rare
Octopod (sp.)	*Octopoda (Order)*	Rare

Marine	*Species Name*	Occurrence in LAA
Invertebrates		
Porifera		
Sponges (sp.)	*Porifera Pphylum)*	Occasional
Marine Mammals		
Baleen Whales (Mysticetes)		
Blue whale (Atlantic Pop.)	*Balaenoptera musculus*	Rare
Fin whale (Atlantic Pop.)	*Balaenoptera physalus*	Rare
Humpback whale (Western North Atlantic Pop.)	*Megaptera novaeangliae*	Rare
Minke whale (North Atlantic subspecies)	*Balaenoptera acutorostrata*	Rare
North Atlantic Right whale	*Eubalaena glacialis*	Rare
Sei whale (Atlantic Pop.)	*Balaenoptera borealis*	Rare
Toothed Whales		
Atlantic White-sided dolphin	*Lagenorhynchus acutus*	Rare
Harbour porpoise (Northwest Atlantic Pop.)	*Phocoena phocoena*	Rare
Killer whale (Northwest Atlantic Pop.)	*Orcinus orca*	Rare
Long-finned pilot whale	*Globicephala melas*	Rare
Northern bottlenose whale (Davis Strait-Baffin Bay-Labrador Sea Pop.)	*Hyperoodon ampullatus*	Rare
Northern bottlenose whale (Scotian Shelf Pop.)	*Hyperoodon ampullatus*	Rare
Short-beaked Common dolphin	*Delphinus delphis*	Rare
Sperm whale	*Physeter macrocephalus*	Rare
Sowerby's Beaked Whale	*Mesoplodon bidens*	Rare
White-beaked Dolphin	*Lagenorhynchus albirostris*	Rare
Pinnipeds and Otters		
Grey seal	*Halichoerus grypus*	Rare
Harbour seal	*Phoca vitulina*	Rare to Occasional
Harp Seal	*Phoca groenlandica*	Rare
Hooded seal	*Crystophora cristata*	Rare
River Otter (Marine)	*Lutra canadensis*	Rare
Marine Reptiles		
Kemp's ridley Sea turtle	*Lepidochelys kempii*	Rare
Leatherback Sea turtle (Atlantic Pop.)	*Dermochelys coriacea*	Rare
Loggerhead Sea turtle	*Caretta caretta*	Rare

Marine	*Species Name*	Occurrence in LAA
Marine Flora		
Filamentous Algae (red, brown and green Algae sp.)	-	Occasional to Common
Coralline Algae (sp.)	*Orallinales (Order)*	Occasional to Common
Dulse	*Palmeria palmata*	Occasional
Eelgrass	*Zostera marina L.*	Occasional to Common
Irish moss	*Chondrus crispus*	Occasional to Common
Kelps (Finger)	*Laminaria digitata*	Occasional to Common
Kelps (Winged)	*Alaria esculenta*	Occasional to Common
Kelps (Cabbage)	*Laminaria longicruris*	Occasional to Common
Ribbon Weed	*Petalonia sp,*	Occassional
Rockweed	*Ascophyllum nodosum*	Occasional to Common
Sea Colander	*Agarum sp.*	Occasional to Common
Smooth Cord Weed	*Chordaria filum*	Occasional
Sour Weed	*Demarestia sp,*	Occasional to Common

Source: Occurrence level was based on habitats, distributions and detections of species from various articles, reports, and online platforms available by Provincial (Gov. NL) and Federal (Gov. Canada) Agencies, Organisations (COSEWIC website, SARA Website, Fishbase website) and Environmental Impact Assessments (LGL, 2019, LGL 2007).
Notes: See the Baseline Study and AIS Section for additional organisms potentially located in LRA.
'*' = Consider as Marine fish as well as diadromous fish.

Marine Plankton

Plankton is an umbrella term for small passive organisms in the aquatic environment, some which drift with ocean currents and tides their entire life cycle, while others are only classified as plankton in early life stages until they are large enough to swim against the currents (NOAA, 2023). Two subcategories of plankton (i.e. zooplankton and phytoplankton) in the RAA/LAA are discussed below.

Zooplankton community structure is strongly influenced by depth, temperature, and season. Community complexity differs substantially along the Northwest Atlantic Region (i.e. Gulf of St. Lawrence, Scotian shelf, Newfoundland and Labrador Shelves) (DFO, 2022d). Copepods are by far the most abundant group in the Northwest Atlantic Region (Davis, 1986; DFO, 2022d), but non-copepod organisms also contribute substantially to total zooplankton abundance (DFO, 2022d). Two copepod taxa, *Calanus finmarchicus* and *Pseudocalanus spp.*, represent different broad groups with similar life histories and are considered key bioindicators of the condition of the zooplankton communities and community shifts on the Newfoundland and Labrador Shelves (DFO, 2022d). Zooplankton communities associated with the Newfoundland shelves are likely to be found in RAA and LAA due to proximity and similar physical oceanography.

Copepod, krill, amphipod and euphausiid species, as well as planktonic egg and larval stages of fish and invertebrates, dominate the zooplankton community in Placentia Bay, which is most abundant between mid-April and mid-June (Husky Energy, 2012). The distribution of pelagic eggs and early larval stages were consistent with passive drift, but later stages of larvae frequently concentrated on the western side of Placentia Bay. The highest concentrations of American plaice and Atlantic cod eggs were on the western side of Placentia Bay, with densities of Atlantic cod eggs highest during early spring.

Table 3.1.2-14 shows the major zooplankton taxa found in LAA during the 2023 aquatic baseline study (Appendix B1). Arthropoda was the dominant taxa (49.26% of total zooplankton biomass) followed by Cnidaria (46.29%). Zooplankton community composition from Argentia Harbour (LAA) concurred with DFO (2022d) and showed that copepods were by far the most abundant group of zooplankton. Two-thirds of the Arthropoda biomass was associated with Copepod taxa and contributed to 32.69% of the total biomass, while the non-copepods taxa contributed 16.57% to total zooplankton biomass. Cnidaria were also an important part of the LAA zooplankton community (46.29%). Davis (1986) conducted extensive characterization the zooplankton in Placentia Bay and all major taxa from the baseline study were represented in categories described by Davis (1986). Species of zooplankton found in Placentia Bay (Davis, 1986) coincided with species of high abundance collected in August during the baseline study including *Temora longicornis, Centropages hamatus, Oithona sp., Acartia sp., Calanoida indet., Pseudocalanus sp. complex, Centropages sp., Eurytemora sp. Evadne sp., and Obelia sp.*

Table 3.1.2-14 Major Marine Zooplankton Taxa Found in the LAA, Aquatic Baseline, 2023.

Phylum (Class)	Biomass %
Bryozoa (Cyphonautes)	0.22%
Chaetognatha	0.00%
Cnidaria	46.29%
Arthropoda	49.26%
Arthropoda (Non-Copepoda)	16.57%
Arthropoda (Copepoda)	32.69%
Ctenophora	0.05%
Echinodermata	0.05%
Mollusca	4.06%
Nemertea	0.05%
Chordata	0.00%
Annelida (Polychaeta)	0.02%
Total Biomass (mg/L)	100.00%

Phytoplankton blooms in the Northwest Atlantic Ocean are characterized by spring and fall events (LGL, 2018). Time-series coastal stations primary production analysis demonstrated a pattern of a few larger phytoplankton species (often diatoms) dominating the spring bloom with succession to a higher cell density of smaller phytoplankton species as temperature increases throughout the summer months. Typically, phytoplankton shifts have been defined by reoccurring yearly cycles of picophytoplankton (0.2 to 2 µm) (prior to spring bloom), diatoms (during the spring bloom), followed by other phytoplankton (e.g., coccolithophores like golden brown algae (e.g. haptophytes), post-spring-bloom), with further succession towards small phytoplankton during the fall bloom. Water samples from Placentia Bay in 1998 were analyzed for chlorophyll ‘a’ to estimate phytoplankton standing crop, and chlorophyll ‘a’ concentrations were higher in the inner bay than the outer bay and were highest in April.

Biomass estimates of phytoplankton collected in August 2023, were dominated by Diatoms of >30 µm in size, while Haptophytes were underrepresented compared to the Diatoms. The phytoplankton community composition in the LAA during the summer of 2023 was similar to what would have been expected during the spring bloom in the Northwest Atlantic Ocean, suggesting a possible delay in the typical phytoplankton community shift.

Marine Benthos

The marine benthos species occurring in the LAA and RAA are discussed below.

Benthos communities are composed of benthic surface-dwelling epifauna and burrowing bottom-dwelling infauna. The benthic communities of the Placentia Bay marine ecosystem include intertidal, shallow subtidal and subtidal bottom-dwelling organisms and dominant fauna in intertidal and shallow subtidal

habitat include blue mussel, green sea urchin, common periwinkle, barnacle, frilled anemone, horse mussel, and various amphipods and isopods. In deeper areas of the bay, polychaetes, amphipods, sand dollar, sea urchins, sea stars, scallops, mussels and brittle stars dominate. In recent years, the invasive European green crab has also become important in the benthic community. Infauna such as seaworm-like (polychaete, annelids), and epifauna such as echinoderms (e.g. sea stars, brittle stars, mud stars, sea urchins, sand dollars, sea cucumber) tunicates, shellfish (e.g. shrimps, snow crabs, lobster), gastropods (e.g. whelks), bivalves (e.g. horse mussels, scallop, mussels), sea anemones, sponges, soft corals, bryozoans, and hydrozoans could be expected to be found within the RAA (LGL, 2018).

Benthic organisms in LAA were associated with the dominant substrate type in Argentia Harbour (i.e. mud, silty mud and sandy mud) and the Argentia Peninsula (i.e., sand and muddy sand; poorly sorted sand gravel; boulder, gravel, patches of coarse sand and poorly sorted gravel) and consisted mostly of seaworm-like (e.g., polychaete), shellfish, echinoderms, bivalves, bryozoans, and hydrozoans. ROV surveys in the nearshore near Argentia harbour indicated that sand dollars were very common in sandy habitats, while sea urchins characterized rocky habitats. Rock crabs, hermit crabs, sea stars, barnacles, broken shells, planktonic sea gooseberries, and frilled anemones were also observed.

Samples of the benthic community in Argentia Harbour were collected in the 2023 baseline study (Appendix B1) and were limited to sampling infauna. Average abundance, richness, and biomass were 694 organisms, 38 taxa, and 117 g/m^3, respectively. The benthic community was dominated by Annelida (Polychaeta) (94.7%), followed by Nemertea (2.4%), Mollusca (2.0%), Arthropoda (0.4%), and Echinodermata (0.4%) in abundance. Simpson's Diversity and Evenness Indexes were 0.873 and 0.030, respectively, indicating relatively low diversity.

Marine Fish

Fish are commonly associated with particular habitat types in nearshore areas of Placentia Bay, and species such as cod, cunner, winter flounder, lumpfish and herring are frequently associated with habitats such as eelgrass, kelp beds or cobble. Soft sediment habitat (e.g., sand or mud) provide refuge for benthic species such as American plaice and winter flounder. Capelin, herring and sand lance from nearshore pelagic schools near the surface, particularly at night and are important forage fish species for higher trophic levels. Several fish species migrate seasonally to Placentia Bay, and this includes Atlantic herring, capelin and Atlantic cod in spring and Atlantic mackerel and possibly herring in autumn. Atlantic salmon, brook trout, brown trout and American eel migrate to and from rivers and feed in Placentia Bay during summer. Many of the species that use the shallow areas of Placentia Bay migrate to deeper waters during winter, such as lobster, snow crab and winter flounder. American plaice, Atlantic cod, cunner, winter flounder, lumpfish, wolffish, capelin, herring, mackerel and sand lance reproduce in Placentia Bay, and many rely on coastal habitats for spawning and refugia. DFO research vessel surveys of fish and fish

habitat in Argentia found few fish and shellfish and winter flounder, longhorn sculpin, little skate, snow crab, and rock crab occurred in very low numbers (Husky Energy, 2012).

Many of the numerous marine finfish species that occur in Placentia Bay have ecological and economic importance, primarily from a fisheries perspective. This section provides summary information regarding the life histories and ecological associations for finfish species of special interest found in the RAA. Fish species of interest found occasionally or commonly in RAA include Atlantic cod (NL and Laurentian North (LN) populations), American plaice (NL Population), Atlantic herring and lumpfish, important commercial species, and capelin, an important species in the food chain of many fish, marine mammals, and birds.

Atlantic cod has historically been one of the leading food fisheries in the world, and until recent years was NL's single most important commercial species. The various Atlantic cod populations have decreased precipitously during the past couple of decades, to the point where inshore Atlantic cod appear to be more abundant than those in the offshore areas (DFO, 2017). The NL and LN Atlantic cod populations were designated "Endangered" by COSEWIC in 2003 (COSEWIC, 2003).

St. Pierre Bank (Northwest Atlantic Fisheries Organization (NAFO) Division. 3Ps) Atlantic cod stock is comprised of the LN Population (COSEWIC, 2003). This stock migrates seasonally between neighbouring areas and also migrates seasonally between inshore and offshore sub-components. Some Newfoundland Shelf Atlantic cod populations migrate from the relatively warm offshore waters to inshore coastal waters in spring to feed primarily on capelin before returning offshore in the fall (COSEWIC, 2003). The Atlantic cod fishery occurs in 3Ps, typically between mid-May and the end of March. Seasonal closures of the entire stock area generally occur annually (usually from March to mid-May) at the peak of spawning time with an aim to minimize impacts on spawning aggregations (DFO, 2021). Spawning is broadly distributed in 3Ps and may occur close to the shore of southern Newfoundland (e.g. inshore of the Placentia Bay), as well as offshore in Burgeo Bank, St. Pierre Bank and in the Halibut Channel (DFO, 2022c). Inshore cod spawning occurs in several bays in Placentia Bay (Lawson and Rose 2000a). The timing of spawning is variable and prolonged among stocks, with spawning in Placentia Bay occurring from March until August (DFO, 2021; 2022c). Spawning is often synchronized with higher availability of larvae food like plankton bloom (spring and fall), especially in spring. Juveniles settle in the demersal area after the larval stage where they stay for a period of one to four years. Young Atlantic cod begin to undertake the seasonal migration after the settlement period as undirected swimming in coastal waters, while adults directly migrate to and from specific, highly preferred locations which are temperature or feeding-related (COSEWIC, 2003).

Capelins are important for the optimal growth, condition and reproductive potential of northern cod (Rose and O'Driscoll, 2002). Capelin was found in 9.5% of the cod taken in Placentia Bay in January and June and constituted 22% of the diet in terms of weight and condition of Placentia Bay cod was higher than in neighbouring bays.

The American plaice (NL Pop.) St. Pierre Bank Stock (NAFO 3Ps) and two other stocks (NAFO 2J3K, 3LNO) that were designated "threatened" in 2009 by COSEWIC (COSEWIC, 2009; DFO, 2011). These stocks have been under fishing moratoria since 1993 but are allowed as bycatch in other fisheries (COSEWIC, 2009; DFO, 2011; DFO, 2020a), which accounts for the catch in Placentia Bay (3Psc). American Plaice typically occupy all areas of the continental shelves. These fish may occupy non-preferential habitats (temperature, sediment type, etc.) to access rich feeding sites (COSEWIC, 2009). They are most abundant in water deeper than 100 m but have also been observed in coastal shallower waters of Placentia Bay (<15 m) (LGL, 2018). The NL population of American plaice migrate mainly before spawning which starts at the end of winter and continues until the end of spring depending on geographic location. Spawning in St. Pierre Bank, Grand Bank and Northeast Newfoundland Shelf occurs in March through May (COSEWIC, 2009) and suggests that spawning of American plaice in Placentia Bay may occur during this time period.

There are five coastal Atlantic herring stocks in east and southeast Newfoundland, one of which is the St. Mary's Bay-Placentia Bay (SMB-PB) stock (Wheeler *et al*., 2004; DFO, 2009). Spring spawners to dominate most stocks and Atlantic herring spawn during May and June. These demersal spawners deposit adhesive eggs on stable bottom substrates, typically in shallow (<20 m depth) coastal waters, primarily on gravel or rocky bottom where there is an abundance of seaweed. Eelgrass has been associated with herring spawning in some locations (Scott and Scott, 1988). The larvae from herring eggs are pelagic and pelagic larvae and juveniles are known to make diel (night-to-day) vertical migrations. The juveniles and adults tend to avoid the surface waters during daylight hours. Herring are pelagic schooling fish do not appear to have any substrate preference during juvenile and adult phases. Atlantic herring are visual feeders, consuming primarily plankton during daylight hours (Scott and Scott, 1988).

Lumpfish are semi-pelagic, spending much of their time away from the coast. Adult lumpfish exhibit seasonal migrations, moving into shallow coastal waters to spawn in spring and early summer, and then returning to offshore waters in late summer and early fall. Female lumpfish are commercially fished for their roe during the inshore spring-summer spawning season (Kearley, 2012). Lumpfish eggs adhere to the substrate and larval hatch typically occurs during May–June and the larvae attach to macroalgae and hard substrates. Juvenile lumpfish remain in coastal areas up to age one, when they adopt semi-pelagic characteristics of adult lumpfish and distribute themselves offshore (Scott and Scott, 1988; Kearley, 2012).

Capelin is one of the most ecologically important fish species as it is important food for many fish, marine birds, and mammals. These pelagic fish exhibit inshore-offshore migrations associated with spawning. Capelin typically overwinter in offshore waters, move shoreward in early spring to spawn on appropriate beaches in spring/summer, and return to offshore waters in autumn. Juvenile capelin are found in Newfoundland bays but capelin larvae are rapidly carried out of the bays and inshore areas by surface currents (DFO, 2015). The arrival of capelin to the head of Placentia Bay generally occurs in June and July.

Five stock complexes of capelin have been recognized in the Newfoundland region based on spawning and overwintering locations, including the Saint-Pierre Bank stock that spawns on the south coast of Newfoundland and Placentia Bay (Carscadden *et al*., 1989). Beach suitability for spawning is dependent on substrate type, with a preference for gravel, and eggs are typically deposited in the intertidal zone, although capelin also deposit eggs in the subtidal zone (Carscadden *et al*., 1989). The size of the substrate on a beach will determine its suitability for capelin spawning and capelin appear to prefer gravel 5 to 15 mm in diameter but will spawn on substrate as small as 2 mm diameter and as large as 25 mm diameter.

There are a total of 31 capelin beaches that have been identified in the bay, eight of which are major sites with at least some spawning every year (Sjare *et al*., 2003). Typical capelin beaches are located at Fox Harbour (north of Argentia) and Point Verde, southern Ship Cove and Gooseberry Cove (along the Cape Shore south of Argentia) and capelin spawning on beaches near Argentia has been reported historically (Catto *et al*., 1999).

Capelin larvae were most abundant near the islands in the center of Placentia Bay, and capelin biomass was highest June in outer Placentia Bay, while the highest capelin densities in January occurred on the eastern side of outer Placentia Bay, and south of Merasheen and Red Islands (O'Driscoll and Rose, 1999). Highest densities in March were towards the western side of outer Placentia Bay and throughout the inner bay while June densities were distributed evenly throughout outer Placentia Bay.

Marine Shark

Sharks can be found in Placentia Bay marine area, but most are rarely observed. Six species of shark that occur in Newfoundland waters are: Atlantic spiny dogfish, basking shark, porbeagle shark, shortfin mako shark; blue shark; and white shark (Table 3.1.2-15). The porbeagle shark was designated as endangered by COSEWIC in May 2004 and is known to occur in southern Newfoundland waters but are most common on continental shelves (COSEWIC, 2004; Scott and Scott, 1988). The shortfin mako shark was designated as threatened by COSEWIC in April 2006, and are pelagic and found in continental shelf habitats. The blue shark occurs primarily in oceanic pelagic and continental shelf habitats. The Atlantic population of white shark is designated as endangered on Schedule 1 of SARA and by COSEWIC. White sharks are relatively rare in Canadian waters, which represents the northern-most portion of their distribution (COSEWIC, 2006).

No species of sharks are expected to be found occasionally or commonly near the Argentia Harbour and the LAA considering the shallow coastal water, proximity of shoreline, marine traffic and the predominantly pelagic and offshore nature of shark distribution.

Marine Mammals

Marine mammals that could occur in Placentia Bay are identified in Table 3.1.2-15. Eleven species of marine mammals are expected to regularly occur in Placentia Bay, including eight species of cetaceans and three species of seals, while several additional species have been observed in the bay but are considered rare. Three species of baleen whales regularly occur in Placentia Bay including humpback whale, fin whale, and minke whale. Two mysticete species, the blue whale and North Atlantic right whale, whose occurrence in Placentia Bay are considered rare, are listed as Endangered under Schedule 1 of SARA. Five species of toothed whales are known or expected to regularly occur in Placentia Bay including long-finned pilot whales, short-beaked common dolphin, Atlantic white-sided dolphin, white-beaked dolphin, and harbour porpoise. The harbour porpoise is considered of Special Concern by COSEWIC. Harbour, grey, and harp seals occur in Placentia Bay. Harbour seals may occur in small numbers year-round whereas harp and grey seals are considered visitors. Harbour seals prefer the quiet waters of bays and inlets and generally use inshore rocks and sand bars for resting and are observed throughout coastal areas of Placentia Bay (Sjare *et al.*, 2005). These seal species are not considered at risk by COSEWIC nor are they listed on SARA. Some river otters in the Placentia Bay have adopted a predominant marine lifestyle and one of the highest otter densities in Newfoundland occurs from the southern extent of Merasheen Island to the head of Placentia Bay (Goudie and Jones, 2007).

The shallow water composing the majority of LAA, proximity of shoreline, marine traffic and feeding behaviour of whales, seals, and river otter make it unlikely that marine mammals will occur occasionally or commonly near the Argentia Peninsula and Harbour and interact with the Project's marine component.

Marine Reptiles

There are two marine reptile species that may occur in Placentia Bay, Leatherback Sea turtles (Atlantic Pop.) and Loggerhead Sea turtles (Table 3.1.2-15). Leatherback sea turtles regularly occur in Placentia Bay and they are listed as Endangered on Schedule 1 of SARA. Two primary areas of important habitat were recognized for the Leatherback Sea turtles (Atlantic Pop.): the southeastern Gulf of St. Lawrence; and the waters south and east of the Burin Peninsula, which include parts of Placentia Bay (DFO, 2020b). Loggerhead sea turtles, also listed as Endangered on Schedule 1 of SARA, may also occur in Placentia Bay but their occurrence is considered uncommon. Husky Energy (2012) also considered that Kemp's ridley sea turtle could potentially be found in Placentia Bay. The migratory and feeding behaviour of sea turtles make it very unlikely that there will be a substantial presence of marine reptiles near the LAA.

Marine Shellfish

Shellfish in Placentia Bay comprise a substantial number of species (Table 3.1.2-15). Snow crab and American lobster are two shellfish with the highest economic importance for commercial fisheries in

Placentia Bay (DFO, 2023d). These species are substantially fished throughout the bay, in the RAA and to an extent in the LAA. As for Snow crab and American lobster, sea scallops are harvested commercially. In Placentia Bay, scallops are also harvest recreationally. Shellfish species of economic value found occasionally and commonly in the LAA will be discussed below.

Snow crab in Newfoundland waters typically occurs at water depths ranging between 60 and 400 m on substrates consisting of mud and gravel. The commercial fishery for snow crab has been very lucrative since the groundfish moratorium in 1992, but recent years have seen a downward turn in the stock (DFO, 2016). The mating of first-time spawning females occurs during winter, while multiple-time spawners occur during spring and summer (DFO, 2019b). The eggs are carried by the females until larval hatch during the summer months. The larvae are pelagic and may remain in the water column for months. The pelagic larval stage eventually settles to the seabed and continues development to maturity in the benthic habitat. The snow crab fishing season in 2023 in 3Ps occurred from the start of April to the end of June and Placentia Bay North 3Psc is an inshore fishery where snow crabs are fished within the RAA.

American lobster has a continuous distribution around the island of Newfoundland, occupying a relatively narrow band of rocky habitat over an approximate depth range of 2-40 m (Ennis, 1984). The inshore lobster fishery is primarily conducted in areas with water depths of 15–20 m during spring and early summer and remains important for many fishers (DFO 2016a). Lobster mating typically occurs during the summer months, immediately after the female moults. The female carries the developing eggs on the underside of her abdomen. Hatching occurs the following summer and the resultant larvae assume a pelagic existence. The planktonic larvae settle to the benthic habitat for development to the adult stage (DFO, 2021a). The American lobster is an opportunistic feeder and is known to consume a variety of food including crustaceans, echinoderms, molluscs, fishes, and polychaetes (DFO, 2021a). The American lobster fishery (usually May to July) was the second most lucrative fishery in 3Psc for 2023.

Sea scallops are generally distributed throughout the shallow (<20 m) coastal regions around Newfoundland, occurring primarily on sand/gravel or gravel/pebble substrates. They are abundant in shallow sheltered sandy locations, such as western Placentia Bay. Commercial and recreational harvesting of sea scallops occurs in areas around Newfoundland, including Fortune Bay, Placentia Bay, and St. Mary's Bay. Sea scallops are harvested nearshore in northern Placentia Bay, in water depths <200 m. Spawning typically occurs in September and October. Both the eggs and larvae are planktonic, and the larva develops a "foot" that allows it to attach to the substrate and then develop to the juvenile stage. The juveniles then lose their attachments and lie freely on the ocean bottom for development to the adult stage (DFO, 2007).

Overall, the marine environment within the LAA and RAA is residence to a vast range of benthic organisms while providing adult feeding grounds, migratory paths, and possible spawning, nursery, and larval or juvenile rearing areas to many fish and shellfish species. Species of special concern, like American plaice

(Newfoundland Pop.) and Atlantic cod (Laurentian North Pop.), or species of high economic value like snow crab and lobster (American), might carry out some of their life history processes within the RAA through a substantial period of the year, notably during spring and summer months.

3.1.2.15 Marine Fisheries and Aquaculture

The following section gives an overview of the fishing industry activities within Placentia Bay, which might overlap with the RAA or LAA. Commercial fishing is considered an important economic contributor for communities of Placentia Bay, including those in proximity to the Project. Licenses and quotas are set by DFO for individual species management areas and NAFO divisions and subdivisions. The Placentia Bay region is located within the NAFO Division 3Ps. The area North of 3Ps is referred to as the “inshore area” and consists of Sub-Division 3Psa, 3Psb, and 3Psc units and Placentia Bay is situated in sub-Division 3Psc. Weather and ice conditions, availability of resources, fisheries licencing and management, and harvesting plans and preferences influence the extent and timing of fishing activity in the Placentia Bay.

Commercial, recreational, and Indigenous fisheries take place in many areas in southern Newfoundland. The fishing industry is not the only core seafood industry in the Placentia Bay and aquaculture and seafood processors are also an important part of the industry. Activities related to the marine fishery, aquaculture industry and fish/seafood processing in Placentia Bay, RAA and LAA will be discussed below.

Marine Commercial Fisheries

Commercial fishery data sets for species that interact with the RAA (NAFO sub-divisions 3Psc) were acquired from DFO (DFO, 2023), and are presented in Tables 3.1.2-15 and 3.1.2-16. Harvest data are provided by landed weight (kgs) and value ($) by species between 2018 and 2022. The 3Psc area covers an area much more expansive than the RAA, however, general information on trends associated for the fishery in this sub-division provide insight and knowledge for the general area in which the Project will occur.

Commercial fisheries have undergone considerable changes over the last three decades, shifting in many locations from a groundfish-based to a shellfish-based industry, and more recently back to a groundfish-based fishery. A harvesting moratorium on Atlantic cod in 3Ps was declared from 1993 to 1996 and prior to that, Atlantic cod had comprised ~50–70% of the annual catch weight (1986–1993) while snow crab accounted for only ≤1%. Immediately after the moratorium, Atlantic cod comprised only 5% of the annual catch, while the proportion of snow crab increased to ~10–23%. A limited cod fishery was reinstated in 1987, and since then cod and snow crab are the principal species harvested in 3Ps accounting for 50-75% of the annual catch.

The fisheries in Placentia Bay are conducted year-round although the overall catch has been much less evenly distributed throughout the year, compared to a decade ago. The 3Psc ground fishery reopened in the mid-1990s, and the peak harvesting months in terms of quantity have been June and July. This pattern was influenced by the cod fishing activities, which generally occur throughout all months except April. May and June were the two highest months by value, owing to the large harvest of high-value snow crab in May.

Tables 3.1.2-15 and 3.1.2-16. provide the quantities (in Kgs) and values ($) of landings in 3Psc per species from 2018 to 2022, respectively. Snow crab (8,448,726 Kgs), Atlantic cod (7,087,930 Kgs) and Atlantic herring (1,455,683 Kgs) were the top three species of importance in 3Psc, in terms of volume landed weight, between 2018 to 2022. In terms of value, snow crab ($104,240,363), American lobster ($10,493,676) and Atlantic cod ($10,469,315) were the top three species. It is apparent that economically, the fishing industry in Placentia Bay was mainly dominated by the snow crab fishery in those years.

Table 3.1.2-15 Landed Weight (Kgs) in the 3Psc Commercial Fishery, 2018-2022.

Preliminary Landings in 3Psc						
Species	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
American plaice	22,475	16,803	14,498	O/L	O/L	**53,776**
Capelin	-	O/L	-	-	-	-
Clams, Stimpsons surf	-	-	-	-	O/L	-
Cod, Atlantic	2,727,138	2,077,822	1,327,311	458,109	497,550	**7,087,930**
Crab, Queen/Snow	749,838	1,103,765	1,259,145	2,170,861	3,165,117	**8,448,726**
Greysole/witch flounder	O/L	O/L	O/L	-	-	-
Haddock	12,505	O/L	47.9	O/L	O/L	**12,553**
Hake, white	3,263	O/L	O/L	O/L	O/L	**3,263**
Halibut, Atlantic	9,138	5,632	6,920	2,647	O/L	**24,337**
Herring, Atlantic	O/L	O/L	670,494	O/L	785,189	**1,455,683**
Lobster (American)	14,263	27,566	10,315	7,567	8,622	**68,333**
Monkfish (Am angler)	O/L	O/L	O/L	O/L	-	-
Pollock	31,071	9,193	O/L	O/L	-	**40,264**
Redfish	7,244	280	153	O/L	O/L	**7,677**
Scallop, Iceland	O/L	-	-	O/L	O/L	-
Scallop, Sea	O/L	O/L	O/L	236,221	O/L	**236,221**
Sea cucumber	-	-	O/L	-	-	-
Sea Urchins	O/L	O/L	-	-	-	-
Seal fat	-	O/L	-	-	-	-
Seal skins, harp, beater (no.)	-	O/L	-	-	-	-
Shark, blue	O/L	-	-	-	-	-
Shark, mako (Shortfin)	-	-	-	O/L	-	-
Skate	O/L	O/L	O/L	O/L	-	-
Squid, Illex	-	O/L	O/L	-	-	-

Preliminary Landings in 3Psc						
Species	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
Tuna, bluefin	-	-	-	O/L	O/L	-
Turbot/Greenland halibut	O/L	O/L	O/L	O/L	O/L	-
Whelks	O/L	O/L	O/L	O/L	O/L	-
Winter flounder	O/L	O/L	O/L	O/L	O/L	-
Wolffish, Striped/ Atlantic	O/L	O/L	-	-	-	-
Yellowtail flounder	O/L	O/L	O/L	O/L	-	-
Other Landings (O/L)	1,441,203	2,076,983	243,823	1,455,178	412,014	**5,629,201**

Source: Economic Analysis and Statistics DFO, 2023.

Notes:

"-" = No data available

O/L = Categorized as Other Landings, did not meet confidentiality requirements specified within the Statistics Act and DFO policies.

Table 3.1.2-16 Landed Value ($) Recorded in the 3Psc Commercial Fishery, 2018-2022.

Preliminary Landings in 3Psc						
Species	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
American plaice	16,801.15	11,932.58	10,747.36	O/L	O/L	**39,481**
Capelin	-	O/L	-	-	-	-
Clams, Stimpsons surf	-	-	-	-	O/L	-
Cod, Atlantic	3,751,807.74	3,271,372.12	1,907,720.22	644,110.82	894,304.06	**10,469,315**
Crab, Queen/Snow	7,966,089.86	12,969,738.03	101,976.57	35,271,928.61	47,930,629.90	**104,240,363**
Greysole/witch flounder	O/L	O/L	O/L	-	-	-
Haddock	12,189.74	O/L	40.57	O/L	O/L	**12,230**
Hake, white	2,917.17	O/L	O/L	O/L	O/L	**2,917**
Halibut, Atlantic	86,335.22	56,345.98	54,756.27	21,593.78	O/L	**219,031**
Herring, Atlantic	O/L	O/L	233,551.02	O/L	346,032.50	**579,584**
Lobster (American)	199,306.96	386,368.89	9,631,302.85	128,646.42	148,050.64	**10,493,676**
Monkfish (Am angler)	O/L	O/L	O/L	O/L	-	-
Pollock	22,368.67	5,734.45	O/L	O/L	-	**28,103**
Redfish	6,001.54	235.28	109.70	O/L	O/L	**6,347**
Scallop, Iceland	O/L	-	-	O/L	O/L	-
Scallop, Sea	O/L	O/L	O/L	707,442.30	O/L	**707,442**
Sea cucumber	-	-	O/L	-	-	-
Sea Urchins	O/L	O/L	-	-	-	-
Seal fat	-	O/L	-	-	-	-
Seal skins, harp, beater (no.)	-	O/L	-	-	-	-
Shark, blue	O/L	-	-	-	-	-
Shark, mako (Shortfin)	-	-	-	O/L	-	-
Skate	O/L	O/L	O/L	O/L	-	-
Squid, Illex	-	O/L	O/L	-	-	-

Preliminary Landings in 3Psc						
Species	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
Tuna, bluefin	-	-	-	O/L	O/L	-
Turbot/Greenland halibut	O/L	O/L	O/L	O/L	O/L	-
Whelks	O/L	O/L	O/L	O/L	O/L	-
Winter flounder	O/L	O/L	O/L	O/L	O/L	-
Wolffish, Striped/ Atlantic	O/L	O/L	-	-	-	-
Yellowtail flounder	O/L	O/L	O/L	O/L	-	-
Other Landings (O/L)	616,079.99	1,136,313.19	421,619.44	630,894.67	1,275,625.72	**4,080,533**

Source: Economic Analysis and Statistics DFO, 2023.

Notes:

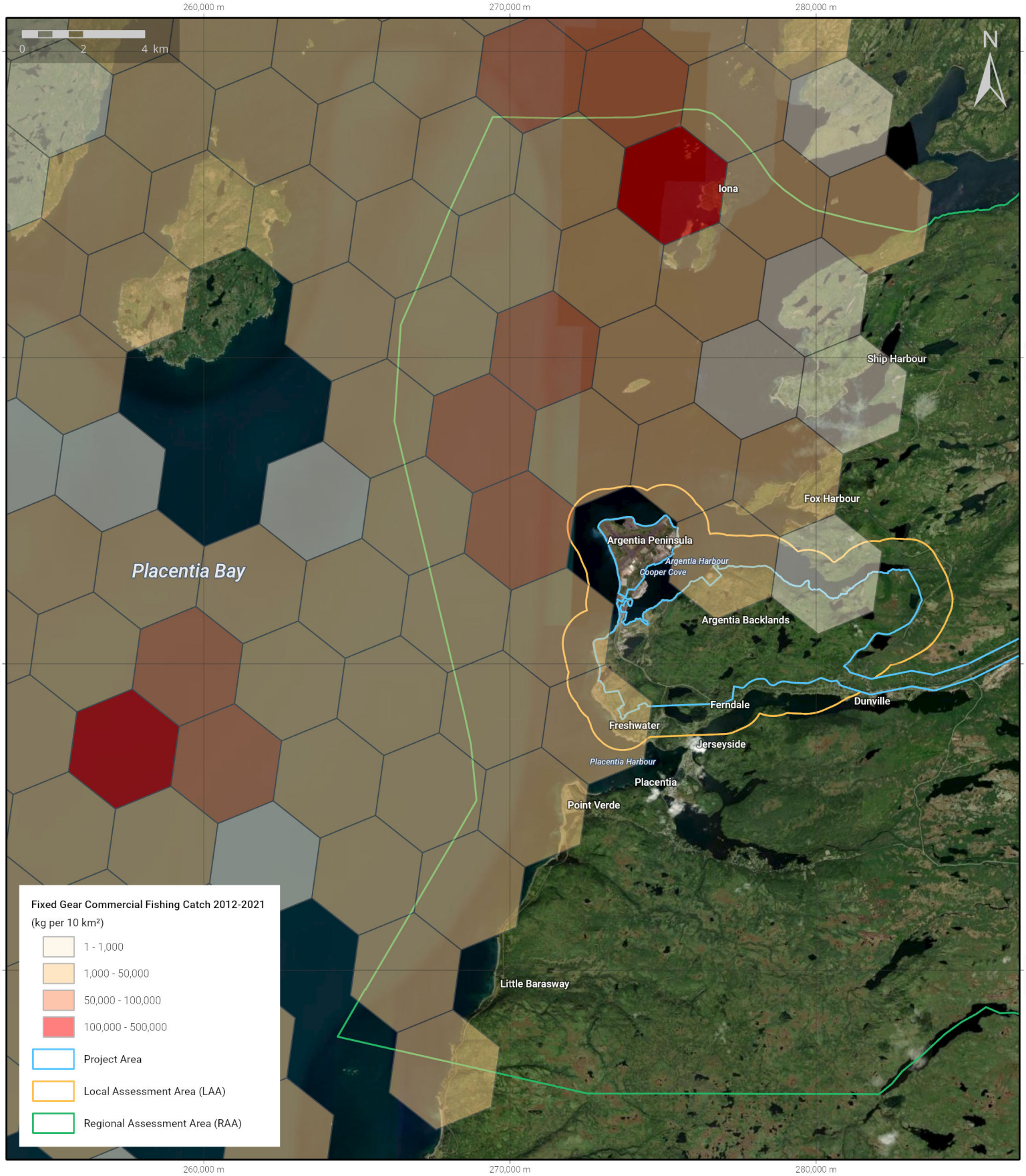
"-" = No data available

O/L = Categorized as Other Landings, did not meet confidentiality requirements specified within the Statistics Act and DFO policies.

Commercial fisheries data was also obtained through the online Canada Marine Planning Atlas (DFO, 2023e) to give a visual representation of fishing activity adjacent to the RAA. Placentia Bay fisheries employ both mobile gear (typically towed by a vessel) and fixed gear (most often set out and left by the fisher, typically anchored or weighted in place).

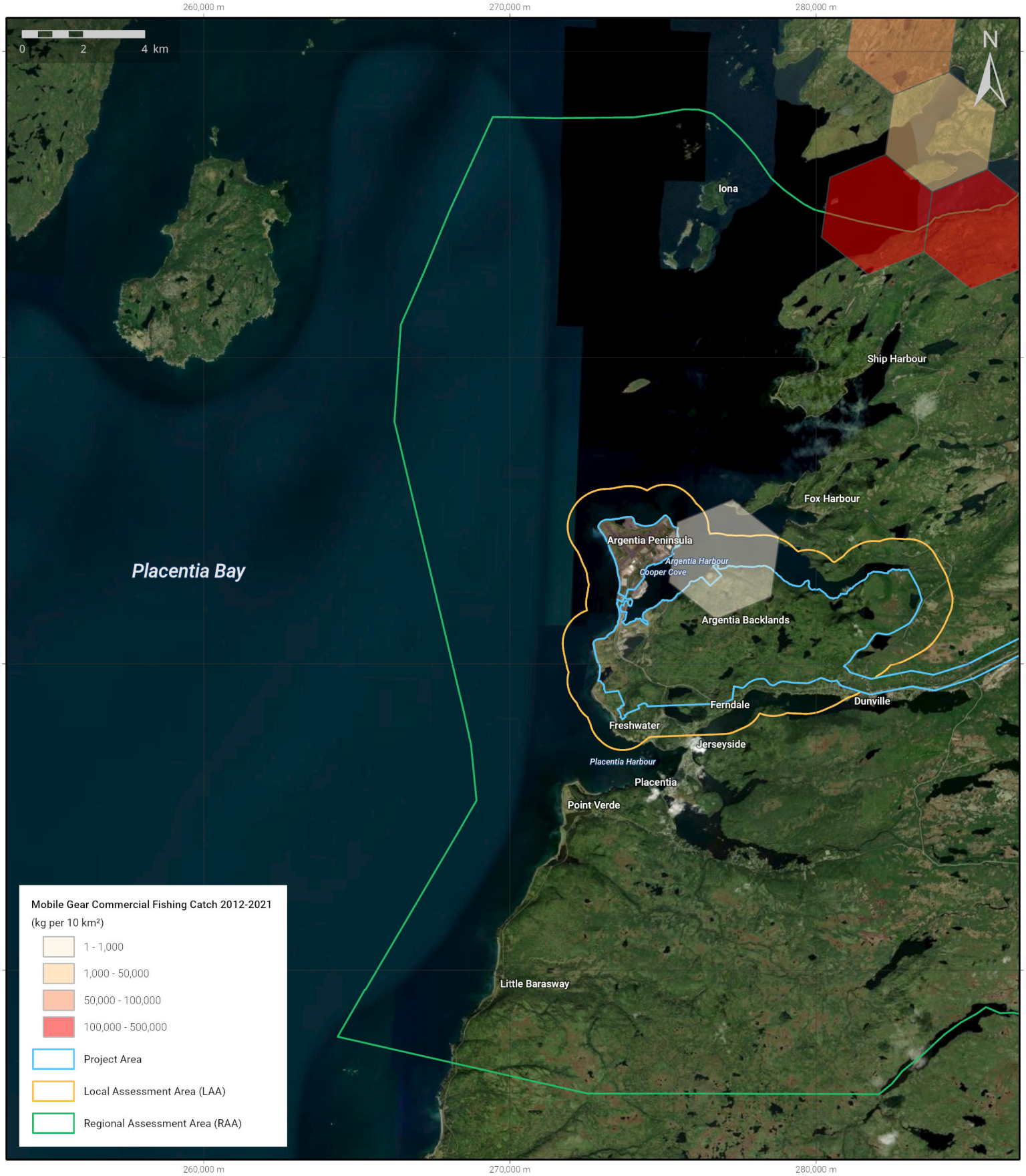
Figures 3.1.2-15 and 3.1.2-16 showed the catch density associated with using fixed and mobile gears during 2012 to 2021 adjacent to the RAA and LAA, respectively. Fixed gear (e.g. crab and lobster pots, gillnets, hand line, longline) were the most common type of fishing gear and tend to be more 'site specific' than mobile fisheries. Fixed gear may be left in place for several days while the fishing boat returns to port. Fixed gears were used widely throughout the entire bay and RAA, with the crab and lobster pots being the most common gear type deployed (DFO, 2023e). Mobile gears were scarcely used in Placentia Bay and adjacent to the RAA compared to fixed gears. A small density of mobile gear (i.e., dredge) was used near the mouth of Argentia Harbour (LAA) for the scallop fishery. The north of the RAA coincided with high activity for purse and/or tuck seine, which were used near Long Harbour and Fair Haven for the Atlantic herring fishery (DFO, 2023e). Fishing gear used in Placentia Bay is often specific to the species harvested with pots and traps used for snow crab and lobster, scallop drags for scallops, purse seines for herring, and diving for sea urchins. Cod is harvested using several gear types but in Placentia Bay, the majority of the cod catch is harvested with gillnets.

Husky Energy (2012) reported that very little fishing activity takes place in Argentia Harbour, however, lobster pots were set at various locations along the shoreline adjacent to the harbour, continuing along the shoreline towards Placentia Sound and extending into the south shore of the sound. Lobster is also harvested on the north shore of the sound, continuing to the west to Fox Harbour. Herring spawn near the shore along the east side of the Argentia Peninsula. Fishers also reported that capelin sometimes spawn on the beach in the cove between the tip of the Peninsula and The Pond, and that capelin traps have sometimes been set close to the shore in this area. DFO also stated that cod were caught at various locations relatively close to land along the north side of Placentia Sound, and on grounds to the west along this shoreline up to Fox Harbour and continuing along the north shore. These grounds were considered very good cod hand lining areas and were used by both commercial harvesters and recreational fishers.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 15	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Commercial Fishing Catch by Fixed Gears	NOTES: Sourced from the 'Eastern Canada Commercial Fishing' dataset published by the Government of Canada/Fisheries and Oceans Canada (DFO).	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-013-Rev1



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 16	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Commercial Fishing Catch by Mobile Gears	NOTES: Sourced from the 'Eastern Canada Commercial Fishing' dataset published by the Government of Canada/Fisheries and Oceans Canada (DFO).	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

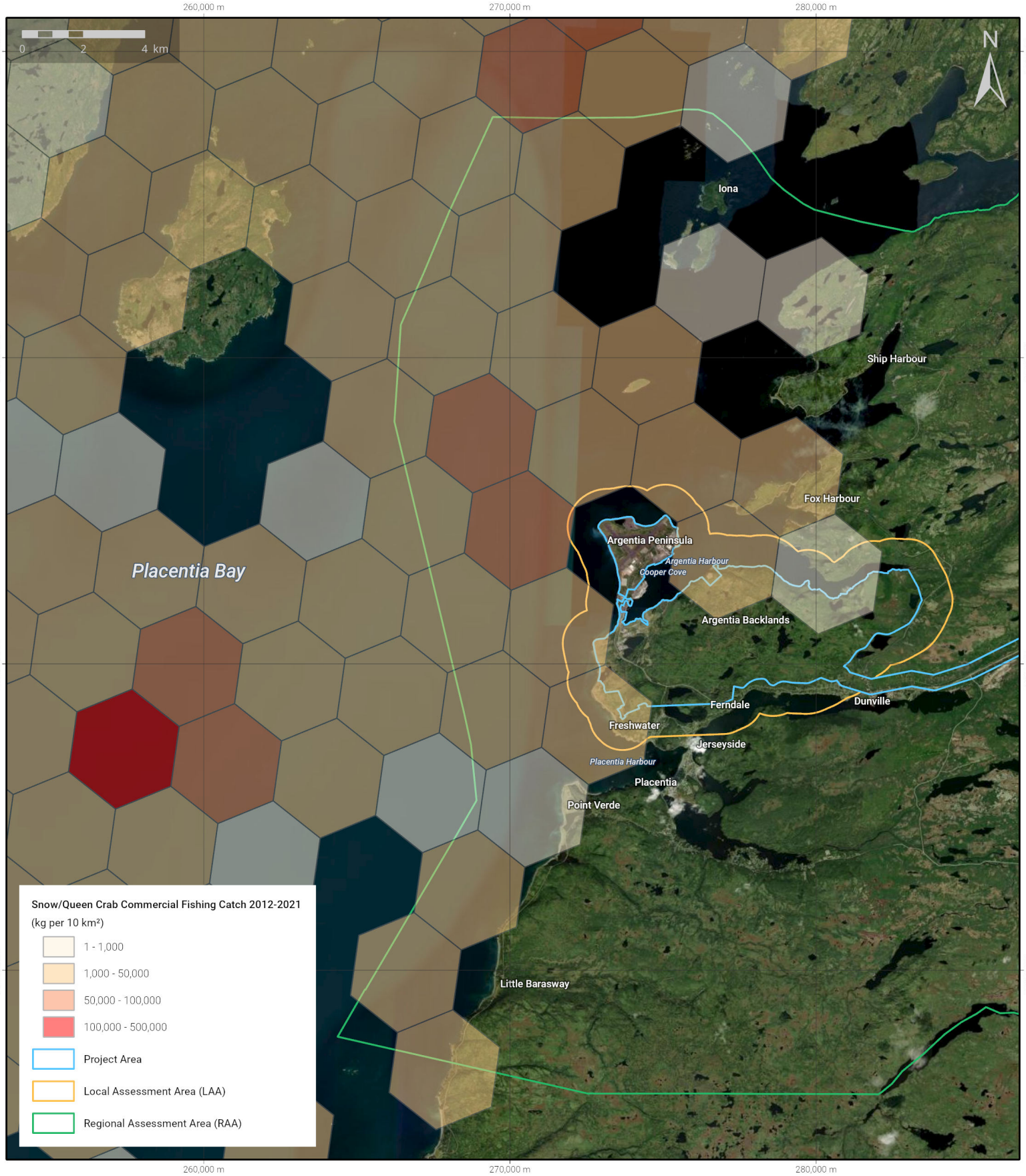
SEM MAP ID: 238-005-GIS-014-Rev1

Husky Energy (2012) examined geo-referenced catch data for 2005 to 2010 for a marine area 2.5 km in radius from Argentia Harbour and a range of species had been harvested within this area in every year since 2005 from 2010. The predominant species was mackerel, other species harvested include sea scallops, snow crab, Atlantic cod, mackerel, lumpfish and whelk. A variety of gears were used including purse seine, pots, longline, baited handline and gillnets. Local fishers noted that the catch data did not include other species, such as lobster, herring, flounder, lumpfish, which were not captured in the geo-referenced dataset. Harvesting activities took place throughout most months, with activities in July and September accounting for most of the catch. Enterprises from communities such as Placentia, Jerseyside, Argentia, Main Brook, Fox Harbour and Southern Harbour harvested various species in the general vicinity of Argentia.

Figures 3.1.2-17 and 3.1.2-18 illustrate the density of snow crab and Atlantic cod commercial fishing near the RAA and LAA, from 2012 to 2021. These figures show locations with catch density associated with the two most common fish species in terms of quantity in Placentia Bay (DFO, 2023e). Both species are expected to be found and fished within the RAA and LAA surrounding the Argentia Peninsula and outside of the mouth of the harbour (DFO, 2023e).

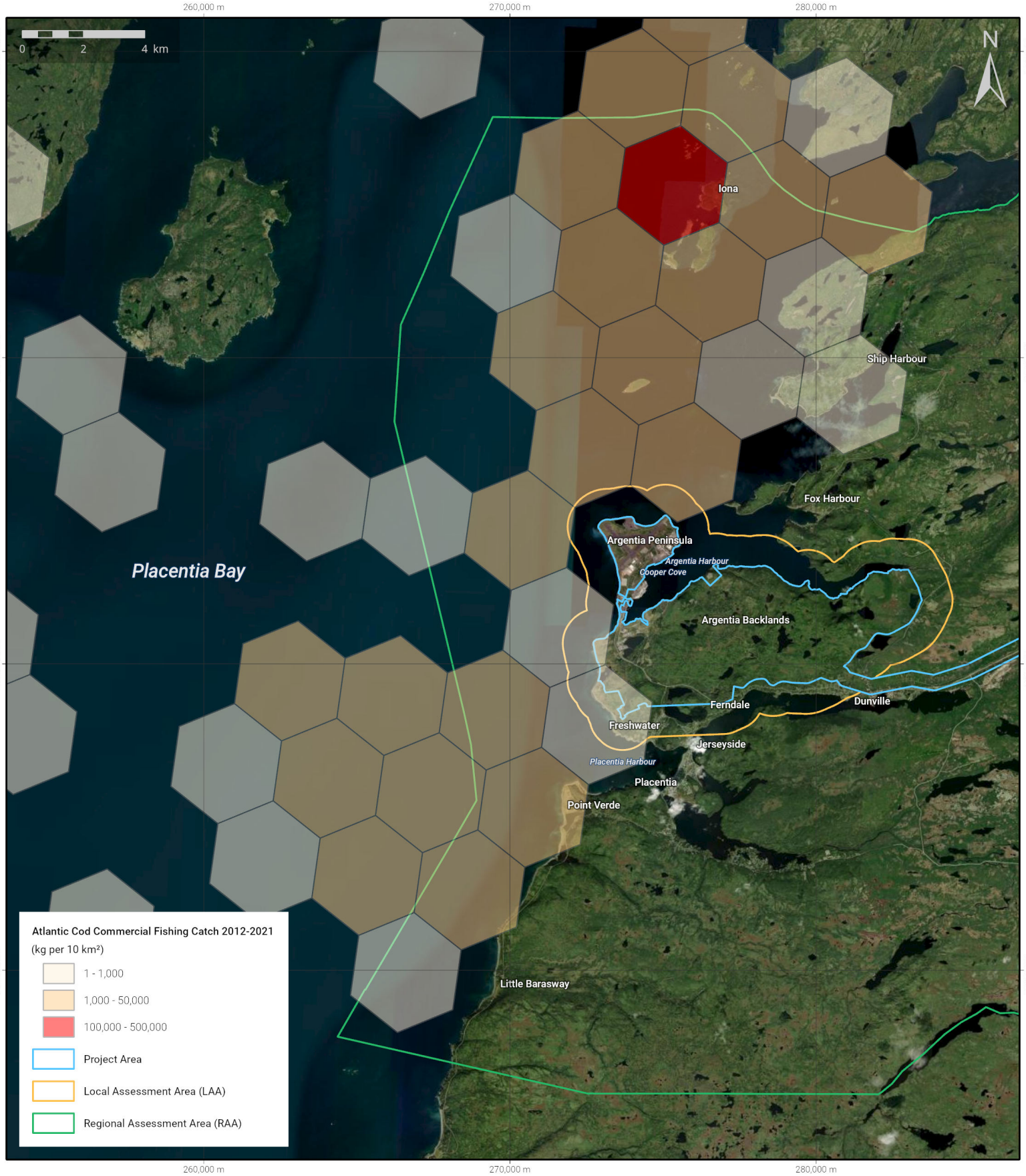
DFO has been working since 1996 to document coastal fisheries resources through direct contact with individuals and stakeholders in coastal communities, including Placentia Bay. DFO used this information to create Community-based Coastal Resource Inventories (CCRIs) and Figure 3.1.2-19 shows the location of the major fisheries in Placentia Bay from that knowledge source (O'Brien *et al.,* 2008). This information indicates that the major fisheries occurring in proximity to the RAA are for American lobster and Atlantic cod and the snow crab fishery occurs in deeper offshore areas.

Table 3.1.2-17 describes the commercial fishing seasons set by DFO for 2023 (DFO, 2022g). Fishing seasons start and end dates may vary from year to year and is subject to change. The 2023 fishing season dates for 3Ps demonstrate the temporal dynamic in commercial fishing in Placentia Bay and adjacent to the RAA. Some fisheries are regulated by quotas and once the quota is reached the fishery is closed. The fishing season for Atlantic cod and most groundfish starts mid-May through March with a relatively long harvesting season. The shellfish fishery has a relatively short harvesting season, with American lobster between May and July and snow crab between April and June.



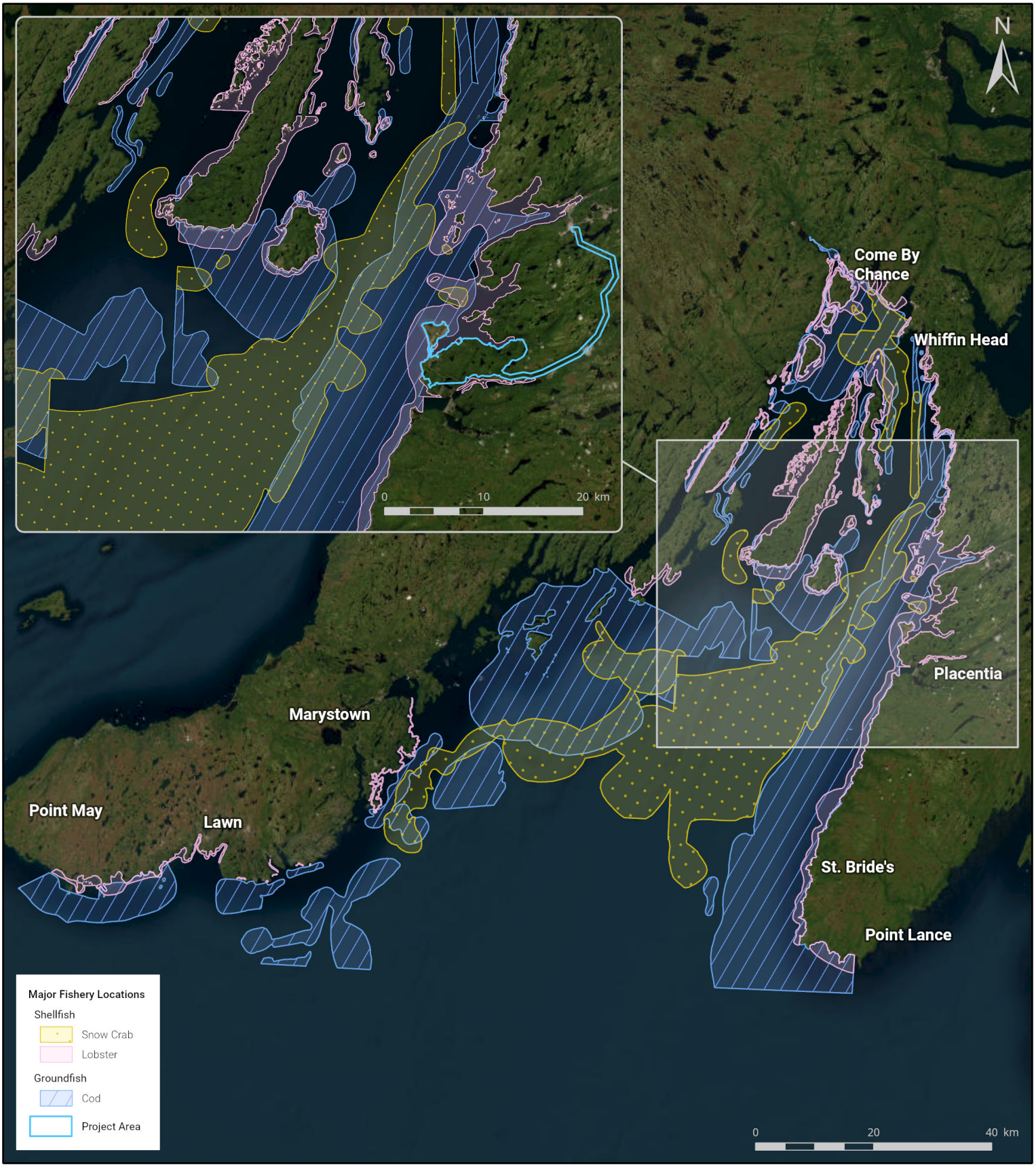
Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 17	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Density of Commercial Fishing Catch of Snow/Queen Crab	NOTES: Sourced from the 'Eastern Canada Commercial Fishing' dataset published by the Government of Canada/Fisheries and Oceans Canada (DFO).	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-015-Rev1



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 18	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Density of Commercial Fishing Catch of Atlantic Cod	NOTES: Sourced from the 'Eastern Canada Commercial Fishing' dataset published by the Government of Canada/Fisheries and Oceans Canada (DFO).	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-016-Rev1



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 19	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Location of Major Fisheries in Placentia Bay	NOTES: Fishery information sourced from the 1996-2007 Community-Based Coastal Resource Inventory (CCRI) published by Fisheries and Oceans (DFO) on the Government of Canada's Open Data Portal.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-038-Rev1

Table 3.1.2-17 Marine Commercial Fisheries Seasons in 3Ps in 2023.

Fixed Gears	
Species Common Names (Area)	**Commercial Fishing Season Date**
Atlantic halibut (3Ps - all units)	Mid-May to March 31
American place (3Ps - all units)	Fishing is not authorized in NAFO Sub-Division 3Ps (Bycatch only)
Atlantic cod (3Ps units (b) and (c))	Mid-May to February 28.
Greenland halibut (Turbot) (3Ps - all units)	Mid-May to March 31
Lobster (Lobster Fishing Area 10 - 3Ps unit (c))	May 1 to July 10
Redfish (3Ps - all units)	Fishing is authorized in NAFO Sub-Division 3Ps units (a) and (b) for fixed gears, not in unit (c) (Bycatch only)
Skate/Monkfish (3Ps units (a), (b) and (c))	April 1 to March 31, but only open during periods when Atlantic halibut retention is prohibited.
Snow/Queen crab (3Ps - all units)	Early April to June 30
White hake (3Ps unit (c))	Fishing is not authorized in NAFO Sub-Division 3Ps unit (c) (Bycatch only)
Winter flounder (Blackback) (3Ps- all units)	Mid-May to March 31
Mobile Gears	
Species Common Names	**Commercial Fishing Season Date**
Herring (Herring Fishing Area 10 - 3Ps unit (c))	Summer April 1 to June 30, Fall August 15 to March 31
Redfish (3Ps units (a), (b), (c), (e), (f), (g), and (h) portion of Redfish Unit 2)	July 1 to March 31
Scallop (Scallop Fishing Areas 10 - 3Ps unit (c))	Jan 1 to Dec 31.
Skate (3Ps - all units)	April 1 to March 31
Grey sole/witch flounder (3Ps - all units)	April 1 to March 31
Source: Fisheries Management Decisions DFO, 2022g. **Notes**: Dates of fishing season are subject to change. For some fisheries, specific dates for openings and closings will be determined in consultation with industry through the normal Conservation Harvesting Plan (CHP) process (DFO, 2022). Some specific opening dates are determined annually in consultation with the FFAW/industry, while other fisheries openings may be delayed or staggered due to the DFO research vessel science survey. The 2022-2023 season NAFO Sub-Division 3Ps for groundfish mobile and fixed gear vessels, less than 27.4 m have been used to represent various groundfish (e.g. Atlantic halibut, Atlantic cod, Greenland halibut, monkfish, redfish, skate, white hake, and winter flounder).	

Table 3.1.2-18 summarizes commercial fishery seasons in 3Psc by month for the six most important commercial species in terms of landed weight and value. Snow crab, followed by American lobster and Atlantic cod were the three most economically valued species by far, according to the landed values from 2018 to 2022 in 3Psc. Sea scallops, Atlantic herring, and Atlantic halibut represented the other three fisheries by value in Placentia Bay between 2018 and 2022 (Table 3.1.2-16). Fishing in Placentia Bay is conducted year-round, however, the peak fishing season in 3Psc starts in the spring (April or May) and ends in summer (July), with June being the month with the most ongoing commercial fishing activity.

Table 3.1.2-18 Top Commercial Fisheries by Season in 3Psc, 2023.

Species Common Names	Jan.	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Atlantic Halibut												
Atlantic Cod												
Atlantic Herring												
American Lobster												
Scallop												
Snow/Queen Crab												

Source: Fisheries Management Decisions DFO, 2022g.
Notes: Gray cells represent OPEN fishing season. Light gray cells represented the less valuable species economically while dark gray represents the three species of highest economic importance for the period 2018-2022, (Economic Analysis and Statistics DFO, 2023). Colour-crossed cells indicate that the fishing season started or ended mid-month. Crossed cells represented CLOSED fishing season.

Marine Recreational Fisheries

The following section addresses the marine and coastal recreational fisheries that could occur in the RAA or LAA. Table 3.1.2-19 provides information on the recreational fisheries in in the province in relation to required licencing and seasonal dates for specific fisheries. DFO regulates coastal water recreational fisheries (saltwater/marine/brackish) in NL. Recreational fishing licenses may be required for some species and not for others for residents. Recreational fishery regulations and management measures apply to a variety of species including mussel, clam, squid, mackerel, capelin, trout, smelt, various groundfish species, seal (personal use), scallop and shark.

Table 3.1.2-19 Marine and Coastal Recreational Fisheries in Newfoundland and Labrador.

Species Common Name	Licence Required (Y/N)	Season Date
Mussel	N	Open year-round
Clams	N	Open year-round
Squid	N	Open year-round
Mackerel	N	April 1 to December 31
Capelin	N	Open year-round
Trout (Coastal Waters)	N	Open year-round
Smelt (Coastal Waters)	N	Open year-round
Groundfish	N	The season is announced annually in spring, with an opening first date in July continuing to the beginning of October
Seal (Personal Use)	Y	TBD
Scallop	Y	January 1 to December 31
Shark	Y	April 1 to December 31

Source: DFO 2023f

Groundfish like Atlantic cod are the main recreational fishery in insular Newfoundland for cultural and historical reasons and recreational fishing occurs within the RAA. DFO permits a recreational groundfish

fishery in designated NAFO Divisions, including in the RAA (NAFO Subdivision 3Psc) (DFO, 2023h). Groundfish species that can be retained (n=5) include Atlantic cod, flounder (e.g., winter, witch, and yellow flounders), American plaice, pollock, haddock, redfish, turbot (i.e. Greenland halibut), skate, and white hake, while sculpins and cunners may be released. Retaining Atlantic halibut, wolffish sp., or shark sp. is not permitted.

Recreational fishing activity along the coast of the Project Area (i.e., Argentia Harbour and Peninsula and Argentia Backlands coast) may be lower due to private land status and remote access, and higher marine traffic from Argentia Harbour. Other areas, like the coastal southern limit of the LAA, may experience more recreational fishing, particularly during the groundfish fishery from July to October.

Marine Indigenous Fisheries

The following section discusses of the potential presence of Indigenous fishery activities near the RAA. The closest Indigenous community to the Project is the Miawpukek First Nation located at the mouth of Conne River on the south coast of insular Newfoundland. Miawpukek operates and/or functions under the umbrella of, or in collaboration with, several enterprises from the seafood sector, both fisheries and aquaculture (e.g., Netukulimk Fisheries Ltd.; Miawpukek First Nations with RS Marine Ltd. (NLDFFA, 2023).

The Miawpukek First Nation has commercial licences in 3Ps and they hold enterprises and other licenses that permit access to other Divisions (e.g., 3KL, 3LN, Areas 4-33) (Equinor, 2017). Miawpukek mainly harvest snow crab, but also has the prospect of harvesting sea cucumber, groundfish, whelk, bluefin tuna, cunners, and other species (NLDFFA, 2023). The Miawpukek First Nation has a FSC licence in a portion of 3P, from along the south coast to Bay d'Espoir, for scallop, lobster, mackerel, herring, rainbow trout, brook trout, Atlantic cod, American eel, rainbow smelt, capelin, seal (harp, grey, and harbour), snow crab, whelk, and redfish (Equinor, 2017). The south coast of Bay d'Espoir is situated within the NAFO Sub-Division 3Psa, further West of the Burin Peninsula. Miawpukek is also involved in the commercial fishery with one of the largest wild seafood companies, Clearwater Seafoods, and is a member of the Mi'kmaq Coalition, which acquired 50% of this company in 2021.

Miawpukek are important in the aquaculture business, recently aiming to assess cunner bioavailability as cleaner fish for aquaculture sea lice issues (NLDFFA, 2023). Miawpukek are also involved in monitoring traditional harvests, commercial fisheries, food fishery, Atlantic salmon, American eel, and northern wolfish, among other resources across the province (Indigenous Guardians Toolkit, n.d.). The Miawpukek are therefore an important stakeholder in Newfoundland's commercial, recreational and Indigenous fisheries, which could extend to a potential involvement in fisheries in 3Psc or freshwater resources near the RAA.

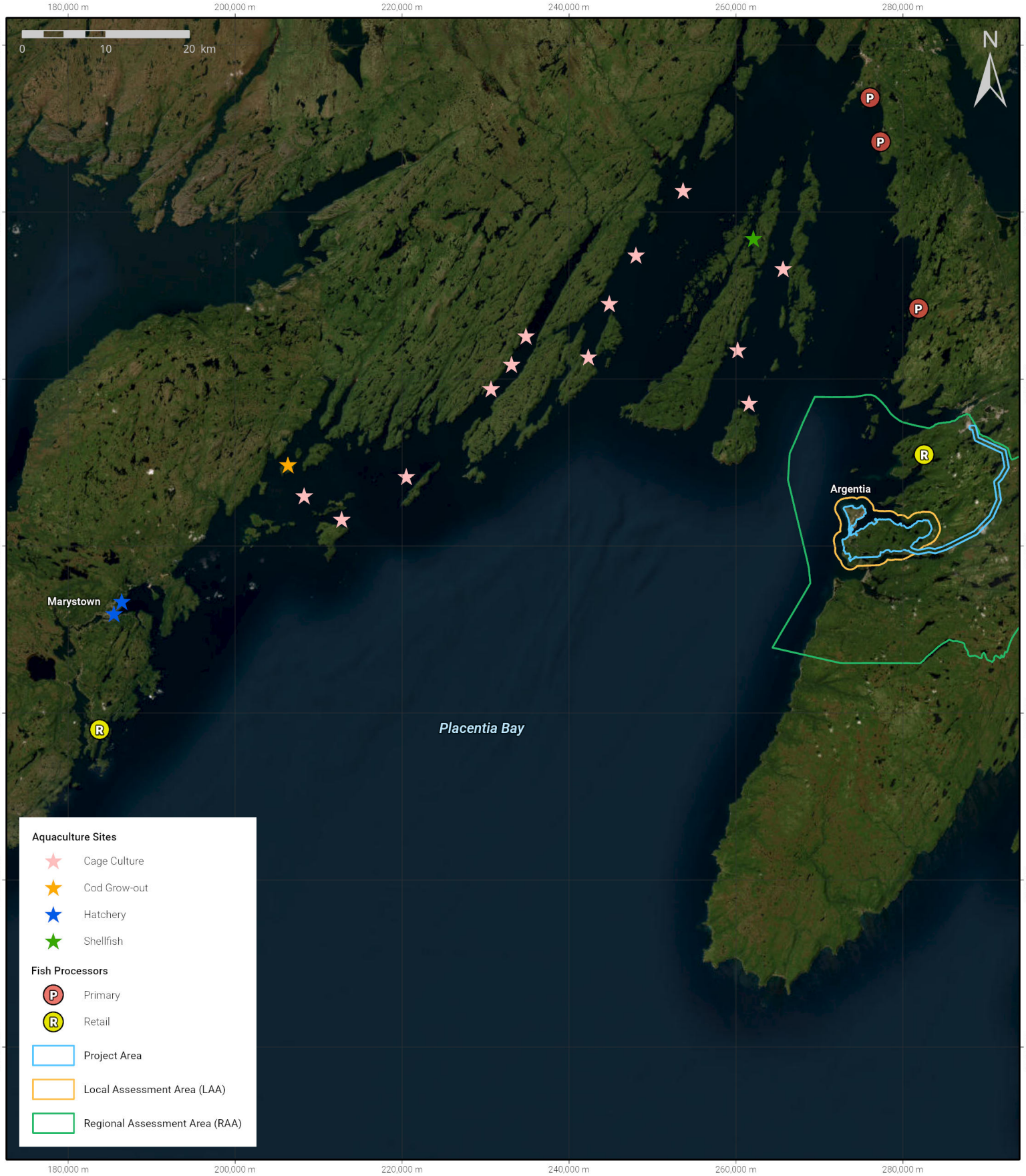
Aquaculture and Fish Processing

Possible interactions with the aquaculture industry or seafood processors within Placentia Bay and the RAA are discussed below. Aquatic farmed species that are produced in NL include finfish (e.g., Atlantic salmon, steelhead trout, Atlantic cod) and shellfish (e.g., blue mussels and American oysters) (Gov. NL. n.d.a). Atlantic salmon is the principal salmonid aquaculture species in the province. The finfish aquaculture sector operates marine-based cage sites along the province's south coast and comprises three large multinational companies, Mowi Canada East, Cooke Aquaculture and Grieg Seafood. The south coast region is the only part of the province that is suitable for salmonid culture, as the bays (e.g. Placentia Bay) and fiords are generally ice-free the entire year (Gov. NL, n.d.a)

Figure 3.1.2-20 provides the location and type of aquaculture sites as well as licensed seafood processors in Placentia Bay and adjacent to the RAA. Placentia Bay has two land-based and 16 marine-based licenced aquaculture sites. Both land-based facilities near Marystown are characterized as hatcheries (DFO, 2023e) and are owned by Marbase Cleanerfish Ltd. and Grieg NL Nurseries Ltd. Most of the marine-based sites are situated near the West coast of Placentia Bay, and the Western and Central Channels near Merasheen Island. Grieg Marine NL Ltd. Grieg Newfoundland Salmon Ltd. operates 14 of the 16 licenced marine-based cage culture sites for Atlantic salmon production. Aquaculture sites are located inshore, typically in sheltered coves or along protected shorelines. Site locations are often influenced by environmental factors, proximity to other human activities, community sewage outfalls and access to services (roads and electricity). None of the marine cage sites in Placentia Bay are located in the RAA.

There are several seafood-licensed processors found on the Placentia Bay coast including Dandy Dan's Fish Market Limited (Ship Harbour) (Figure 3.1.2-20), Avalon Ocean Products Incorporated (Fair Haven), Quin-Sea Fisheries Limited (Southern Harbour), and Icewater Seafoods Inc. (Arnold’s Cove). Dandy Dan's Fish Market Limited (retail) is the only operator within the RAA (DFO, 2023e).

Argentia Harbour is important for infrastructure to support the aquaculture industry. Grieg Seafood NL has selected Argentia for a feed distribution center to supply its marine-based cage sites in Placentia Bay. Harvested salmon from Grieg Seafood NL Ltd. are landed at Argentia and trucked to a processing facility in Bay de Verde. Argentia is expanding its support for this industry with a new aquaculture-dedicated wharf development (Aquaculture Wharf) and proposed supply warehouses, in the harbour's southern area (NL DECC, 2022). Future aquaculture support services near Argentia could include cleaning, maintaining and repairing the net and sea cages as well as a research and development site.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 20	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: J. Crocker	DATE: 24/07/28
	FIGURE TITLE: Aquaculture Sites and Fish Processors in Placentia Bay	NOTES: Fishing data sourced from Statistical Services, Fisheries and Oceans Canada (DFO)	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-017-Rev1

3.1.2.16 Marine Sensitive Time Periods and Working Windows

This section summarizes the sensitive times of the year (e.g. migration, feeding and spawning) for marine species that are likely to be occasionally or commonly present in the marine environment adjacent to the LAA and RAA.

Table 3.1.2-20 provides the sensitive time periods for four species of special concern or high economic value with the potential to occur within the LAA. The four species include Atlantic cod and American plaice (NL populations), which are species of special concern, and American lobster and snow crab, which are species of high economic value in Placentia Bay.

Sensitive time for Atlantic cod is associated with an increased inshore movement or migration in spring before spawning, for inshore spawners. A subsequent migration occurs to deeper waters in response to the coming winter. Atlantic cod spawning activities typically occur in Placentia Bay between March and August and are likely to peak from late March to mid-May. Sensitive times for American plaice are associated with an increased migration in winter before spawning which occurs typically between March and May.

Snow crab and lobster are typically fished from April to June and from May to July, respectively, and spawning typically occurs from February to May and July to September, respectively. Up-slope spawning migration for snow crab and spawning events for both snow crab and lobster are associated with their moulting phases, making them vulnerable to perturbation.

Limited environmental alteration will be expected in the LAA and RAA marine environment in relation to the Project footprint, therefor there are no obvious limited working windows for the Project in relation to the four species of concern or high economic value.

Table 3.1.2-20 Sensitive Time Periods Associated with Potential Marine Organisms in the LAA.

Species	Life History Sensitive Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Peak Activity
Marine Environment														10
Snow Crab	Molting, Spawning	6	10	10	10	7	4	4	1	0	0	0	1	9
	Hatching	0	0	2	5	10	2	1	0	0	0	0	0	8
American Lobster	Molting, Spawning	0	0	0	0	1	1	8	10	8	2	0	0	7
	Hatching	0	0	0	2	3	9	10	10	8	1	0	0	6
American plaice (NL Pop.)	Migrating	3	3	2	0	0	0	0	0	0	0	1	3	5
	Spawning	0	1	8	10	10	1	0	0	0	0	0	0	4
	Hatching	0	0	4	8	8	8	1	0	0	0	0	0	3
Atlantic cod (NL Pop.)	Migrating	1	2	4	5	5	5	4	1	0	0	1	3	2
	Spawning	0	1	4	10	10	7	4	2	0	0	0	0	1
	Incubation, Hatching	0	1	1	4	10	10	7	6	2	2	0	0	0

3.1.2.17 Marine Conservation Concern

Marine Species at Risk and/or of Conservation Concern

The following section presents an overview of the aquatic species of special interest which could potentially occur in the RAA and LAA. Aquatic invasive species (AIS), species with conservation status (e. g. species listed by SARA or the NL ESA), and with potential conservation concern in relation to the Project's marine component are discussed below.

Aquatic Invasive Species

Aquatic invasive species include fish, invertebrates or plant species which were introduced into a new aquatic environment outside their natural range (DFO, 2019a). This also includes species native to other parts of Canada that have been introduced into areas beyond their historical range.

AIS populations can rapidly proliferate once introduced into a favourable habitat and can negatively affect native species. They can also alter habitats to make them less hospitable for native species. Unintended introductions of AIS have been linked to marine transport through ballast water and attachment to ship hulls. The spread of AIS has been rising globally due to increased trade volumes and reduced shipping times (DFO, 2019a; Sardain *et al.,* 2019). Reporting the presence and monitoring the spread of AIS, as well as compliance with precautionary tools, are necessary for prevention and mitigation (McKenzie, *et al.,* 2016).

Table 3.1.2-21 provides a list of the seven AIS that have been reported in Placentia Bay from DFO (C. McKenzie personal communication, September 18, 2023), of which, five were found within the RAA. Occurrence in the RAA is based on reported presence/absence from AIS maps obtained from DFO. Figure 3.1.2-21 demonstrates the extensive distribution of the European green crab in Placentia Bay and throughout other parts of insular Newfoundland. Of any of the AIS, European green crab is the species with the most likelihood to be noticeable within the RAA due to the nature of the species and proximity of areas of detection recorded.

Table 3.1.2-21 Aquatic Invasive Species Identified in Placentia Bay.

Common Name	*Species Name*	Distribution in the RAA	Species Characteristics and Threats to Native Species
European Green Crab	*Carcinus maenas*	Argentia, Fox Harbour, Long Harbour, Placentia NE and SE, Spencer's Cove	The European green crab is an aggressive and territorial crab species that feeds primarily on shellfish and other crustaceans and has also been observed feeding on small and juvenile finfish in eelgrass beds. The green crab may damage eelgrass by burrowing in sediment, cutting the roots of eelgrass. This species has the potential to substantially alter biodiversity and deteriorate habitats in various ecosystems in Newfoundland (DFO, 2010).
Japanese Skeleton Shrimp	*Caprella mutica*	Fox Harbour	The Japanese skeleton shrimp is a small amphipod crustacean that infests artificial structures such as buoys and mussel aquaculture socks. This species' abundance may reach 100,000 individuals per m^2, competing with mussels for food and space (DFO, 2023g).
Coffin Box	*Membranipora membranacea*	Argentia, Placentia	Coffin box is a small Bryozoan invertebrate that can cover substance surfaces as it lives with others in colonies. It can that can harm kelp beds, which are highly productive marine habitats, contributing as a food source and hiding place for many species of fish and invertebrates. Coffin box can starve kelp by blocking the access to nutrients and light availability and permanently alter kelp beds and affect biodiversity (DFO, 2011a).
Oyster Thief	*Codium fragile ssp. fragile*	Not in the RAA	Oyster thief is a green alga and can replace native seaweeds (kelp and eelgrass). This can disturb natural ecological cycles between underwater kelp forests and barrens, typically controlled by sea urchin populations (DFO, 2013).
Golden Star Tunicate	*Botryllus schlosseri*	Argentia, Fox Harbour, Long Harbour, Placentia NE and SE, Spencer's Cove	Golden star tunicate a filter feeder, and overgrowth may cover surrounding plants and animals, depriving them of sunlight or food. They also compete for food with nearby filter feeders, such as mussels and scallops. The spread of golden tunicate can disrupt shellfish harvesters, aquaculture farmers, and aquatic organisms living on the ocean floor (DFO, 2022h).
Vase Tunicate	*Ciona intestinalis*	Argentia	Vase tunicate is a filter-feeding organism that competes with bivalves for nutrients, bacteria and other small organic matter. Their overgrowth may cover surrounding plants and animals, depriving them of sunlight, food or space. The vase tunicate is prevalent in submerged aquaculture structures (i.e. mussel socks). This organism may cause water quality issues and decrease the size and condition of commercially raised mussels (DFO, 2013a).
Violet Tunicate	*Botrylloides violaceus*	Not in the RAA	The violet tunicate is a filter feeder, absorbing nutrients from phytoplankton (algae), bacteria and other small organic matter. Overgrowth may cover surrounding plants and animals, depriving them of sunlight or food, and compete for food with nearby mussels and scallops. The violet tunicate can release a chemical, making it hard for aquatic organisms to attach properly to substrates, and become vulnerable to water currents. Tunicates can disrupt shellfish harvesters, aquaculture farmers, and aquatic organisms living on the ocean floor (DFO, 2011b).

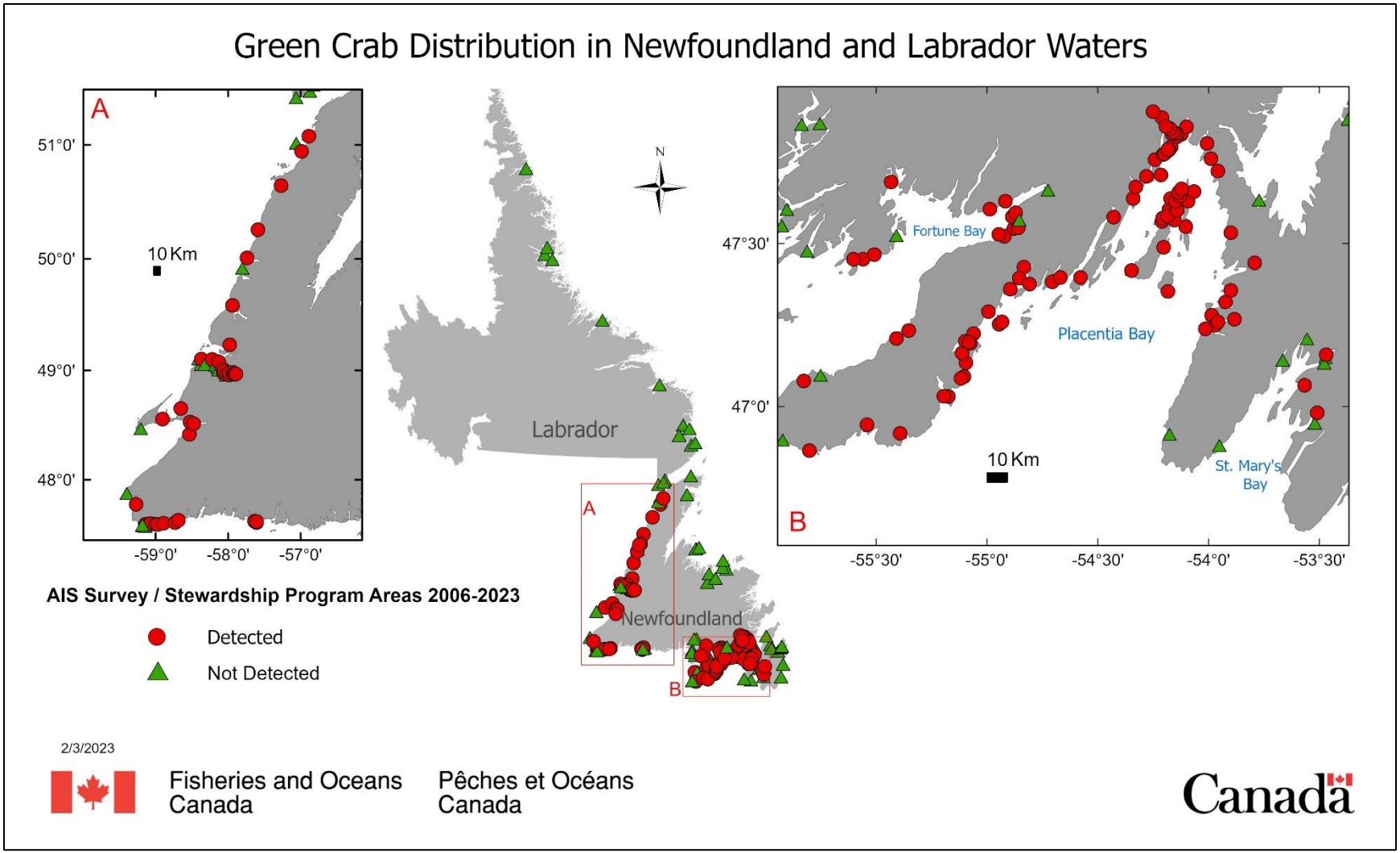


Figure 3.1.2-21 European Green Crab (*Carcinus maenas*) Distribution in Placentia Bay.

Listed Species and/or of Conservation Concern

Species listed under the *Species at Risk Act* (SARA) Schedule 1 are legally protected and are ranked as extirpated, endangered, threatened and of special concern. The *Newfoundland and Labrador Endangered Species Act* (NL ESA) designates species as extirpated, threatened, endangered, vulnerable, data deficient, or not at risk. Information used to identify and characterize the species of interest in the RAA and LAA included listing under SARA and the NL ESA and information provided by the Atlantic Canada Conservation Data Centre (AC CDC) based on a request made in 2023. Supporting documentation included COSEWIC reports and publicly available literature. Aquatic invasive species are also of special concern and have been discussed previously.

Tables 3.1.2-22 provides the aquatic species of special interest with their potential to occur in the LAA. Overall, 38 aquatic species of concern other than AIS have been reported in Placentia Bay or the Avalon Peninsula. There are 21 marine fish, ten marine mammals (five baleen whales and five toothed whales and two marine reptiles that have been identified). Only four of 33 species are expected to be found occasionally or commonly in the RAA and LAA, based on habitat utilization and reported presence of which two are marine finfish and two are diadromous fish.

Table 3.1.2-22 Summary of Marine Species of Special Concern.

Common Name	Species Name	IUCN Red List[1]	COSEWIC Status	SARA Status	Occurrence in LAA
Finfish					
Marine Fish					
Acadian Redfish (Atlantic Pop.)	*Sebastes fasciatus*	Endangered	Threatened	Not Listed	Rare
American Plaice (NL Pop.)	*Hippoglossoides platessoides*	Endangered	Threatened	Not Listed	Occasional
Atlantic (Striped) Wolffish	*Anarhichas lupus*	N/A	Special Concern	Special Concern	Rare
Atlantic Cod (Laurentian North Pop.)	*Gadus morhua*	Vulnerable	Endangered	Not Listed	Common
Atlantic Cod (NL Pop.)			Endangered	Not Listed	Occasional
Atlantic Spiny Dogfish	*Squalus acanthias*	Vulnerable	Special Concern	Not Listed *	Rare
Basking Shark (Atlantic Pop.)	*Cetorhinus maximus*	Endangered	Special Concern	Not Listed *	Rare
Bluefin Tuna (Atlantic Pop.)	*Thunnus thynnus*	Least Concern	Endangered	Not Listed	Rare
Cusk	*Brosme brosme*	Least Concern	Endangered	Not Listed*	Rare
Deepwater Redfish (Gulf of St. Lawrence - Laurentian Channel Pop.)	*Sebastes mentella*	Least Concern	Endangered	Not Listed	Rare
Grenadier (Roundnose)	*Coryphaenoides rupestris*	Critically Endangered	Endangered	Not Listed*	Rare
Lumpfish	*Cyclopterus lumpus*	N/A	Threatened	Not Listed	Rare
Northern Wolffish	*Anarhichas denticulatus*	Endangered	Threatened	Threatened	Rare
Porbeagle Shark	*Lamna nasus*	Vulnerable	Endangered	Not Listed *	Rare
Shortfin Mako shark (Atlantic Pop.)	*Isurus oxyrinchus*	Endangered	Endangered	Not Listed *	Rare
Smooth Skate, (Laurentian-Scotian Pop.)	*Malacoraja senta*	Vulnerable	Special Concern	Not Listed*	Rare
Spotted Wolffish	*Anarhichas minor*	Near Threatened	Threatened	Threatened	Rare

Common Name	Species Name	IUCN Red List[1]	COSEWIC Status	SARA Status	Occurrence in LAA
Marine Mammals					
Baleen Whales					
Blue Whale (Atlantic Pop.)	*Balaenoptera musculus*	Endangered	Endangered	Endangered	Rare
Fin Whale (Atlantic Pop.)	*Balaenoptera physalus*	Vulnerable	Special Concern	Special Concern	Rare
Humpback whale (Western North Atlantic Pop.)	*Megaptera novaeangliae*	Least Concern	Not Listed	Not Listed (Sch1), Special Concern (Sch 3)	Rare
North Atlantic Right Whale	*Eubalaena glacialis*	Endangered	Endangered	Endangered	Rare
Sei Whale (Atlantic Pop.)	*Balaenoptera borealis*	Endangered	Endangered	Not Listed *	Rare
Toothed Whales					
Harbour Porpoise (Northwest Atlantic Pop.)	*Phocoena phocoena*	Least Concern	Special Concern	Not Listed (Sch1), Threatened (Sch 2), Under revision Dec, 2023	Rare
Killer Whale (Northwest Atlantic Pop.)	*Orcinus orca*	N/A	Special Concern	Not Listed *	Rare
Northern Bottlenose Whale (Davis Strait-Baffin Bay-Labrador Sea Pop.)	*Hyperoodon ampullatus*	Near Threatened	Special Concern	Not Listed *	Rare
Northern Bottlenose Whale (Scotian Shelf Pop.)			Endangered	Endangered	Rare
Sowerby's Beaked Whale	*Mesoplodon bidens*	Least Concern	Special Concern	Special Concern	Rare
Marine Reptiles					
Leatherback Sea Turtle (Atlantic Pop.)	*Dermochelys coriacea*	Vulnerable	Endangered	Endangered	Rare
Loggerhead Sea Turtle	*Caretta caretta*	Vulnerable	Endangered	Endangered	Rare

Sources: IUCN websites (2024), COSEWIC website (2023); DFO (2019); NL ESA (2002); SARA websites (2024); LGL (2019).

Notes: 'NL' = Newfoundland and Labrador. 'Pop.' = population(s), 'Not Listed*' = Represent species not on the Species at Risk Acts (SARA) list, although under consideration for addition in Schedule 1 of SARA;

1' = IUCN Red List referred to the global specie if not specified

Marine Species of Concern

Atlantic cod (Laurentian North Pop.) and American plaice (NL population) have a high probability of occurrence in the marine areas of the RAA and LAA (Table 3.1.2-22).

Coastal habitats of Placentia Bay, including the RAA and LAA, provide potential spawning, feeding, nursery, rearing areas and migratory routes for Atlantic cod (Laurentian North Pop.) at different stages of their life circle. Juvenile Atlantic cod, for example, were observed within the near the coastline with less than 15 m depth near east side of Placentia Bay (LGL, 2007).

Coastal habitats of Placentia Bay, including the LAA, provide potential spawning, feeding, nursery, rearing areas and migratory routes for American plaice (NL population) at different stage of their life cycle. Additional information on these two species has been previously provided in the Marine Fish and Fish Habitat and the Marine Fishery portions of this report. Sensitive time periods for these species are discussed in the Sensitive Time Periods and Working Windows previous portion of this report.

LGL (2018) have identified other SARA listed species that have potential to occur in Placentia Bay including white shark, northern wolffish, spotted wolffish, Atlantic wolffish and banded killifish. White sharks are relatively rare in Canadian waters and individuals in Atlantic Canada are likely seasonal migrants, however, one acoustically tagged shark was recorded in Placentia Bay south of Merasheen and Red Islands. No wolffish have been caught as by-catch in commercial fisheries or in DFO research vessel surveys in recent years, however, Atlantic wolffish were captured in DFO research vessel surveys in the period from 2010 to 2015. Newfoundland populations of banded killifish are designated as special concern in SARA and as vulnerable under the NL ESA. The species is euryhaline and populations exist on the western part of Placentia Bay near Marystown. The potential for any of these species to occur in the RAA or LAA would be extremely low.

Marine Habitats of Conservation Concern

The whole of Placentia Bay is designated as an Ecologically and Biologically Significant Area (EBSA), which is one of 14 EBSAs within the Placentia Bay-Grand Banks Large Ocean Management Area PBGB LOMA (DFO, 2019c), and this would include the marine component of the RAA and LAA. DFO has identified EBSAs that may contain depleted or rare species, ecologically significant species and community properties, and degraded areas, which require special management measures (DFO, 2007a). Some EBSAs may be put forward as areas of interest for designation as a Marine Protected Area (MPA) while other areas or species may be considered for protection under other management schemes such as SARA.

The Placentia Bay EBSA boundary extends across the mouth of the bay from St. Lawrence on the west side to the St. Mary's Bay on the east side. It primarily was identified as an EBSA based on coastal data, but the seaward boundary was extended south to capture important areas and habitats for corals and

sponges as well as leatherback turtle. This EBSA has important salmon rivers, capelin spawning beaches, eelgrass habitats and seabird colonies in the nearshore, and many other key features just outside the bay.

Piper's Hole River and Cape Rodger River, which drain into Placentia Bay, have a genetically distinct population of salmon (Bradbury *et al*., 2015). Capelin spawning beaches are heavily concentrated on the east side of the bay, with a few also found on the west side and southern tip of the Burin Peninsula.

Eelgrass habitat is found in many coves and harbours throughout the bay. However, the invasive green crab is having an impact on eelgrass habitat (*Matheson et al.,* 2016). Leatherback turtles are known to frequent the entire bay, with 18% of all sightings from the 2016 Northwest Atlantic International Sightings Survey (NAISS) found within the boundaries of the Placentia Bay EBSA (DFO, unpublished data). This EBSA also captures part of a larger area denoted as important for blue whales (DFO, 2019d). Important areas for large gorgonian coral, soft coral and sponge are found near the seaward boundary of the Placentia Bay EBSA.

The presence of two Significant Benthic Areas (SiBAs) in the south of the bay have been identified (DFO, 2017a), however, these are not close to the RAA. A SiBA is defined as an ecologically and biologically significant habitat type, feature, community, or species considered intrinsically sensitive to fishing impacts and slow to recover (e.g. coral and sponge dominated habitats). There are also no MPAs or critical habitats, as defined under SARA and the NL ESA, identified near the RAA or LAA (DFO, 2023e).

Sensitive areas near the RAA and LAA included: Placentia Bay Extension EBSA; capelin spawning beaches; eelgrass beds; salt marshes; wetlands, and scallop beds. The Canadian Parks and Wilderness Society (CPAWS) have also identified 'Special Marine Areas' in Newfoundland and Labrador (CPAWS, 2018), including Placentia Bay Extension and Bar Haven.

Capelin occurring in southwestern Newfoundland overwinter in offshore waters and migrate inshore to Placentia Bay in early spring to spawn on preferred beaches in spring and summer and then return to the offshore once again in autumn. Capelin typically arrive at the head of Placentia Bay in June and July. Capelin spawning beaches were identified, based on local ecological knowledge, near St. Lawrence, Lamaline, Cape St. Mary's and Placentia. more than 80 capelin beaches have been identified in Placentia Bay of which 31 spawning beaches were identified, eight of which were thought to be annual spawning sites (Sjare *et al.,* 2003). Beach suitability appears to be determined by substrate and capelin spawning beaches occur in sheltered, semi- exposed and exposed areas. Eggs are usually deposited in the intertidal zone, although offshore spawning has also been documented, and larvae are generally carried out of the inshore region by surface currents.

Eelgrass has been found to be among the most productive ecosystems globally and provides a number of important functions and services, including: supporting high diversity; providing refuge and nursery

areas for invertebrates and fishes; providing food sources for migrating and over-wintering waterfowl; stabilizing sediments, filtering the water column; shoreline protection; and recycling and storing nutrients and exchanging gases. Eelgrass is considered an Ecologically Significant Species (DFO, 2009) and is protected under the **Fisheries Act**. Extensive eelgrass beds have been identified in Placentia Bay (Catto *et al.,* 1999), particularly in shallow and sheltered coastal areas. Matheson *et al.* (2016) studied the effects of European green crab invasion on eelgrass including eelgrass beds in Ship Harbour, Fox Harbour, Placentia Sound, and Placentia (NE and SE), Placentia Sound, all within the RAA. Eelgrass habitat was also observed near the Argentia peninsula in low densities while other algae (kelp, sea colander and sour weed) were more abundant (Husky Energy, 2012).

Salt marshes are recognized as sensitive habitats that support birds, insects and terrestrial mammals in tidal areas. Salt marsh plants stabilize sediments and provide coastal protection from erosion and wave action. The main concentrations of salt marshes in Placentia Bay are near Swift Current outside of the RAA and LAA.

3.1.3 Terrestrial Environment

The Project Area is in the Avalon Geological Zone, and is primarily comprised of subaerial volcanic rocks, including unseparated fluviatile and shallow marine siliciclastic sedimentary (Colman-Sadd *et al*., 2000). A review of the “Surficial Geology of the St. John’s and Trepassey Map Areas (NTS 1N and 1K)”, Map 94-230 (Liverman & Taylor, 1994), indicates that surficial soils of the Argentia Peninsula and adjacent mainland consist of marine clay, sand, gravel and diamicton, and the inland portions of the Project Area surficial soils range from till blanket, hummocky terrain to a till veneer, mainly consisting of a blanket of diamicton or sand and gravel, overlying bedrock, with some patches of exposed bedrock further inland.

3.1.3.1 Vegetation

The Project Area is located within the Southeastern Barrens Subregion of the Maritime Barrens Ecoregion (Protected Areas Association of Newfoundland and Labrador, 2008). It is characterized by stands of black spruce (*Picea mariana*), balsam fir (*Abies balsamea*), tamarack (*Larix laricina*), and sporadic patches of yellow birch (*Betula alleghaniensis*). Non-forested habitats present in the Project Area consist mainly of barrens, heaths, rock outcrops, bogs, fens and anthropogenically altered areas.

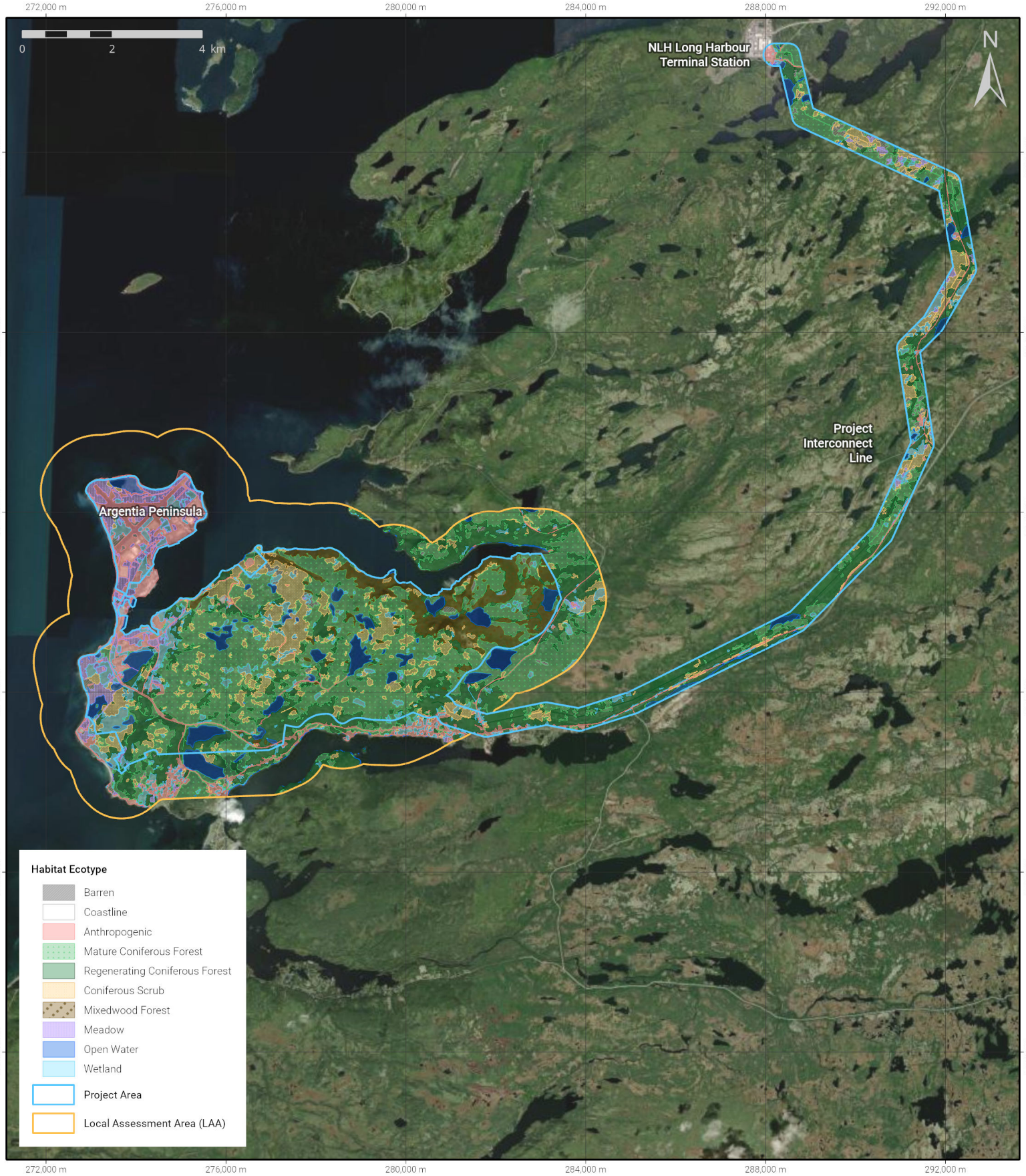
3.1.3.2 Ecological Land Classification (ELC)

A two-method approach was employed for the identification of the ecotypes that exist throughout the Project Area; first, a comprehensive data/information compilation exercise was conducted to compile existing information on the Project Area. Secondly, detailed ELC mapping was completed for the Project Area using high-resolution digital images imported into ArcGIS for interpretation, supported by a comprehensive field verification program. Habitat polygons were interpreted and digitized at a scale of 1:5,000 using imagery and information gathered from ground-truthing efforts in the field. Information was

captured consistently based on a static zoom level with the interpreter defining homogeneous regions for each targeted ecotype. Digitization of polygons was supplemented by a point file within ArcGIS that was populated with attribute information related to each vegetation polygon. This centroid point data was entered based on the interpreter's field experience and familiarity with regional ecotypes and from information collected from the field. Information gathered in the field was also used to refine ecotype boundaries and aggregate ecotypes based on similar characteristics.

The ELC was used to plan the surveys of the other VCs included in this Registration. Specialized ecotypes like wetlands and rock outcrops tend to have elevated potential for the occurrence of rare wildlife and plant species. Such ecotypes were targeted during the rare plant surveys. For example, coniferous forests adjacent to wetlands were targeted for boreal felt lichen, open areas were surveyed for Short-eared Owl, and mature coniferous stands were surveyed for Red Crossbill *percna*.

The ecotype mapping for the Project Area resulted in 2,555 individual polygons representing several ecotypes including Barren, Coastline, Anthropogenic, Mature Coniferous Forest, Meadow, Mixedwood Forest, Regenerating Coniferous Forest, Coniferous Scrub, Open Water, and Wetland (Figure 3.1.3-1). Each is described below.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Ecological Land Classification for the Project Area	NOTES:	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	
			sem	

SEM MAP ID: 238-005-GIS-021-Rev0

Barren

Barrens are characterized by unvegetated, exposed bedrock (Figure 3.1.3-2). Soils are typically well-drained, and ground cover often primarily consists of crustose and fruticose lichens, feathermosses, and low-lying woody plants like lowbush blueberry (*Vaccinium angustifolium*) and black crowberry (*Empetrum nigrum*).



Figure 3.1.3-2 Upland Barren Ecotype in the Project Area.

Coastline

The Coastline ecotype within the Project Area is located primarily on the western side of the Argentia Peninsula and south of the Peninsula along the coast (Figure 3.1.3-3). It is comprised of anthropogenically altered beaches with varying sizes of stony substrates. The coastline is devoid of any significant vegetation but could provide nesting habitat for shorebirds and/or seabirds.



Figure 3.1.3-3 Coastline Ecotype in the Project Area.

Anthropogenic

The Anthropogenic ecotype encompassed all habitats that were significantly altered by human activity, including impervious surfaces, building infrastructure, and the like (Figure 3.1.3-4). This would include the old airstrip on the Peninsula, all the roads and secondary roads throughout the Project Area, concrete bunkers and military structures, and the old railway bed.



Figure 3.1.3-4 Anthropogenic Ecotype in Project Area

Mature Coniferous Forest

Mature Coniferous Forest habitat comprises a substantial proportion of the available habitat in the Project Area, particularly in the Argentia Backlands (Figure 3.1.3-5). This ecotype is an amalgamation of several forest types, including Mature Balsam Fir, Mature Black Spruce, and Mature Fir-Spruce, which were not distinguished from each other as this ELC did not dictate that level of resolution (and field verification). Black spruce (*Picea mariana*) and balsam fir (*Abies balsamea*) typically dominate the tree stratum. The shrub layer often consists of understory balsam fir and low shrub species such as Labrador tea (*Ledum groenlandicum*) and lowbush blueberry (*Vaccinium angustifolium*). Herbaceous vegetation often consists of bunchberry (*Cornus canadensis*), twinflower (*Linnea borealis*), Clinton lily (*Clintonia borealis*), and creeping snowberry (*Gaultheria hispidula*). Ground cover visually consists of a continuous layer of feathermoss species, namely Schreber's moss (*Pleurozium schreberi*), stairstep moss (*Hylocomium splendens*) and plume moss (*Ptilium crista-castrensis*). In wetter areas, *Sphagnum* spp. dominate the moss layer.



Figure 3.1.3-5 Mature Balsam Fir-Sphagnum Forest Adjacent to a Wetland in Project Area.

Regenerating Coniferous Forest

A significant proportion of the Project Area has been affected historically by domestic cutting, windthrow, ice damage, clearcutting, and moose browsing. Therefore, a large percentage (24%) of the Project Area is comprised of Regenerating Coniferous Forest (Figure 3.1.3-6). On the Avalon Peninsula generally, and within the Project Area, this ecotype is mostly represented by young (e.g., 5–15-year-old) balsam fir thickets.



Figure 3.1.3-6 Regenerating Coniferous Forest in the Project Area.

Coniferous Scrub

Within the transition zones from upland forest to wetlands exist swaths of stunted black spruce (and sometimes balsam fir) (Figure 3.1.3-7). These thick scrub areas are often characterized by wetter soils (histosols) and *Sphagnum* spp.



Figure 3.1.3-7 Coniferous Scrub in the Project Area.

Mixedwood Forest

Mixedwood Forest stands were relatively sparse within the Project Area. These were characterized by >25% deciduous trees in a forest stand (3.1.3-8). Yellow birch (*Betula alleghaniensis*) was the most prevalent deciduous species component in these stands, but White birch (*Betula papyrifera*) was also present in some stands. Balsam fir and/or black or white spruce comprised the coniferous component.



Figure 3.1.3-8 Mixedwood in the Project Area.

Meadow

The Meadow ecotype is an anthropogenically formed habitat, located primarily on the Argentia Peninsula and near the coast (Figure 3.1.3-9). It is characterized by graminoid species, often non-native bluejoint grass (*Calamagrostis canadensis*) and myriads of other non-native herbaceous species like hawkweed (*Hieracium* spp.), swamp thistle (*Cirsium muticum*), and red clover (*Trifolium pratense*).



Figure 3.1.3-9 Meadow ecotype in the Project Area.

Open Water

The Open Water ecotype was scattered throughout the Project Area in the forms of ponds, rivers, streams, and open-water wetlands.

Wetland

Wetlands within the Project Area primarily consist of fens and bogs, both were mapped as a Wetland within the ELC (Figure 3.1.3-10). Wetlands in NL can be characterized into five classes (according to the Canadian Wetland Classification System (CWCS)): (i) bog; (ii) fen; (iii) swamp; (iv) marsh; and (v) shallow water wetlands (National Wetlands Working Group, 1997); however, for the purposes of the ELC, this level of resolution was not required.



Figure 3.1.3-10 Wetland Ecotype in the Project Area.

Wetlands provide functions within an ecosystem that can further provide benefits to local communities and support water management and climate change related policies. In addition to supporting biodiversity and providing wildlife habitat, wetlands are essential landscape features that perform critical ecosystem functions like water storage and runoff delay, flood prevention, water purification, groundwater recharge, and carbon storage. Development in wetlands requires a permit under Section 48 of the **Water Resources Act** for all development activities within or affecting wetlands. The following section outlines the regulations pertaining to provincial and federal wetland management.

Regulations

Province of Newfoundland and Labrador

The Water Resources Management Division of the Department of Environment and Climate Change maintains a **Policy for Development in Wetlands** (hereafter the "**Policy**") that establishes criteria for issuing a permit for development activities in and affecting wetlands in accordance with Section 48 of the **Water Resources Act** (hereafter "**the Act**"). The statutory definition of Wetland under the Act refers to "*land that has the water table at, near or above the land surface and includes bogs, fens, marshes, swamps and other shallow open water areas*" (Water Resources Act, 2002).

The stated objective of this **Policy** is to limit developments in wetlands to those which do not adversely affect water quantity, water quality, hydrological characteristics, functions, or habitats. Outlined within the Policy are the types of developments having indirect or direct effects to wetlands that are not permitted, and development activities that may be approved only with written permission by the Minister of Environment and Climate Change. When developments affecting wetlands are permitted under **the Act**, any required mitigative or restoration measures are specified in the terms and conditions of the environmental approval. As more than 90% of the province is managed as Crown Land, the Policy has wide applicability across the land base.

Activities affecting wetlands in Newfoundland and Labrador may also be regulated by the **Environmental Protection Act,** when a proposed project affecting wetlands triggers an Environmental Assessment based on criteria outlined in the **Environmental Assessment Regulations** (2003).

Government of Canada

At the federal level, wetland conservation in Canada is promoted by the **Federal Policy on Wetland Conservation** (hereafter "**the Federal Policy**"), which centers on the objective to "promote the conservation of Canada's wetlands to sustain their ecological and socio-economic functions, now and in the future" (Government of Canada, 1991). **The Federal Policy** outlines the Goals, Guiding Principles and Strategies for achieving this objective.

Under **the Federal Policy**, a wetland is defined as "*land that is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation and various kinds of biological activity which are adapted to a wet environment. Wetlands include bogs, fens, marshes, swamps and shallow waters (usually 2 m deep or less) as defined in The Canadian Wetland Classification System published by the National Wetlands Working Group of the Canada Committee on Ecological Land Classification (1987)*" (Government of Canada, 1991).

Goals of **the Federal Policy** include: maintaining wetland functions and values throughout Canada; enhancement and rehabilitation of wetlands in areas where degradation has reached "critical levels";

recognition of the value of wetland functions within federal resource planning and management processes; securement of significant wetlands; endorsement of sustainable management practices in relevant sectors (e.g., forestry and agriculture); sustainable use of wetlands that allows continued use by future generations; and no net loss of wetlands on federal lands and waters (Government of Canada, 1991). The no net loss of wetlands goal of **the Federal Policy** is associated with a three-step mitigation hierarchy whereby wetland loss is primarily avoided, unavoidable wetland loss is minimized, and any remaining loss is offset through compensation to maintain baseline wetland functioning (Government of Canada, 1991).

The Federal Policy is applicable to all federal lands and waters and provides a directive to all federal departments to protect wetland functions in their operations and programs. **The Federal Policy** may have broader applicability extending to private or provincially managed land in cases where wetland effects are caused by an activity that is federally permitted or funded (Government of Canada, 1991). In this case, the Project is expected to only interact with **the Federal Policy** where the T-line may cross Crown Lands.

3.1.3.3 Fauna (Mammals)

The Project Area, LAA, and RAA each include tracts of wilderness which provides habitat for many mammalian species in the province. Mammals from orders Artiodactyl (e.g., moose), Carnivora (e.g., foxes, coyotes), Rodentia (e.g., beavers, voles) Insectivora (e.g., shrews) and Lagomorpha (e.g., hares) were all considered during mammal surveys. Chiroptera (Bats) required a specialized survey which is described in the Species at Risk section (Section 3.1.3.5). The list of non-volant mammals considered possible for the LAA included in Table 3.1.3-1.

Table 3.1.3-1 Non-volant Mammals with the Potential to Occur in LAA.

Common Name	Species Name	IUCN Red List	Occurrence in LAA
Moose	Alces alces	Least Concern	Common
Lynx	Lynx canadensis	Least Concern	Occasional
Red Fox	Vulpes vulpes	Least Concern	Common
Coyote	Canis latrans	Least Concern	Occasional
Short-tailed Weasel	Mustela erminea	Least Concern	Common
Mink	Neovison vison	Least Concern	Occasional
Otter	Lontra canadensis	Least Concern	Occasional
Beaver	Castor canadensis	Least Concern	Occasional
Muskrat	Ondatra zibethicus	Least Concern	Occasional
Meadow Vole	Microtus pennsylvanicus	Least Concern	Common
Red-backed Vole	Myodes gapperi	Least Concern	Rare
Red Squirrel	Tamiasciurus hudsonicus	Least Concern	Common
Deer Mouse	Peromyscus maniculatus	Least Concern	Rare
Norway Rat	Rattus norvegicus	Least Concern	Occasional

Common Name	Species Name	IUCN Red List	Occurrence in LAA
House Mouse	Mus musculus	Least Concern	Occasional
Snowshoe Hare	Lepus americanus	Least Concern	Common
Masked Shrew	Sorex cinereus	Least Concern	Common
American Marten	Martes americana atrata	Least Concern	Rare

A literature survey and data searches were conducted for the Project Area, including the AC CDC data query. The AC CDC provides provincial lists of flora and fauna and assigns a conservation status rank (S-rank) for each species in the province. No mammal records were provided in the AC CDC data. Mammal field surveys were conducted throughout the field activities from fall 2022 to spring 2024 (concurrently with the ELC, avian, and lichen field surveys). These surveys were designed to determine the presence/absence of mammals within or adjacent to the Project Area and to establish relative usage of the range of habitats within the Project Area. Biologists opportunistically recorded evidence of mammals including tracks, scat, browsing, and auditory detections. Tracks or browsing in close proximity (<50 m) of each other were counted as one, where applicable (e.g., according to age). Table 3.1.3-2 summarizes the observations made during surveys but is not considered inclusive of all the mammals using the Project Area. Interactions between mammals and the Project will be discussed in Environmental Effects (Chapter 4).

Table 3.1.3-2 Mammal observations in the Project Area

Species	Latin Name	Visual	Tracks	Other
Moose	*Alces alces*	Yes	Yes	Pellets, shed antlers
Red Fox	*Vulpes vulpes*	Yes	Yes	Scat
Short-tailed Weasel	*Mustela erminea*	Yes	Yes	-
Coyote	*Canis latrans*	-	Yes	-
Beaver	*Castor canadensis*	-	-	Browsing, dams
Snowshoe Hare	*Lepus americanus*	Yes	Yes	Pellets
Meadow Vole	*Microtus pennsylvanicus*	-	Yes	-
Masked Shrew	*Sorex cinereus*	Yes	Yes	-
Red Squirrel	*Tamiasciurus hudsonicus*	Yes	Yes	Nests, caches, calls

Dedicated surveys would be required to confirm several of the other species, such as hair snags for lynx, or snap-trapping for small mammals. However, those were deemed unnecessary for the scope of this Project. A muskrat (*Ondatra zibethicus*) survey will be conducted in fall 2024 as per discussions with Newfoundland and Labrador Wildlife Division (NL WD) regarding a probable decline in this species.

3.1.3.4 Avifauna

The **Migratory Birds Convention Act**, 1994 (MBCA) and **Migratory Birds Regulations** (MBR) were implemented to protect birds (both populations and individuals) and nests that contain live birds and/or

viable egg(s). The MBCA and MBR prohibit the capture, kill, take, injury, or harassment of a migratory bird, and protect migratory bird nests. In NL, almost all bird families are federally protected by the MBCA. Raptors and owls are an exception and are protected under provincial **Wild Life Act** legislation. Bird SAR are discussed in subsequent sections.

Resident and migratory species of birds in the Argentia area include representatives from the bird Orders Anseriformes (Waterfowl), Galliformes (Gamebirds), Gaviiformes (Loons), Accipitriformes (Raptors), Charadriiformes (Shorebirds), Columbiformes (Doves), Gruiformes (Rails), Strigiformes (Owls), Coraciiformes (Kingfishers), Piciformes (Woodpeckers), and Passeriformes (Perching birds). These varieties of birds may interact with the Project in differing ways, depending on their ecological niches, migration strategy, and morphology/physiology (including the positioning of the eyes and flying ability). Such interactions are discussed in Environmental Effects (Chapter 4).

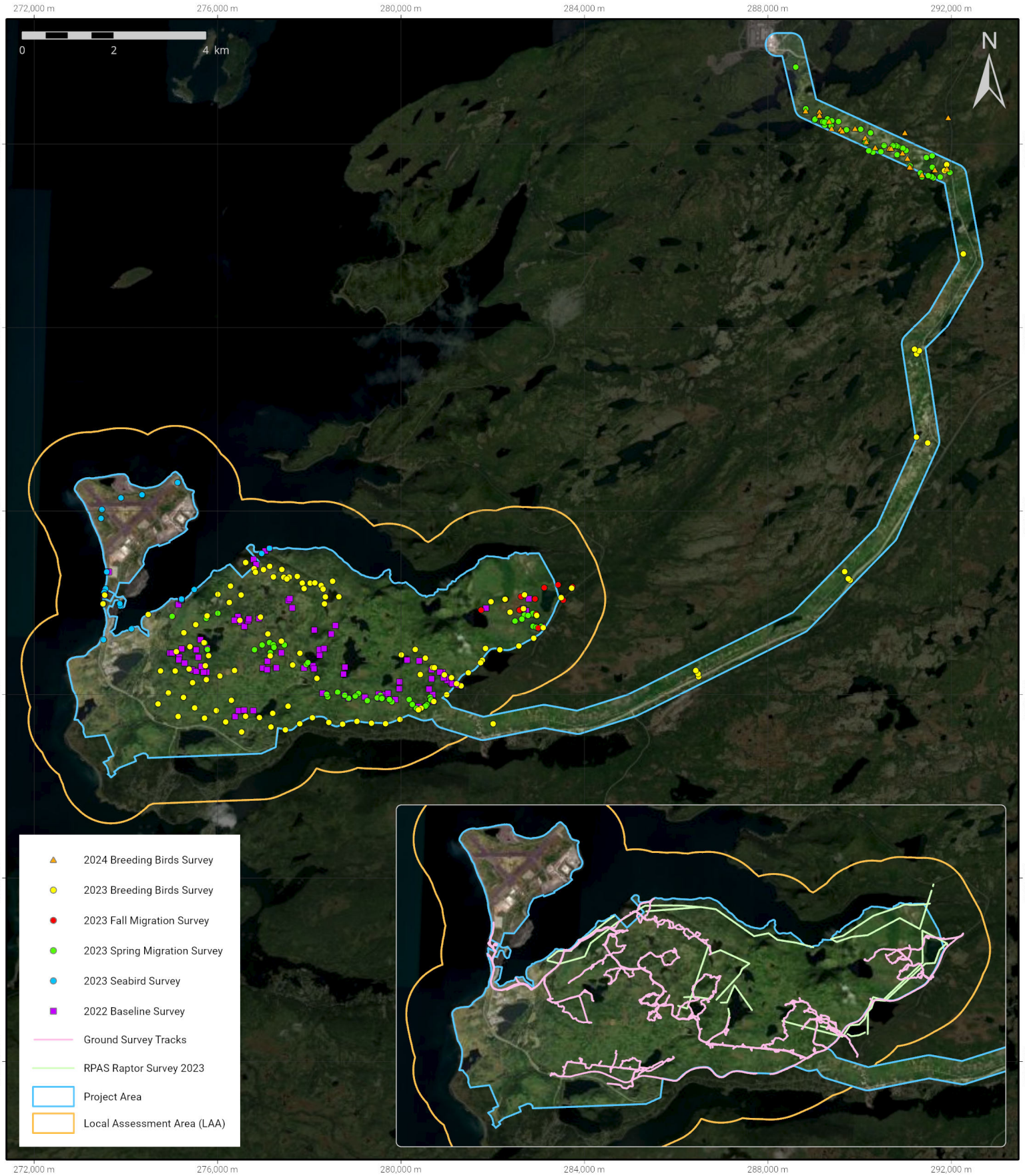
The Project Area, LAA, and RAA are located within the Atlantic Flyway (a route regularly used by large numbers of migrating birds), which is one of four major flyways in North America (Figure 3.1.3-11). This region (and eastern Newfoundland in general) does not experience immense numbers of migrating birds (relative to other parts of Canada), as most eastern avian migrants funnel north and south through eastern mainland Canada. Only a subset of individuals using the Atlantic flyway would reach the latitude of the Project Area.

The bird Orders are grouped and discussed in the following sections, which summarize existing conditions, including historical records for bird species in the Project Area, and a summary of results from original surveys that have been conducted in each season since the fall of 2022. Avifauna survey effort is presented in Figure 3.1.3-12a. Detailed survey results can be found in the Avifauna Component Study in Appendix D1.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 11	COORDINATE SYSTEM: WGS 1984 World Mercator	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Four Major Flyways in North America	NOTES: Adapted from Washington State University-Everett with Everett Community College 2021-2022. Project Development Report 21 pp.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-032-Rev0



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 12a	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/28
	FIGURE TITLE: Survey Effort for Avifauna 2022-2024	NOTES: RPAS - Remotely Piloted Aircraft System	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-040-Rev1

Passeriformes and Piciformes (Perching Birds and Woodpeckers) and Others

Passerines (songbirds) vocalize with songs and calls during the breeding season to attract mates, defend territories, and communicate. Piciformes (woodpeckers) "sing" by drumming on trees and other substrates and have various vocalizations. Breeding bird surveys in Newfoundland are typically conducted in June to maximize the potential for the greatest number of breeding species. Breeding bird surveys are often conducted with the "point count" method (i.e., visiting pre-determined locations and listening and observing for a period of time) or transect surveys, which involve recording observations along routes throughout the Project Area, and often stratifying effort proportionally to habitat types or to focus on specialized habitats (e.g., wetlands, old growth forest). A combination of survey methods was incorporated into the Project, to maximize the number of detections spatially across ecotypes present in the Project Area and temporally. Efforts were conducted year-round, with point counts primarily employed during the breeding season and transect and point count surveys during the rest of the year. In addition, the data were supplemented by two Automatic Recording Units (ARUs) that operated year-round from April 22 to October 18, 2023, as well as from the desktop historical data.

There are many passerine and woodpecker species known from the Project Area, including, but not limited to the following (Table 3.1.3-3), which all have the potential for using the Project Area at some time of year (compiled from original data collected from 2022-2024, supplemented with AC CDC, Cornell University, and eBird information):

Table 3.1.3-3 Potential Life Cycle Uses of the Project Area by Passerine and Woodpecker Species

Species	Scientific Name	NL ESA/ COSEWIC	IUCN Red List	Potential Life Cycle Uses of the Local Assessment Area	
				Breeding	Non-Breeding
American Goldfinch	*Spinus tristis*	-	Least Concern	✓	
American Robin	*Turdus migratorius*	-	Least Concern	✓	✓
Black-and-white Warbler	*Mniotilta varia*	-	Least Concern	✓	
Black-backed Woodpecker	*Picoides arcticus*	-	Least Concern	✓	✓
Black-capped Chickadee	*Poecile atricapillus*	-	Least Concern	✓	✓
Black-throated Green Warbler	*Setophaga virens*	-	Least Concern	✓	
Blackpoll Warbler	*Setophaga striata*	-	Near Threatened	✓	
Blue-headed Vireo	*Vireo solitarius*	-	Least Concern	✓	
Blue Jay	*Cyanocitta cristata*	-	Least Concern	✓	✓
Bohemian Waxwing	*Bombycilla garrulus*	-	Least Concern	✓	✓
Boreal Chickadee	*Poecile hudsonicus*	-	Least Concern	✓	✓
Canada Jay	*Perisoreus canadensis*	-	Least Concern	✓	✓

Species	Scientific Name	NL ESA/ COSEWIC	IUCN Red List	Potential Life Cycle Uses of the Local Assessment Area	
				Breeding	Non-Breeding
Cedar Waxwing	*Bombycilla cedrorum*	-	Least Concern	✓	
Common Raven	*Corvus corax*	-	Least Concern	✓	✓
Common Yellowthroat	*Geothlypis trichas*	-	Least Concern	✓	
Dark-eyed Junco	*Junco hyemalis*	-	Least Concern	✓	✓
Downy Woodpecker	*Dryobates pubescens*	-	Least Concern	✓	✓
Fox Sparrow	*Passerella iliaca*	-	Least Concern	✓	✓
Golden-crowned Kinglet	*Regulus satrapa*	-	Least Concern	✓	✓
Gray-cheeked Thrush	*Catharus minimus*	Threatened	Least Concern	✓	
Hairy Woodpecker	*Dryobates villosus*	-	N/A	✓	✓
Hermit Thrush	*Catharus guttatus*	-	Least Concern	✓	
Horned Lark	*Eremophila alpestris*	-	Least Concern	✓	✓
Magnolia Warbler	*Setophaga magnolia*	-	Least Concern	✓	
Northern Waterthrush	*Parkesia noveboracensis*	-	Least Concern	✓	
Northern Flicker	*Colaptes auratus*	-	Least Concern	✓	✓
Palm Warbler	*Setophaga palmarum*	-	Least Concern	✓	
Pine Grosbeak	*Pinicola enucleator*	-	Least Concern	✓	✓
Pine Siskin	*Spinus pinus*	-	Least Concern	✓	✓
Purple Finch	*Haemorhous purpureus*	-	Least Concern	✓	✓
Red Crossbill	*Loxia curvirostra*	Threatened	Least Concern	✓	✓
Ruby-crowned Kinglet	*Corthylio calendula*	-	Least Concern	✓	
Ruffed Grouse	*Bonasa umbellus*	-	Least Concern	✓	✓
Savannah Sparrow	*Passerculus sandwichensis*	-	Least Concern	✓	
Swainson's Thrush	*Catharus ustulatus*	-	Least Concern	✓	
Swamp Sparrow	*Melospiza georgiana*	-	Least Concern	✓	
Tree Swallow	*Tachycineta bicolor*	-	Least Concern	✓	✓
White-throated Sparrow	*Zonotrichia albicollis*	-	Least Concern	✓	
White-winged Crossbill	*Loxia leucoptera*	-	Least Concern	✓	✓
Wilson's Snipe	*Gallinago delicata*	-	Least Concern	✓	
Wilson's Warbler	*Cardellina pusilla*	-	Least Concern	✓	
Yellow Warbler	*Setophaga petechia*	-	Least Concern	✓	

Sixty-two species of birds were observed during surveys in the Project Area during the breeding season. These comprised a typical suite of boreal forest species, with the most common comprised of passerines like Northern Waterthrush (*Parkesia noveboracensis*), Blackpoll Warbler (*Setophaga striata*), White-throated Sparrow (*Zonotrichia albicollis*), Yellow-bellied Flycatcher (*Empidonax flaviventris*), and Fox Sparrow (*Passerella iliaca*). During spring migration surveys the most commonly observed included White-throated Sparrow, American Robin (*Turdus migratorius*), Yellow-rumped Warbler (*Setophaga*

coronata), and Hermit Thrush (*Catharus guttatus*). For fall migration the most common were White-winged Crossbill (*Loxia leucoptera*), Boreal Chickadee (*Poecile hudsonicus*), Pine Siskin (*Spinus pinus*), Golden-crowned Kinglet (*Regulus satrapa*), and Black-capped Chickadee (*Poecile atricapillus*).

A full list of bird species observed can be found in the Avifauna Component Study in Appendix D1.

Accipitriformes and Strigiformes (Raptors and Owls)

Raptors and owls are protected by the regulations of the NL **Wild Life Act**, including all species of eagles, falcons, hawks, osprey, and owls. Raptor surveys were conducted throughout the Project Area during all seasons of the year from fall 2022 onwards, but efforts focused on migration and breeding season. These surveys necessitated an amalgamation of several techniques, including targeting different habitat types (e.g., open habitats for species like Northern Harrier (*Circus hudsonius*) and Short-eared Owl, mature forest for Great-horned Owl and Northern Goshawk, etc.), and scanning the sky for soaring raptors, as well as searching any cliffs and tall trees for nests.

There are several raptor and owl species known from insular Newfoundland, including, but not limited to, those listed in Table 3.1.3-4. All have potential for using the Project Area at some time of year:

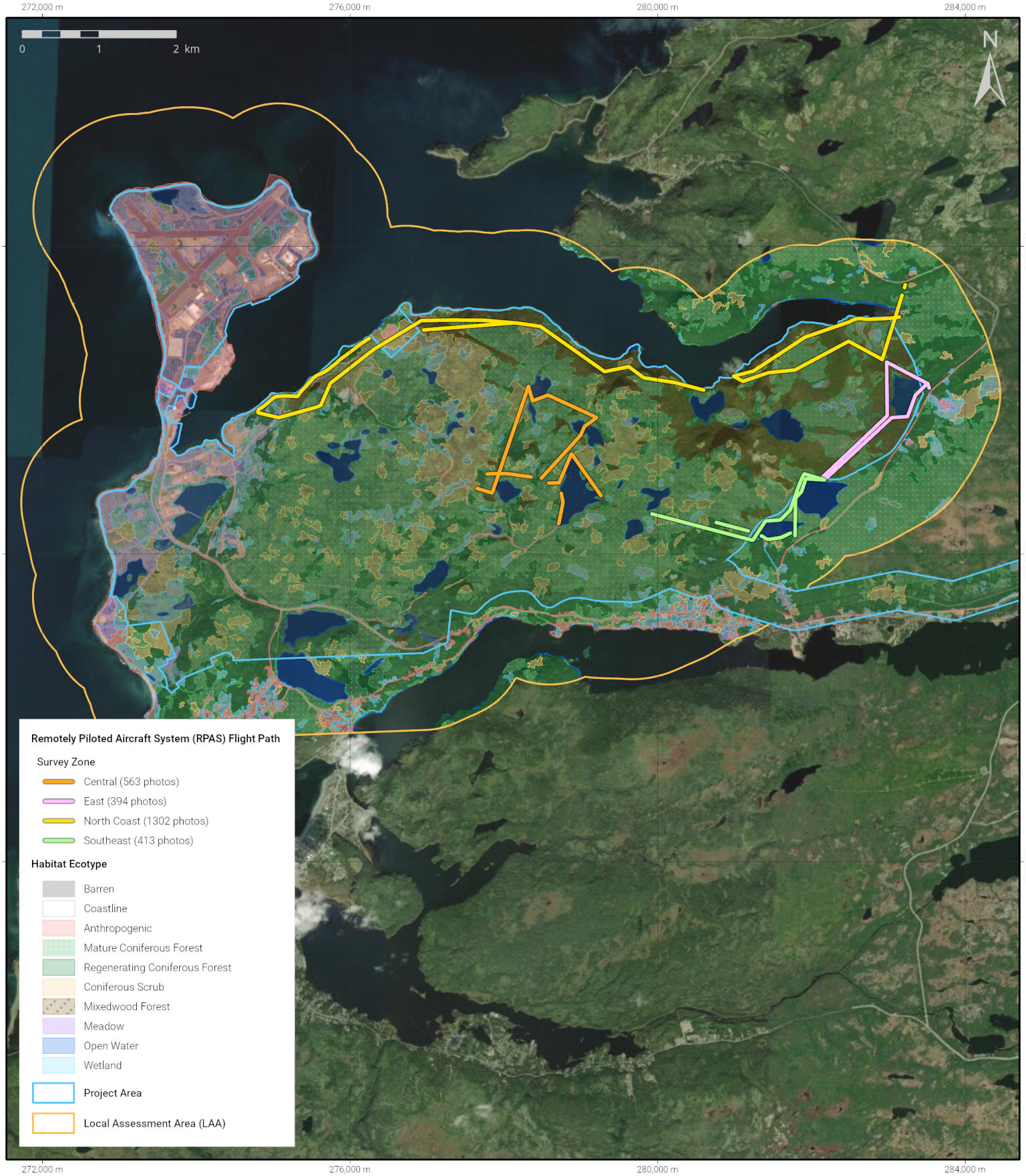
Table 3.1.3-4 Potential Life Cycle Uses of the Project Area by Raptors and Owls

Species	Scientific Name	NL ESA and COSEWIC/ SARA	IUCN Red List	Potential Life Cycle Uses of the Local Assessment Area	
				Breeding	Non-Breeding
American Kestrel	*Falco sparverius*	-	Least Concern	✓	
Bald Eagle	*Haliaeetus leucocephalus*	-	Least Concern	✓	✓
Boreal Owl	*Aegolius funereus*	-	Least Concern	✓	✓
Great Horned Owl	*Bubo virginianus*	-	Least Concern	✓	✓
Merlin	*Falco columbarius*	-	Least Concern	✓	
American Goshawk	*Accipiter atricapillus*	-	N/A	✓	✓
Northern Harrier	*Circus hudsonius*	-	Least Concern	✓	
Northern Hawk Owl	*Surnia ulula*	-	Least Concern	✓	✓
Osprey	*Pandion haliaetus*	-	Least Concern	✓	
Red-tailed Hawk	*Buteo jamaicensis*	-	Least Concern	✓	
Sharp-shinned Hawk	*Accipiter striatus*	-	Least Concern	✓	
Short-eared Owl	*Asio flammeus*	Threatened/ Special Concern	Least Concern	✓	

Surveys since fall 2022 have produced observations of Bald Eagle, Sharp-shinned Hawk, American Goshawk, Great-horned Owl, Merlin, and Northern Harrier. However, no nests were found for any raptors or owls during surveys.

In addition to the on-the-ground surveys, a RPAS flight was conducted in July 2023 to collect high-resolution imagery of the areas with the highest potential for large raptors (flight path is depicted in Figure 3.1.3-12b). A pre-planned aerial transect survey was performed to obtain high quality imagery which was thoroughly investigated for areas of interest (i.e., large stick nests atop trees, etc.). Nest site fidelity across years is common for many raptor species and nests of large raptors can be identified from RPAS high-resolution photographs. No raptor nests were recorded during the flight. A full list of bird species observed during these surveys can be found in the Avifauna Baseline Study in Appendix D1.

The purpose of deploying a RPAS to survey raptor nests as an alternative to the traditional helicopter survey was to minimize disturbance to birds. RPASs represent an effective and adaptable tool for safely surveying raptor nests and provide a permanent record of the survey. Argentia Renewables will continue to pursue ways to embrace technology in this regard. Details on the mitigations for raptors and owls can be found in Section 4.2.3, the Post-Construction Monitoring Plan (Appendix S), and for Short-eared Owl in the Species at Risk Impacts Mitigation and Monitoring Plan (Appendix R). A dedicated Short-eared Owl survey will be conducted in fall 2024 as per discussions with NL WD.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 12b	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Flight Path of the 2023 RPAS Raptor Nest Survey	NOTES:	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	
			sem	

SEM MAP ID: 238-005-GIS-033-Rev1

Anseriformes (Waterfowl), Charadriiformes (Gulls/Auks/Plovers/Sandpipers), and other Waterbirds

Given the location of the Project Area, immediately adjacent to the POA, the area boasts a wide variety of waterfowl and waterbirds (e.g., gulls, alcids, sandpipers, etc.). Since these species may interact with the Project outside of the Project Area (i.e., several species use the marine environment in proximity to the proposed array of turbines), the LAA was used to assess this group instead of the (terrestrial) Project Area.

Table 3.1.3-5 lists the water-associated birds that may be found in the LAA during some stage of their annual cycle (i.e., for breeding, staging during migration, and/or wintering). This list was compiled from original data collected since fall 2022, observations from eBird, AC CDC data, and information from Cornell University on uses of the area from range maps.

Table 3.1.3-5 Water-associated Birds that may use the Local Assessment Area.

Species	Scientific Name	NL ESA/ COSEWIC and SARA	IUCN Red List	Potential Habitat Use of the Local Assessment Area		Potential Life Cycle Uses of the Local Assessment Area		
				Marine	Freshwater	Breeding	Non-Breeding	Migration Only
American Black Duck	*Anas rubripes*	-	Least Concern	✓	✓	✓	✓	
Belted Kingfisher	*Megaceryle alcyon*	-	Least Concern		✓	✓		
Canada Goose	*Branta canadensis*	-	Least Concern		✓	✓	✓	
Common Goldeneye	*Bucephala clangula*	-	Least Concern		✓	✓	✓	
Common Loon	*Gavia immer*	-	Least Concern	✓	✓	✓	✓	
Common Merganser	*Mergus merganser*	-	Least Concern		✓	✓	✓	
Green-winged Teal	*Anas crecca*	-	Least Concern		✓	✓	✓	
Northern Pintail	*Anas acuta*	-	Least Concern		✓	✓		
Red-breasted Merganser	*Mergus serrator*	-	Least Concern	✓	✓	✓	✓	
Ring-necked Duck	*Aythya collaris*	-	Least Concern		✓	✓		
Greater Scaup	*Aythya marila*	-	Least Concern	✓	✓	✓	✓	
Razorbill	*Alca torda*	-	Least Concern	✓		✓	✓	

Species	Scientific Name	NL ESA/ COSEWIC and SARA	IUCN Red List	Potential Habitat Use of the Local Assessment Area		Potential Life Cycle Uses of the Local Assessment Area		
				Marine	Freshwater	Breeding	Non-Breeding	Migration Only
Semipalmated Sandpiper	*Calidris pusilla*	-	Near Threatened		✓			✓
Semipalmated Plover	*Charadrius semipalmatus*	-	Least Concern		✓	✓		
Whimbrel	*Numenius phaeopus*	-	Least Concern		✓			✓
Greater Yellowlegs	*Tringa melanoleuca*	-	Least Concern		✓	✓		
Ruddy Turnstone	*Arenaria interpres*	-	Least Concern	✓	✓			✓
Sanderling	*Calidris alba*	-	Least Concern	✓	✓			✓
Herring Gull	*Larus argentatus*	-	Least Concern	✓	✓	✓	✓	
Double-crested Cormorant	*Nannopterum auritum*	-	Least Concern	✓	✓	✓	✓	
Great Black-backed Gull	*Larus marinus*	-	Least Concern	✓	✓	✓	✓	
Black Guillemot	*Cepphus grille*	-	N/A	✓			✓	
Black-legged Kittiwake	*Rissa tridactyla*	-	Vulnerable	✓		✓		
Northern Gannet	*Morus bassanus*	-	Least Concern	✓		✓		
Mallard	*Anas platyrhynchos*	-	Least Concern		✓	✓	✓	✓
Long-tailed Duck	*Clangula hyemalis*	-	Least Concern	✓			✓	
Harlequin Duck	*Histrionicus histrionicus*	Vulnerable/ Special Concern	Least Concern	✓			✓	
Dovekie	*Alle alle*	-	Least Concern	✓			✓	
Northern Fulmar	*Fulmarus glacialis*	-	Least Concern	✓		✓	✓	
Parasitic Jaeger	*Stercorarius parasiticus*	-	Least Concern	✓				✓
Thick-billed Murre	*Uria lomvia*	-	Least Concern	✓	✓		✓	
Canada Goose	*Branta canadensis*	-	Least Concern		✓	✓		

Species	Scientific Name	NL ESA/ COSEWIC and SARA	IUCN Red List	Potential Habitat Use of the Local Assessment Area		Potential Life Cycle Uses of the Local Assessment Area		
				Marine	Freshwater	Breeding	Non-Breeding	Migration Only
Great Shearwater	*Ardenna gravis*	-	Least Concern	✓			✓	
Black Scoter	*Melanitta americana*	-	Near Threatened	✓	✓			
Common Eider	*Somateria mollissima*	-	Near Threatened	✓		✓	✓	
White-winged Scoter	*Melanitta deglandi*	-	Least Concern	✓			✓	
Black-bellied Plover	*Pluvialis squatarola*	-	Least Concern		✓			✓
Sooty Shearwater	*Ardenna grisea*	-	Near Threatened	✓			✓	
Lesser Yellowlegs	*Tringa flavipes*	Threatened (COSEWIC Only)	Least Concern		✓			✓
Dunlin	*Calidris alpina*	-	Least Concern		✓			✓
White-rumped Sandpiper	*Calidris fuscicollis*	-	Least Concern		✓			✓
American Golden-Plover	*Pluvialis dominica*	-	Least Concern	✓				✓
Least Sandpiper	*Calidris minutilla*	-	Least Concern		✓	✓		
Common Tern	*Sterna hirundo*	-	Least Concern	✓	✓	✓		
Common Murre	*Uria aalge*	-	Least Concern	✓		✓	✓	
Black-headed Gull	*Chroicocephalus ridibundus*	-	Least Concern	✓	✓		✓	
Iceland Gull	*Larus glaucoides*	-	Least Concern	✓			✓	
Glaucous Gull	*Larus hyperboreus*	-	Least Concern	✓			✓	

Harlequin Duck was the only waterfowl SAR known from the region, from the AC CDC search, and from online birding groups that noted many recent observations around the town of Branch, approximately 40 kilometres south of the Project Area. No observations were made in the Project Area or LAA during field surveys conducted from 2022-2024. This species is discussed in the Species at Risk section, but generally is not expected to interact with the Project, as the species solely uses the marine environment in winter and turbulent high-elevation rivers (mostly in Labrador) for the breeding season. There is no suitable habitat for Harlequin Duck within the boundaries of the Project Area, and only wintering habitat

within the RAA. However, if the species is observed during any phase of the Project, a re-evaluation of monitoring and mitigation will be undertaken (through consultations with NL WD and/or ECCC).

3.1.3.5 Species at Risk (SAR) and Species of Conservation Concern (SCC)

Several federal and provincial legislative acts and regulations are pertinent to the potential interactions of the Project with SAR and/or SCC, and with SAR habitats throughout the Project Area. In NL, a SAR can be listed either provincially under the Newfoundland and Labrador **Endangered Species Act** (2001) (NL ESA) or federally under the **Species at Risk Act** (SARA). The Committee for the Status of Endangered Wildlife in Canada (COSEWIC), a committee of government and non-government experts, directs the assessments and classifies species using scientific, community and Indigenous traditional knowledge. In Section 4.1.3 and Appendix R, avoidance and minimization measures for all SAR known from the Project Area are assessed in detail. In cases where interactions with SAR cannot be avoided, minimization measures will be incorporated, and a *Permit to Engage in an Economic Activity Under Section 19 of the NL ESA, SNL 2001 C.E.-10-1* will be sought from the NL WD.

In addition, the Atlantic Canada Conservation Data Centre (AC CDC), provides data on SAR and rarity rankings for each species. These non-SAR but rare flora and/or fauna will be considered Species of Conservation Concern (SCC) and will also be considered in this document, pertaining primarily to plants and some bird species. SCC do not have legislation associated with their status but are considered rare in the province. Conservation status for each species is represented by a status rank (S-rank). AC CDC maintains S-ranks for terrestrial vertebrates, vascular plants, bryophytes, lichens, and invertebrates. SCC are comprised of S-ranked species from ‘S1’ to ‘S3S4’, with lower numbers representing greater rarity and conservation concern.

Each piece of SAR legislation and regulatory body is discussed below.

Regulations

3.1.3.6 Newfoundland and Labrador Endangered Species Act

The NL WD coordinates the assessment and listing of SAR and develops recovery and management plans, monitoring programs, and research projects to promote the conservation of SAR and to ensure no native species become extinct in the province due to human activity or interference. The NL ESA provides special protection for plant and animal species considered to be Endangered, Threatened, or Vulnerable. This legislation applies to species, sub-species and populations that are native to NL but does not include marine fish, bacteria, and viruses. Designation under the Act follows recommendations from COSEWIC and/or the Species Status Advisory Committee (SSAC) on the appropriate assessment of a species. Classifications of the **NL ESA** are outlined in Table 3.1.3-6.

Table 3.1.3-6 NL Endangered Species Act Status Criteria.

Classification	Description
Extinct	No longer exists.
Extirpated	No longer exists in the wild, but exists elsewhere (e.g. exists in another province, a zoo, or a botanical garden).
Endangered	Faces imminent extirpation or extinction. For example, taxon in this category can have a declining total population size, a very small population (<250 mature individuals), an area of occupancy of less than 500 km2, and/or occur at five or less locations. Without intervention, this taxon is likely to become Extirpated from the province.
Threatened	Is likely to become endangered if nothing is done to reverse the factors limiting its survival. For example, taxon in this category can have a declining total population size, a very small population (<1000 mature individuals), an area of occupancy of less than 2000 km2, and/or occur at 10 or less locations.
Vulnerable	Has characteristics which make it particularly sensitive to human activities or natural events such as susceptibility to catastrophic events (e.g. oil spill) or restricted habitat or food requirements that are themselves under threat. This category may also be used to identify a wildlife species that has recovered from Threatened or Endangered status but which is not yet secure. Species in this category are likely to become threatened or endangered if not managed effectively.
Data Deficient	All sources of available information have been investigated but the information in the status report is insufficient to determine risk of extinction based on distribution and/or population status. Listing in this category indicates that more information is required and future research may show another classification is appropriate.
Not At Risk	Generally applied to widespread and abundant taxa unlikely to fit the criteria for Vulnerable, Threatened or Endangered in the near future.

Government of Canada's Species at Risk Act (SARA)

SARA was proclaimed in June 2003 to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are Extirpated, Endangered or Threatened as a result of human activity, and to manage species of Special Concern to prevent them from becoming endangered or threatened.

In addition, it complements existing laws and agreements to provide for the legal protection of wildlife species and the conservation of biological diversity. The Act aims to prevent wildlife species from becoming extinct and to secure the necessary actions for their recovery. It applies to all federal lands in Canada, all wildlife species listed as being at risk, and their critical habitat. Descriptions of SARA classifications can be found in Table 3.1.3-7.

Table 3.1.3-7 SARA Status Criteria.

Classification	Description
Extinct	A wildlife species that no longer exists
Extirpated	A wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild
Endangered	A wildlife species that is facing imminent Extirpation or Extinction
Threatened	A wildlife species that is likely to become Endangered if nothing is done to reverse the factors leading to its Extirpation or Extinction
Special Concern	A wildlife species that may become a Threatened or an Endangered species because of a combination of biological characteristics and identified threats

Committee on the Status of Endangered Wildlife in Canada

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is an independent advisory panel to the Minister of Environment and Climate Change Canada that meets twice a year to assess the status of wildlife species at risk. Members are wildlife biology experts from academia, government, non-governmental organizations, and the private sector. COSEWIC designations are regarded as recommendations to the federal government; the government makes the final decision on whether species will be listed under the SARA. Descriptions of COSEWIC classifications can be found in Table 3.1.3-8.

Table 3.1.3-8 COSEWIC Status Criteria.

Classification	Description
Extinct (X)	A wildlife species that no longer exists
Extirpated (XT)	A wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild
Endangered (E)	A wildlife species that is facing imminent extirpation or extinction
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed
Special Concern	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats
Data Deficient (DD)	A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.
Not At Risk (NAR)	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

Atlantic Canada Conservation Data Centre (AC CDC)

The AC CDC provides provincial lists of flora and fauna and assigns a conservation status rank (S-rank) for each species in the province. The AC CDC maintains S-ranks for all terrestrial vertebrates, vascular plants, bryophytes, macrolichens, and many invertebrate groups. It should be noted that S-ranks do not have any legislative protections, and for this reason are often referred to as Species of Conservation

Concern (SCC) for species with S-ranks of S1 to S3. However, the AC CDC also provides the corresponding SAR information for those species that are both a SCC and SAR (Table 3.1.3-9).

Table 3.1.3-9 AC CDC S-Rank Definitions.

S-rank	Definition
SX	Presumed Extirpated - Species or community is believed to be extirpated from the province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
S1	Critically Imperiled - Critically imperiled in the province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the province.
S2	Imperiled - Imperiled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the province.
S3	Vulnerable - Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S4	Apparently Secure - Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5	Secure - Common, widespread, and abundant in the province.
SNR	Unranked - Provincial conservation status not yet assessed.
SU	Unrankable - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA	Not Applicable - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
S#S#	Range Rank - A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
SH	Possibly Extirpated (Historical)—Species or community occurred historically in the province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become SH without such a 20-40 year delay if the only known occurrences in a province were destroyed or if it had been extensively and unsuccessfully looked for. The SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
Not Provided	Species is not known to occur in the province.

Possible, Probable, and Confirmed SAR for the Project

To assess the likelihood of SAR using the Project Area or LAA, a comprehensive desktop review was conducted, followed by field surveys for each candidate species identified. From an AC CDC data query it was determined that three SAR had potential for using the Project Area based on historical records within 5 km of the center point of the Project Area: Gray-cheeked Thrush (*Catharus minimus*), Harlequin Duck (*Histrionicus histrionicus*), and Short-eared Owl (*Asio flammeus*) (Table 3.1.3-10). This information provided a starting point for the SAR assessment.

Secondly, a desktop ArcGIS assessment of the ecotypes present (from the ELC) was conducted, and several more SAR were deemed possible or probable to interact with the Project. Rusty Blackbird (*Euphagus carolinus*), Northern myotis (*Myotis septentrionalis*), Olive-sided Flycatcher (*Contopus cooperi*), and blue felt lichen (*Degelia plumbea*) were all assessed as Possible, and boreal felt lichen (*Erioderma pedicellatum*), Red Crossbill *percna* (*Loxia curvirostra percna*), and little brown myotis (*Myotis lucifugus*) were all deemed Probable.

Thirdly, surveys were conducted for each of the aforementioned species to attempt to confirm the presence/absence of each in the Project Area (and extrapolate findings to the LAA, where necessary). The following species were confirmed as present within the boundaries of the Project Area: Gray-cheeked Thrush, Red Crossbill *percna*, little brown myotis, Northern myotis, Silver-haired Bat, Yellow-banded Bumblebee, boreal felt lichen, blue felt lichen, and water pygmy-weed. One SAR that was detected but was somewhat unexpected, and not part of the desktop assessment, was the hoary bat (*Lasiurus cinereus*). Each SAR is discussed in the sections below, including a summary of results from the field surveys.

Species of Conservation Concern

The AC CDC data request for the 5 km area surrounding the center of the Project Area included the following results for S3-S1 species (Table 3.1.3-10).

Table 3.1.3-10 AC CDC Data Results for the Project Area.

Common Name	Scientific Name	Taxonomic Family	Use	Year	S-Rank (2015) *	COSEWIC Rank	NL ESA Rank	SARA Rank	IUCN Red List
American Golden-Plover	Pluvialis dominica	Charadriidae	Fall Migration	2020	S3M				Least Concern
American Golden-Plover	Pluvialis dominica	Charadriidae	Fall Migration	2020	S3M				Least Concern
Black-bellied Plover	Pluvialis squatarola	Charadriidae	Fall Migration	2020	S3M				Least Concern
Black-Bellied Plover	Pluvialis squatarola	Charadriidae	Fall Migration	2021	S3M				Least Concern
Gray-cheeked Thrush	Catharus minimus	Turdidae	Breeding Season	1991	S2B, SUM		Threatened		Least Concern
Greater Yellowlegs	Tringa melanoleuca	Scolopacidae	Breeding Season	2021	S3B, S4M				Least Concern
Harlequin Duck	Histrionicus histrionicus	Anatidae	Winter	1947	S3B, S2N, SUM	Special Concern	Vulnerable	Special Concern	Least Concern
Horned Lark	Eremophila alpestris	Alaudidae	Breeding Season	2021	S3B, SUM				Least Concern
Lesser Yellowlegs	Tringa flavipes	Scolopacidae	Fall Migration	2021	S3M	Threatened			Least Concern
Northern Goshawk	Accipiter gentilis	Accipitridae	Resident	2002	S3				Least Concern
Northern Harrier	Circus cyaneus	Accipitridae	Spring Migration	2002	S3B, SUM				Least Concern
Northern Harrier	Circus cyaneus	Accipitridae	Breeding Season	2021	S3B, SUM				Least Concern
Northern Harrier	Circus cyaneus	Accipitridae	Fall Migration	2020	S3B, SUM				Least Concern
Sanderling	Calidris alba	Scolopacidae	Fall Migration	2020	S3M				Least Concern
Short-eared Owl	Asio flammeus	Strigidae	Breeding Season	1991, 2019, 2021	S3B, SUM	Threatened	Vulnerable	Special Concern	Least Concern
* under the S-Rank column, the following qualifiers are used: B = Breeding (i.e., the conservation status refers to a breeding population in the Province; M = Migrant (i.e., the conservation status refers to an aggregating transient population in the Province.									

Plant Species at Risk

The landscape of the Project Area is largely a mosaic of forests of various ages and species compositions, and the vegetation communities present are the result of various harvesting activities and disturbances over the past several decades, with many alterations dating back to the era of the military

base in Argentia. Some of these habitat types had heightened potential for the presence of rare plants including the wetlands, anthropogenic areas (namely the Argentia Peninsula), and rock outcrops. A rare flora study was conducted to compile historical records of rare plants known in the Project Area, and conduct original surveys in appropriate habitats to catalogue any rare species in the Project Area, their relative abundances, and their locations. These efforts addressed species listed under SARA, COSEWIC, the NL ESA, and species ranked regionally rare to uncommon (i.e., ranked S1 to S3) by the Atlantic Canada Conservation Data Centre (AC CDC).

There are currently thirty provincially listed plant Species at Risk (SAR) known to occur in NL. A data request to the AC CDC for a 5 km radius covering the Project Area (Figure 3.1.3-13) produced the following list of four species, all ranked in 2015:

- Water pygmy-weed (*Tillaea aquatica*) observed in 2020, listed as S1
- Sago pondweed (*Stuckenia pectinata*), observed in 1924, listed as S2S3
- Maritime sea-blite (*Suaeda maritima*), observed in 1924, listed as S3
- Southern running-pine (*Diphasiastrum digitatum*), observed in 1988, listed as S2

These species records are all from the brownfield Argentia Peninsula. Water pygmy-weed was discovered most recently (2020) in the cracks and depressions of the former runway. Southern running-pine was found in 1988 in the gravel of the former airbase. The other records date back a century to a location behind “The Pond” on the northwestern end of the Peninsula. Water pygmy-weed, sago pondweed, and maritime sea-blite were all found in that area in 1924. There were no historical records of rare plants from the remainder of the Project Area.

A survey for water pygmy-weed was conducted on July 16, 2024, throughout the accessible portions of the Argentia Peninsula, with four individuals recorded. The locations of water pygmy-weed were recorded, and mitigations will be considered in consultation with NL WD.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 13	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: J. Crocker	DATE: 24/07/28
	FIGURE TITLE: AC CDC Rare Fauna Results in the Project Area	NOTES: Data retrieved from the Atlantic Canada Conservation Data Centre (AC CDC).	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-039-Rev0

In addition to the AC CDC data query and literature search, a rare plant survey was conducted in the Project Area in areas of high potential, as determined from the ELC. These included areas of disturbance, wetlands, and rocky outcrop. The rare plant survey was conducted in early September 2023 and coverage of all the high-potential areas was 100%.

Throughout baseline surveys and fieldwork efforts conducted in 2022 and 2023, all visits to the Project Area were used to record observations of rare plant species. In addition, a dedicated rare plant survey was completed in September 2023 that focused on areas and species with high probability of occurrence in the Project Area (Appendix D6). There were thirteen rare plants observed in the Project Area, none of which are SAR or listed by the NL ESA. A dedicated 2024 water pygmy-weed survey on the Argentia Peninsula was completed and the observation of four plants were recorded.

Lichen Species at Risk

The ecological conditions of the Project Area provided potential habitats for three rare lichen species that are listed under the NL ESA and the SARA: boreal felt lichen (*Erioderma pedicellatum*), vole ears lichen (*Erioderma mollissimum*), and blue felt lichen (*Pectenia plumbea*). Boreal felt lichen and blue felt lichen are listed as Vulnerable by the Province and as Special Concern federally. Vole ears lichen is listed as Endangered under both the NL ESA and SARA. Vole ears lichen is historically known to be present in Southeast Placentia. Wrinkled Shingle Lichen (*Pannaria lurida*) is a fourth species of rare lichen known in NL but is highly unlikely to inhabit the Project Area. Nevertheless, it was sought out and was considered during blue felt lichen surveys of deciduous forests. The organism will not be discussed further as it was not found during surveys, confirming its low potential for existing in the area. The three rare lichens deemed to have potential for the Project Area are discussed below.

Blue Felt Lichen

Blue felt lichen typically grows on branches and trunks of trees but may also occur on forest floor substrates such as non-vascular vegetation (i.e., mosses) and rock (COSEWIC, 2010). Blue felt lichen is listed as vulnerable under the NL ESA. This species prefers deciduous phorophyte hosts like yellow birch, which is relatively more common in the central and northern parts of the Avalon Peninsula. Red maple (Acer rubrum) is the preferred phorophyte in Sir Robert Bond Park in Whitbourne but BLFL has been known to also occur on white spruce (Picea glauca) in other portions of the Avalon (COSEWIC, 2010).

Eighty thalli of blue felt lichen were identified on yellow birch in several small stands within the Project Area, primarily around Big Shalloway Pond (Figure 3.1.3-14).



Figure 3.1.3-14 Blue Felt Lichen on Yellow Birch Stands near Big Shalloway Pond.

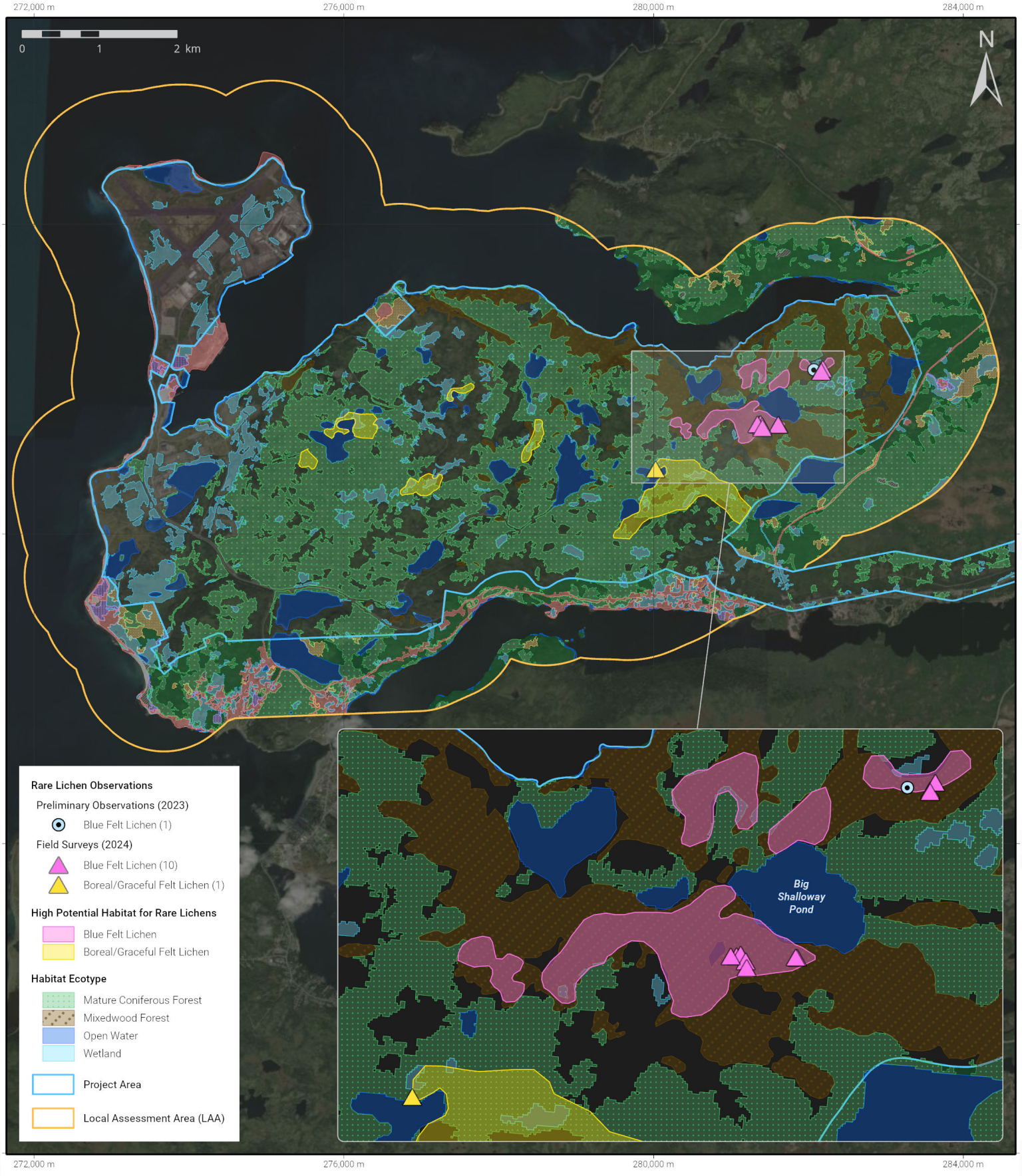
Boreal Felt Lichen and Vole Ears Lichen

The preferred phorophyte for boreal felt lichen is mature balsam fir, with the principal substrate for growth being liverwort species, *Frullania asagrayana* (Cornejo & Scheidegger, 2016). The water sacs of *Frullania* host *Rhizonema*, the cyanobacterial partner which associates with the fungal hyphae of the boreal felt lichen to create a viable lichen. Boreal felt lichen reproduces through spore dispersal using apothecia (fruiting bodies). These apothecia appear as small mushroom-like structures on the upper surface of the lichen ranging from black to bright red when fully developed. Boreal felt lichen does not reproduce by soredia (i.e., asexual reproduction structures) like many other species (e.g., *Erioderma mollissimum*, *Coccocarpia palmicola*). However, boreal felt lichen may reproduce vegetatively by fragmentation when portions of existing thalli break off and colonize a new substrate with a suitable microsite (e.g., healthy *Frullania* presence).

Anthropogenic activities that alter boreal felt lichen habitat and forest quality have historically played a role as stressors on populations in NL. These include forestry operations, land development/conversion, wildfires, gap dynamics, tree diseases, overbrowsing of balsam fir by moose, and insect infestation.

Preferred habitats for boreal felt lichen include closed canopy, mature balsam fir forests on transitions to wetlands or near waterbodies. High-potential habitats were mapped based on species composition and proximity to wetland/water (Figure 3.1.3-15) before an extensive field program that targeted 100% coverage of all high-potential areas. Preliminary surveys were conducted for boreal felt lichen and vole ears lichen during other surveys, such as the ELC ground-truthing, bird surveys, and mammal surveys. Vole ears lichen has similar habitat requirements as boreal felt lichen (but can colonize deciduous species) but is much rarer; for the survey any potential boreal felt lichen habitat was considered as potential vole ears lichen habitat.

Boreal felt lichen was (somewhat surprisingly) only found at one site north of Hickey's Pond on the eastern side of the Project Area, despite the absence from several high-potential areas. Only two thalli were observed on one balsam fir tree.



Pattern | Argentia Renewables

FIGURE NUMBER: 3.1.3 - 15		COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
FIGURE TITLE: Rare Lichen Observations and Suitable Habitat		NOTES: High potential habitat determined through ELC ecotype, terrain, canopy analysis combined with field observations (point collections) of lichen habitat potential during various terrestrial component studies.	REVIEWED BY: C Burke	
PROJECT TITLE: Argentia Renewables			APPROVED BY: C Burke	sem

SEM MAP ID: 238-005-GIS-022-Rev0

Bird Species at Risk

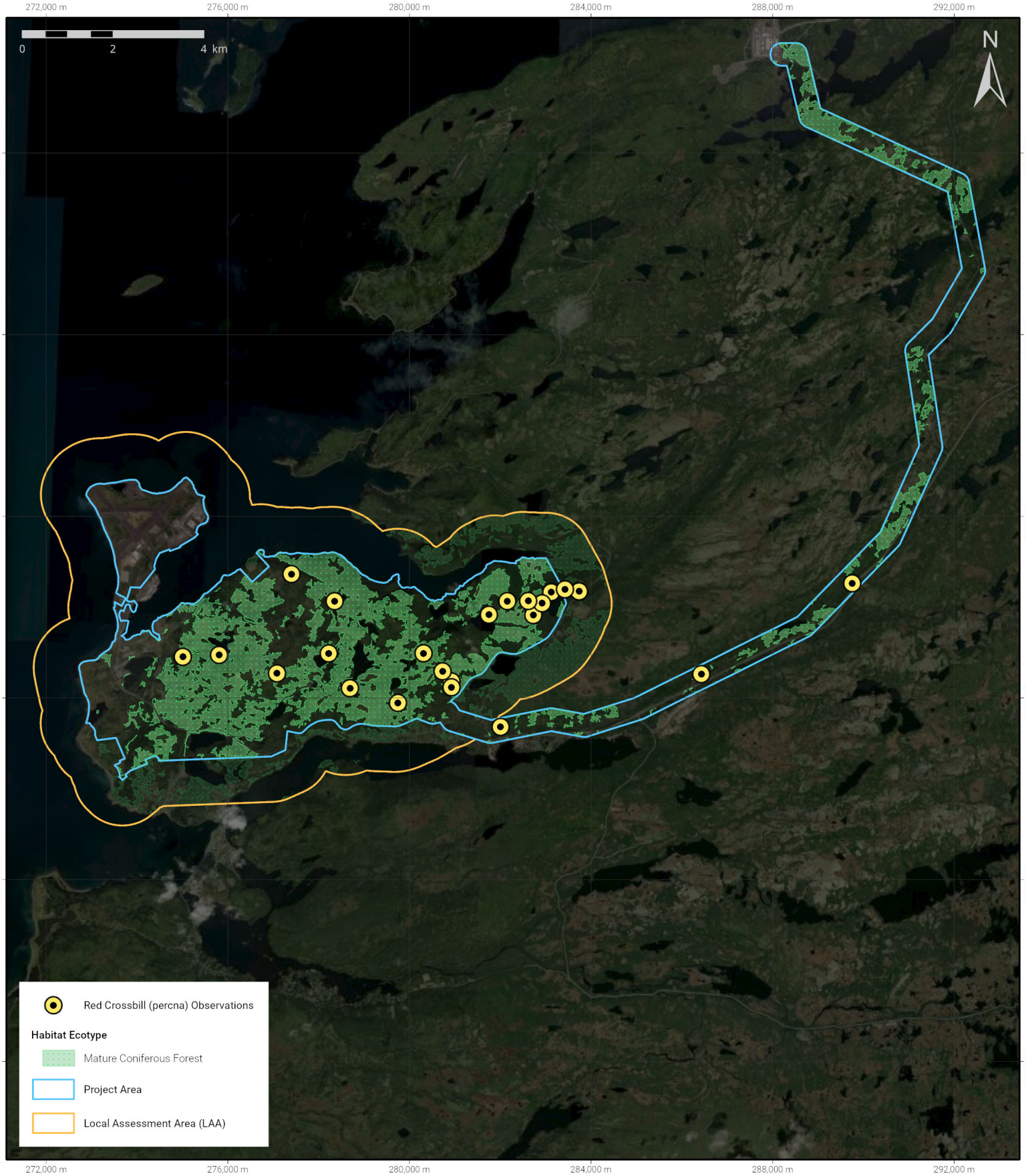
A comprehensive assessment was conducted to determine the historical presence of bird SAR in the Project Area, the potential for SAR to use the Project Area or LAA (and to interact with the Project), and the current use of the areas by SAR. The assessment was comprised of a review of AC CDC data, eBird and the NLbirds lists, species range maps, and by conducting on-the-ground surveys to establish current use. The sections below summarize the results of the desktop and field surveys for each SAR deemed possibly present in the Project Area or LAA.

Red Crossbill *percna*

The Newfoundland subspecies of Red Crossbill (*Loxia curvirostra percna*) is a medium-sized finch ranging from dull red to greyish-olive, most notably recognized by their specialized curved and crossed mandibles for seed eating (COSEWIC, 2016). It is a distinct Newfoundland subspecies listed as Threatened under the NL ESA and SARA.

A desktop ArcGIS habitat suitability exercise displayed an abundance of the Mature Coniferous ecotype in the Project Area (Figure 3.1.3-16). This ecotype comprised suitable foraging and nesting habitat for Red Crossbill *percna* in the form of mature coniferous trees with dense foliage cover (Environment Canada, 2006). Red Crossbill *percna* are dependent on conifer forests for their food resources in the form of conifer seeds and cones (COSEWIC, 2016). This species historically relied on red pine (*Pinus resinosa*) and eastern white pine (*Pinus strobus*) but due to declines in those tree species in insular NL, it now depends primarily on black and white spruce (COSEWIC, 2016). Cone availability is critical for survival and reproduction, so Red Crossbill is irruptive throughout its range, in pursuit of food resources (COSEWIC, 2016). Red Crossbill exhibits site fidelity to breeding areas, nests anytime between spring and fall in loose colonies, and foraging together in flocks (COSEWIC, 2016).

Threats to Red Crossbill *percna* in insular Newfoundland include (1) habitat alteration, due to the removal of mature coniferous habitat for forestry and development activities (COSEWIC, 2016) (2) competition for conifer cones from the introduced red squirrel (*Tamiasciurus hudsonicus)* (Benkman, 1989) (3) nest predation by squirrels, and (4) the decline of native and non-native pine trees (Benkman, 1989).



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 16	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Red Crossbill *percna* Observations and Suitable Habitat	NOTES:	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-023-Rev1

Comprehensive field studies were conducted on avifauna year-round, beginning in fall 2022 and extending to spring 2024, including targeted studies for Red Crossbill *percna* within the Mature Coniferous habitat ecotype. The species was observed several times in the Project Area, during point count surveys, transect surveys, and with autonomous recording units (ARUs). Observations were recorded during spring and fall migration, breeding season, and during winter surveys. The detailed results from Red Crossbill *percna* surveys are discussed in the Avifauna Baseline Study in Appendix D1, and mitigations for interactions with the Project are discussed in the draft Species at Risk Impacts and Mitigation Monitoring Plan (Appendix R) and Post-construction Monitoring Plan (Appendix S).

Rusty Blackbird

Rusty Blackbird (Euphagus carolinus) is a medium-sized songbird with yellow eyes and a black, slightly curved bill (COSEWIC, 2017). It is a wetland specialist that feeds primarily on invertebrates, but also on small fish and crustaceans (COSEWIC, 2017). It is listed as Vulnerable under the NL ESA and as Special Concern under Schedule 1 of the SARA and by COSEWIC. The Canadian breeding population has suffered one of the greatest population declines of birds in Canada, which ostensibly began in the 1920s (COSEWIC, 2017). There are an estimated 40,000 individuals in Atlantic Canada and are known to breed in wetlands around Newfoundland and Labrador (N.L. Department of Environment and Conservation, n.d.-a).

Rusty Blackbird breeding habitat is characterized by coniferous-dominated forests near wetlands, such as treed swamps, bogs, and beaver ponds, and nests are constructed in shrubs or small trees near water (COSEWIC, 2017). Suitable habitat for Rusty Blackbird appears to be decreasing on both the breeding and wintering grounds, due to the degradation and loss of wetlands by human activities, the contamination and/or acidification of wetlands, and habitat degradation due to climate change (COSEWIC, 2017). According to the Management Plan for Rusty Blackbird (N.L. Department of Fisheries, Forestry, and Agriculture, 2020), potential threats in Newfoundland have not been adequately studied, but habitat loss/degradation, disease transmission, and the effects of climate change have been identified as potential threats.

Within the D3-4 nesting zone of insular Newfoundland (within which the Project Area lies), Rusty Blackbird usually nests between early May and mid-July (Figure 3.1.3-17). The Wetland ecotype from the ELC (Figure 3.1.3-18) would comprise potential habitat for Rusty Blackbird and these habitats were targeted during surveys for this species. It was noted during surveys that the wetland types present were atypical of those often associated with this species; Rusty Blackbird prefers wet woodlands, often in the form of treed swamps or bogs. Most wetlands in the Project Area lacked the vertical structure necessary for this species. All areas with high potential (of which there were few) for Rusty Blackbird were visited during the breeding season. No Rusty Blackbird observations were made during the two years of surveys, and none were detected from the ARU data. While there were many wetlands in the Project Area, there

were almost none with the vertical structure typical of Rusty Blackbird breeding habitat (i.e., treed swamps or marshes, beaver ponds).

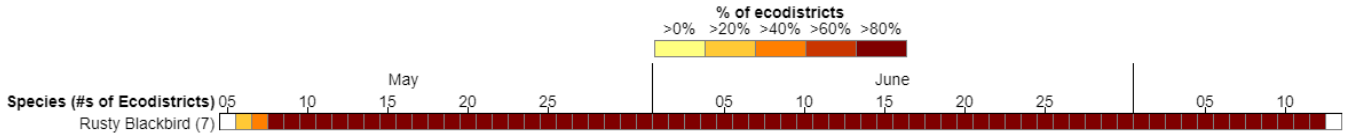
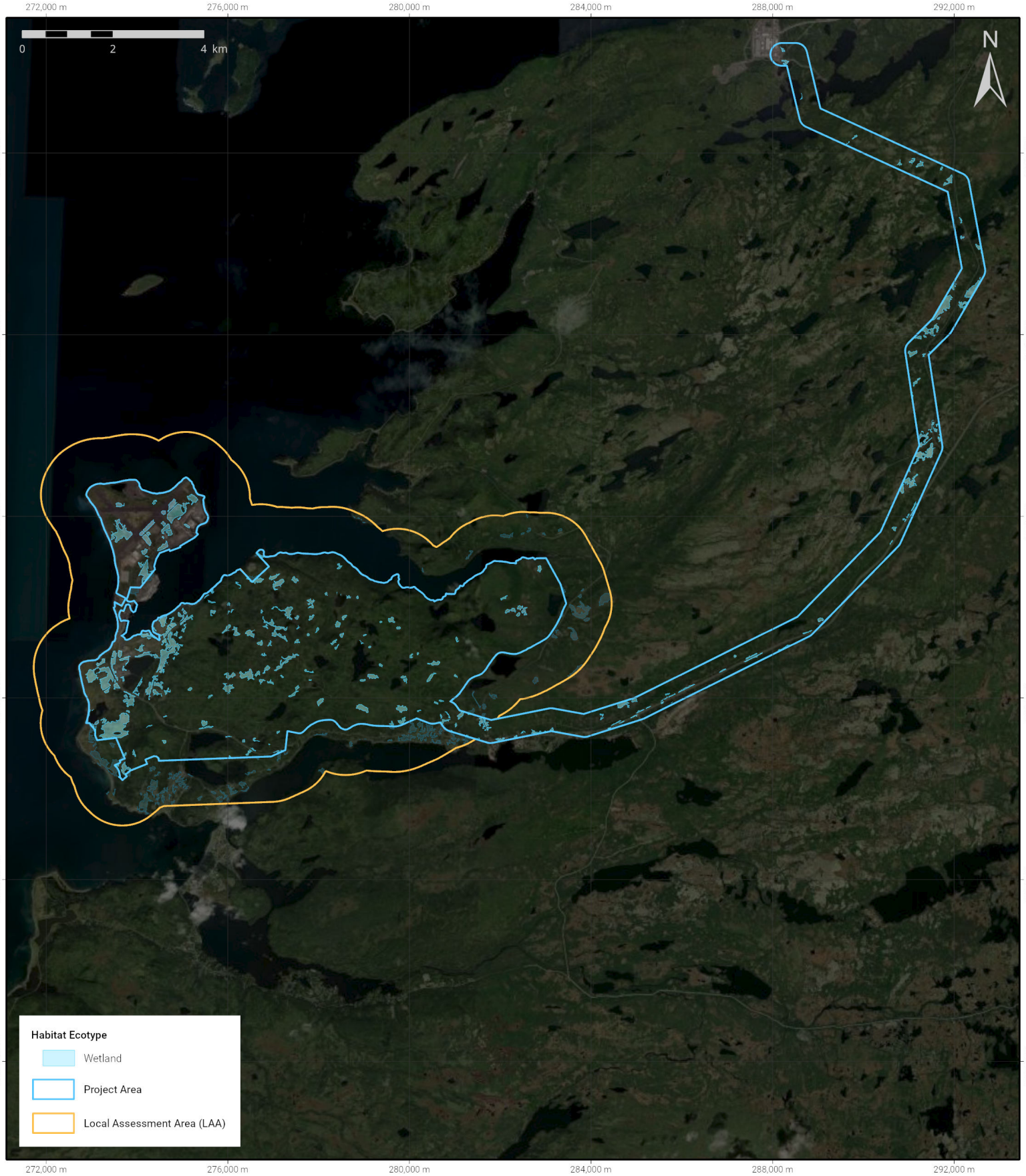


Figure 3.1.3-17 Nesting Calendar for Rusty Black Bird in D3-4.

If this SAR is detected within the Project Area in the future, mitigations will include those discussed for other passerine species in the Species at Risk Impacts and Mitigation Monitoring Plan (Appendix R) and Post Construction Monitoring Plan (Appendix S). In addition, if this SAR is observed, consultations with the NL WD will be sought to discuss appropriate mitigation measures.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 18	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Rusty Blackbird Suitable Habitat	NOTES:	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	
			sem	

SEM MAP ID: 238-005-GIS-034-Rev0

Gray-cheeked Thrush

The Gray-cheeked Thrush (*Catharus minimus minimus*) is a medium-sized thrush with a grayish-brown face and upperparts with stippling on the throat and breast. The Newfoundland subspecies of Gray-cheeked Thrush is listed as Threatened under the NL ESA (and by COSEWIC) but is not currently listed under the SARA. In Newfoundland, threats to Gray-cheeked Thrush may include habitat loss and/or fragmentation due to forestry practices and nest predation by red squirrels (Thompson *et al*., 1999; Lewis & Montevecchi, 1999). Declines may also be attributable to threats on wintering grounds rather than those on breeding grounds in Newfoundland. More research is needed to definitively establish the causal factors in the decline. Recent research has indicated that the species may be now essentially a higher elevation subspecies in NL (≥350 m) (Robineau-Charette et al., 2023).

Gray-cheeked Thrush in Newfoundland prefers windswept coastal coniferous tuckamore, coniferous scrub, and regenerating clearcuts of balsam fir saplings. In the Project Area coastal windswept conifer scrub exists in patches along the Argentia Peninsula and regenerating balsam fir thickets exist in windfallen clearings throughout the Argentia Backlands. Bogs and fens throughout the Argentia Backlands may also provide habitat in the coniferous scrub on their peripheries. Upland rocky outcrops and barrens may also contain suitable scrub habitat. The ELC ecotypes suitable for Gray-cheeked Thrush habitat therefore included Coniferous Scrub and Regenerating Coniferous Forest (Figure 3.1.3-19). Surveys for Gray-cheeked Thrush targeted those ecotypes as areas of heightened potential. Three observations of Gray-cheeked Thrush were made during the breeding bird survey, and one observation was made during the fall migration survey. This species was previously known from the Placentia area as per data from eBird, the Newfoundland Breeding Bird Atlas and the Province of Newfoundland and Labrador (Species Status Advisory Committee [SSAC], 2010). From the AC CDC data query, there was one occurrence of Gray-cheeked Thrush recorded in the Project Area in 1991. Data suggests that the once ubiquitous population on the Island of Newfoundland declined drastically in recent years (SSAC, 2010). During point count surveys in June 2023, three observations were recorded in the Project Area. Two of the observations were in a forested area near a treed bog, and the other observation was near the Argentia Sunset RV Park in mature forests.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 19	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Gray-cheeked Thrush Observations and Suitable Habitat	NOTES:	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-035-Rev0

Within the D3-D4 nesting zone of insular Newfoundland, Gray-cheeked Thrush usually nests between late May and mid-July (Figure 3.1.3-20).

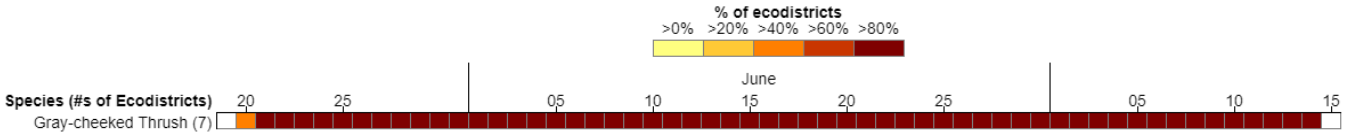
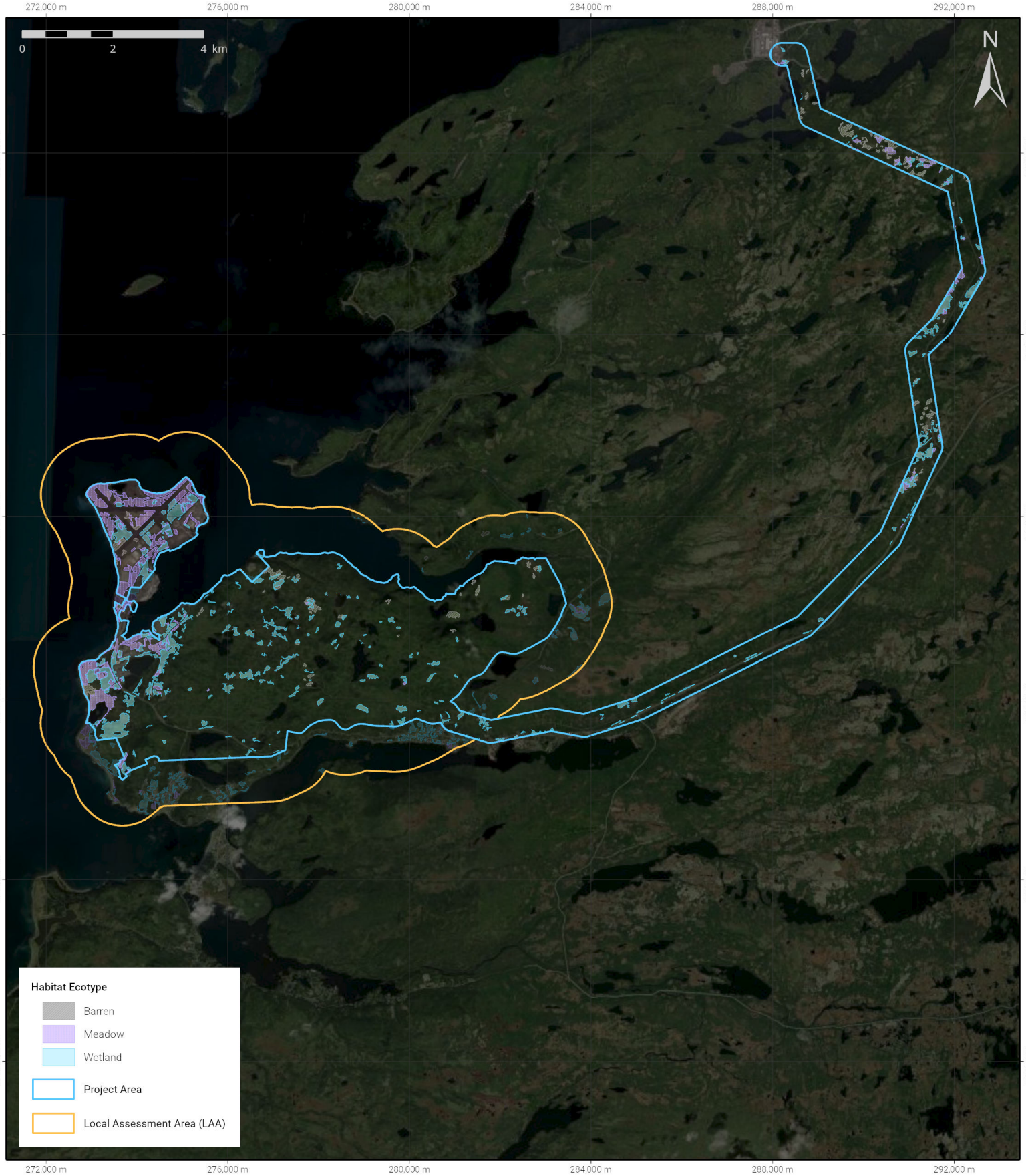


Figure 3.1.3-20 Nesting Calendar for Gray-cheeked Thrush in D3-4.

3.1.3.7 Short-eared Owl

Short-eared Owl (*Asio flammeus*) is a medium-sized owl, approximately 34-42 cm in length (COSEWIC, 2021). The plumage is mottled brown above and is buff with heavy streaking below. Unlike most owls, the Short-eared Owl is diurnal and hunts for small mammals mostly around dusk and dawn. Short-eared Owl is listed as Vulnerable under the NL ESA and was recently assessed as Threatened by COSEWIC. Short-eared Owl is listed as Special Concern under the SARA Schedule 1. Short-eared Owl is also protected by the **NL Wild Life Act** and **Wildlife Regulations**.

Short-eared Owl generally favours open habitats throughout the year, including grasslands, tundra, and wetlands (COSEWIC, 2021). In NL, Short-eared Owls have been observed in several habitat types, including tundra, coastal barrens, sand dunes, fields, and bog habitats (N.L. Department of Environment and Conservation, n.d.-b). Open habitats are particularly abundant on coastal barrens and above the treeline in Labrador, although virtually all coastal areas and nearshore islands are suitable habitat (N.L. Department of Environment and Conservation, n.d.-b). Nests are located on the ground in shallow scrapes near taller vegetation for concealment (COSEWIC, 2021). In winter, Short-eared Owl roost in conifers adjacent to open areas used for hunting or on the ground in the shelter of tall grasses or forbs (COSEWIC, 2021). Declines in the extent and quality of open grassland and wetland habitats have likely reduced the distribution and abundance of Short-eared Owl in southern Canada (COSEWIC, 2021). Short-eared Owl is also known to perch along roads and fly relatively close to the ground, sometimes colliding with vehicles (COSEWIC, 2021). Fragmentation of breeding habitat by roads and other anthropogenic developments may increase predation risk (COSEWIC, 2021). Collisions with wind turbines and power lines have also been identified as a possible threat (Environment and Climate Change Canada [ECCC], 2018a).



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 21	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Short-eared Owl Suitable Habitat	NOTES:	REVIEWED BY: CBurke	
			APPROVED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		sem	

SEM MAP ID: 238-005-GIS-036-Rev0

Within the D3-4 nesting zone of insular Newfoundland, Short-eared Owl usually nest between mid-April to mid-July (Figure 3.1.3-22).

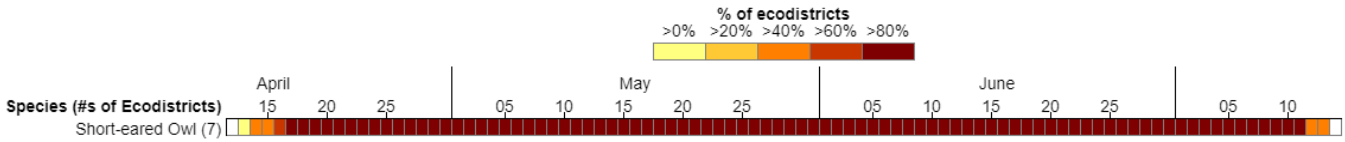


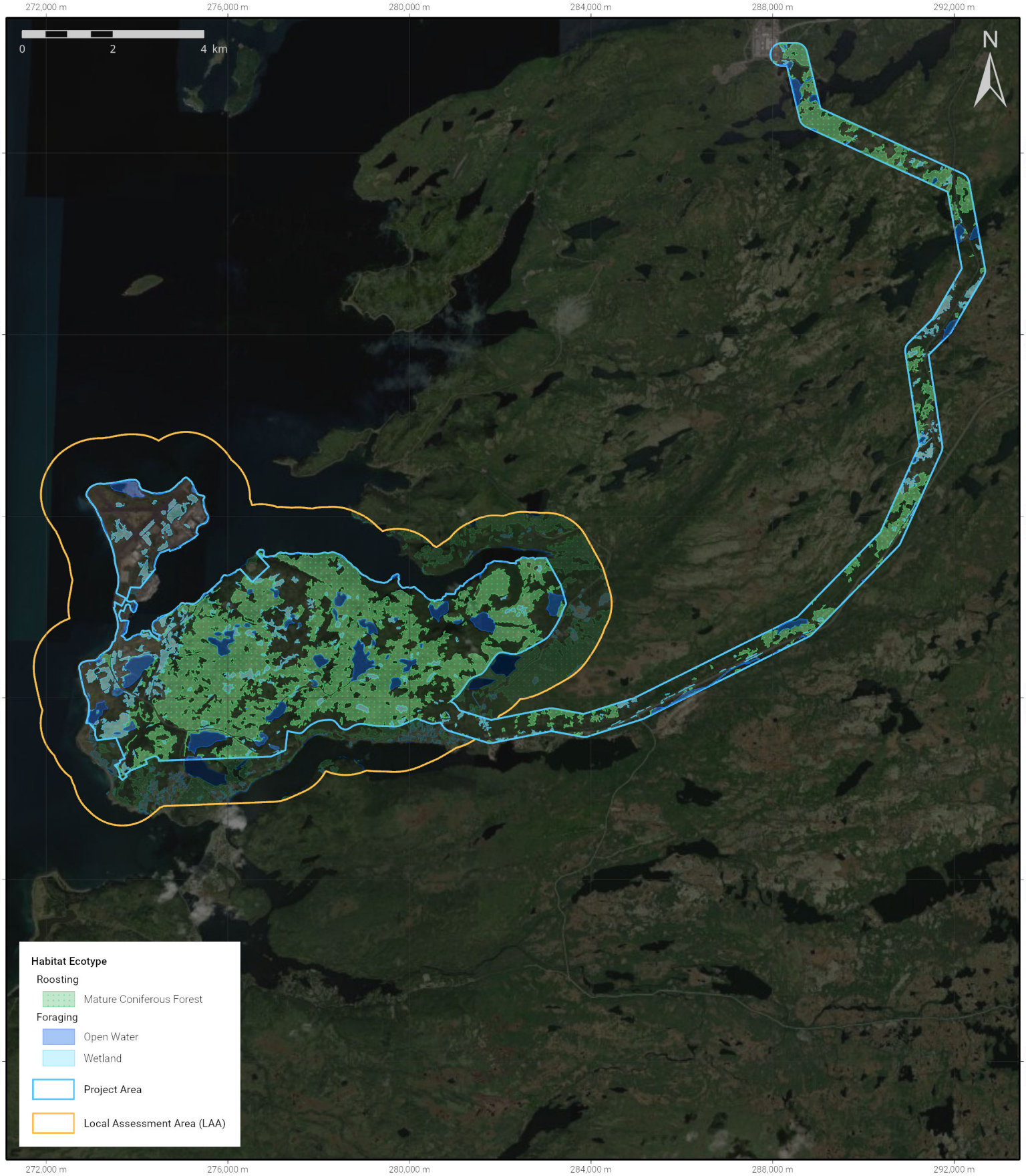
Figure 3.1.3-22 Nesting Calendar for Short-eared Owl in D3-4.

An AC CDC data request produced four historical records of Short-eared Owl within 5 km radius of the center of the Project Area, all of which occurred on the Argentia Peninsula and dated back to 1991. Two other observations occurred in July 2019 and the last one was in July of 2021. Given the industrial nature of the peninsula it is unlikely this would be considered high quality habitat.

Comprehensive field studies were conducted on avifauna year-round beginning in fall 2022 and extending to spring 2024, including targeted surveys for Short-eared Owl within the Wetland and Meadow habitat types. No Short-eared Owl observations were recorded during these surveys, but a follow-up survey will be conducted in 2024. This species will be specifically addressed as part of an avian powerline collision risk assessment to identify portions of the Project that will have bird flight diverters installed. Methods for avifauna surveys were discussed in the Avifauna Component Study in Appendix D1, and mitigations for interactions of Short-eared Owl with the Project are discussed in the Species at Risk Impacts and Mitigation Monitoring Plan (Appendix R) and Post-construction Monitoring Plan (Appendix S).

Bat Species at Risk

Four species of bats were considered possible for the Project Area. The little brown myotis (*Myotis lucifugus*) is common throughout Newfoundland and was expected to be using the Project Area. This species, along with Northern myotis (*Myotis septentrionalis*), a less commonly known species in Newfoundland, are both experiencing drastic declines due to White-nose Syndrome (WNS), a fungal disease that causes bats to arouse from hibernation and die from starvation and freezing (COSEWIC, 2013). Due to this threat, both species were listed as endangered in Canada by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2013 (COSEWIC, 2013), and were emergency listed as endangered on the federal SARA in 2014 (ECCC, 2018b). WNS was discovered in Newfoundland in 2018 (N.L. Fisheries and Land Resources, 2018), and both species were listed as Endangered under the NL ESA in 2021 (N.L. Fisheries, Forestry, and Agriculture, 2021. A map of suitable bat habitat is presented in Figure 3.1.3-23.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 23	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Bat Suitable Habitat	NOTES:	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	
			sem	

SEM MAP ID: 238-005-GIS-037-Rev0

The other two bat species found in the Project Area were the hoary bat (*Lasiurus cinereus*) and silver-haired bat (*Lasionycteris noctivagans*). These species are migratory and spend the summer months in Canada before returning south to overwinter (COSEWIC, 2023). These bats are not susceptible to WNS; however, they are at an increased risk of windmill collisions during migration (Voigt *et al*., 2024; COSEWIC, 2023).

Tables 3.1.3-11 through 3.1.3-13 demonstrate the average calls detected per night and per night hour in 2022 and 2023. Data is by detector (e.g., BL BAT 1) and by month.

Table 3.1.3-11 Average Calls per Night and Night Hour, 2022.

Species	Calls per Night		Calls per Night Hour	
	Month			
	Sept.	Oct.	Sept.	Oct.
Little brown myotis (*Myotis lucifugus*)				
BL BAT 1	1	0.0967	0.0877	0.00730
BL BAT 2	1.5	0.0322	0.131	0.00243
BL BAT 3	1.7	0.129	0.149	0.00974
NOTES • In 2022, detectors were deployed in September and October only. • Two bat species were detected in 2022: the little brown myotis and the silver-haired bat. The silver-haired bat was recorded four only times and is thus not included in this table. Further information is provided in Appendix D2 (Bat Component Study).				

Table 3.1.3-12 Average Calls per Night, 2023.

Species	Month					
	May	Jun.	Jul.	Aug.	Sept.	Oct.
Little brown myotis (*Myotis lucifugus*)						
ARG BAT 1	1.6	107.7	28.1	28.9	0.93	-
ARG BAT 2	-	-	-	50.5	4.06	-
ARG BAT 3	0.516	4.482	35.967	40.064	1.6	-
ARG BAT 4	-	0.103	11.7	8.096	1.633	-
ARG BAT 5	-	2.655	23	48.7	2.566	0.0645
Northern myotis (*Myotis septentrionalis*)						
ARG BAT 1	1.6	107.7	28.1	28.9	0.93	-
ARG BAT 2	-	-	-	1.096	0.4	0.032
ARG BAT 3	0.096	0.793	1.419	1.193	0.233	-
ARG BAT 4	-	0.103	1.483	0.806	0.2	-
ARG BAT 5	-	-	1.032	1.838	0.2	0.032
Silver-haired bat (*Lasionycteris noctivagans*)						
ARG BAT 1	-	-	-	-	-	-
ARG BAT 2	-	-	-	0.064	13.9	0.032
ARG BAT 3	-	-	-	-	-	0.032
ARG BAT 4	-	-	-	-	-	-
ARG BAT 5	-	-	-	-	0.1	0.064
Hoary bat (*Lasiurus cinereus*)						

Species	Month					
	May	Jun.	Jul.	Aug.	Sept.	Oct.
ARG BAT 1	-	-	-	-	-	-
ARG BAT 2	-	-	-	-	-	-
ARG BAT 3	-	-	-	-	-	-
ARG BAT 4	-	-	-	-	-	-
ARG BAT 5	-	-	-	-	0.5	-

Table 3.1.3-13 Average Calls per Night Hour, 2023.

Species	Month					
	May	Jun.	Jul.	Aug.	Sept.	Oct.
Little brown myotis (*Myotis lucifugus*)						
ARG BAT 1	0.182	13.156	3.313	3.039	0.081	-
ARG BAT 2	-	-	-	5.31	0.356	-
ARG BAT 3	0.058	0.547	4.236	4.217	0.14	-
ARG BAT 4	-	0.012	1.379	0.852	0.143	-
ARG BAT 5	-	0.324	2.709	5.13	0.225	0.00487
Northern myotis (*Myotis septentrionalis*)						
ARG BAT 1	0.113	0.122	0.117	0.105	0.087	-
ARG BAT 2	-	-	-	0.115	0.035	0.00243
ARG BAT 3	0.0109	0.0968	0.167	0.125	0.020	-
ARG BAT 4	-	0.012	0.174	0.084	0.017	-
ARG BAT 5	-	-	0.121	0.193	0.017	0.00243
Silver-haired bat (*Lasionycteris noctivagans*)						
ARG BAT 1	-	-	-	-	-	-
ARG BAT 2	-	-	-	0.006	1.222	0.00243
ARG BAT 3	-	-	-	-	-	0.00243
ARG BAT 4	-	-	-	-	-	-
ARG BAT 5	-	-	-	-	0.008	0.00487
Hoary bat (*Lasiurus cinereus*)						
ARG BAT 1	-	-	-	-	-	-
ARG BAT 2	-	-	-	-	-	-
ARG BAT 3	-	-	-	-	-	-
ARG BAT 4	-	-	-	-	-	-
ARG BAT 5	-	-	-	-	0.0438	-

Each bat species is discussed below, along with further results from the bat detector surveys which were conducted from fall 2022 to the present and will continue through 2024.

3.1.3.8 Little Brown Myotis

In 2013, little brown myotis (*Myotis lucifugus)* was listed as Endangered under the SARA Schedule 1 and was listed as Endangered on the NL ESA in 2021.

Little brown myotis is the most common bat in insular Newfoundland, known from all parts of the island. It is a small, insectivorous species with a diet consisting of a wide range of terrestrial and aquatic insects, which they primarily hunt in the airspace above waterbodies/wetlands (COSEWIC, 2013). In NL, little brown myotis is a resident species typically found in forested habitats near foraging habitat. In the Project Area, the Mature Coniferous Forest ecotype would be considered roosting habitat, and the Wetlands and Open Water ecotypes would be considered suitable foraging habitats. However, they may also use the airspace above and within all the other ecotypes.

During the breeding season, females form large maternity roosts where they give birth to and raise their pups (COSEWIC, 2013). Maternity roosts may be at a natural site, such as a cavity in a tree, a snag, a rock crevice, a cave, or the underside of loose bark, or, more often at an anthropogenic site such as an attic in a building or within other structures like sheds or abandoned cabins (COSEWIC, 2013). Females are thought to select a quality maternity roost at the expense of travelling long distances to forage (Broders *et al*., 2013). Little brown myotis spend winters in hibernation in underground sites, such as caves and abandoned mines.

An AC CDC data query turned up zero results for little brown bat for the Project Area, which is likely due to a lack of survey effort in the area. Baseline surveys have been conducted for all bat species since the fall of 2022 with Anabat Swift detectors deployed around the Project Area (three locations in fall 2022 and five locations in 2023), adjacent to waterbodies/wetlands deemed to be suitable foraging habitat. A brief deployment in the fall 2022 (September 9 to October 3) resulted in the detection of 134 echolocation calls of little brown myotis from all three detectors. Efforts in 2023 (from five detectors) produced 12,257 calls of Little Brown Myotis. The detector with the fewest detections had 666, and the highest had 4,973 (mean of 2,451 per detector). Monitoring is ongoing in 2024 with the deployment of eight detectors, beginning in mid-April and with a temporal window extending to November. The baseline study report on bats can be found in Appendix D2.

Northern Myotis

Northern myotis, Endangered on the NL ESA and SARA, is found throughout southern Canada and is most common in central and eastern provinces (COSEWIC, 2012). Northern myotis are insectivores and tend to forage in forested areas, on moths, and a variety of other invertebrates (Broders *et al*., 2010; BCI, 2024a). They can be difficult to visually distinguish from little brown bats, as the two species are very similar, and may share hibernacula in the winter (COSEWIC, 2012).

Suitable habitat for Northern myotis exists throughout the Project Area in the form of the Mature Coniferous Forest ecotype. This species can also be found within and using the airspace above all the other ecotypes as well.

An AC CDC data query produced zero results for Northern myotis. Bat detector surveys conducted in the fall of 2022 did not record any Northern myotis, but 643 calls were detected during 2023 (from five detectors, with a low of 47 detections and a high of 306; mean of 128.6 per detector). Monitoring is ongoing in 2024 with the deployment of eight (8) detectors, beginning in mid-April and with a temporal window extending to November. The baseline study report on bats can be found in Appendix D2.

Hoary Bat

The Hoary Bat (*Lasiurus cinereus*) is the largest bat in Canada. They have distinct brown fur heavily frosted with white on their body, yellow fur around the face, they weigh between 20-35 g, and have an average wingspan of 43 cm (Reid, 2006). Hoary Bats feed primarily on large moths, but also flies, beetles, and grasshoppers. Hoary bat is widespread in eastern Canada but is relatively rare in the Atlantic Provinces. It is a long-distance migrant, moving from northern breeding sites to overwintering sites as far south as Mexico. Hoary bats are typically solitary and roost in the foliage of mature deciduous or coniferous trees. Hoary bats are particularly vulnerable to collisions with turbines during migration and account for the majority of bat fatalities at many wind projects in North America.

An AC CDC data query produced zero results for hoary bat for the Project Area. Bat detector surveys conducted in the fall of 2022 did not record any hoary bats, but 15 calls were detected on September 20, 2023 (from just one of the five detectors on one night). From this low number of detections, it may be probable that the Argentia area is not a significant migratory route for hoary bat. However, monitoring is ongoing in 2024 with the deployment of eight detectors, beginning in mid-April and with a temporal window extending to November, and with two on meteorological towers to survey the airspace of the swept area of the turbines. The baseline study report on bats can be found in Appendix D2.

Silver-haired Bat

Silver-haired bats are a migratory species that can be found across Canada during the summer and fall (COSEWIC, 2023). In the spring, females form maternity colonies in cavities of trees or snags, where they typically give birth to two pups (COSEWIC, 2023). During this time, males are typically solitary (COSEWIC, 2023). Most silver-haired bats overwinter south of Canada (COSEWIC, 2023). They are insectivorous and eat a wide variety of insects, although tend to prefer smaller, softer insects (BCI, 2024b). Silver-haired bats have dark fur with silver or grey tips, and are larger than local bats, typically weighing between 8-11 grams (Kunz, 1982).

An AC CDC data query produced zero results for silver-haired bat for the Project Area. Bat detector surveys conducted in the fall of 2022 recorded four echolocation calls, and 426 were detected during 2023 (421 of which were from one detector). From this relatively low number of detections, it may be likely that the Argentia area is not a regular migratory route for silver-haired bat, nevertheless monitoring is ongoing in 2024 starting with the deployment of eight detectors, beginning in mid-April and with a

temporal window extending to November. The baseline study report on bats can be found in Appendix D2.

Mammals

No mammal SAR were observed in the Project Area in 2022 or 2023. An American marten(*Martes americana atrata*) hair snag survey will be undertaken in 2024 as per discussions with NL WD and in following with NL WD's guidance document (Herdman, 2014).

Insects

Yellow-banded Bumble Bee

The yellow-banded bumble bee (*Bombus terricola*) is a medium-sized bumble bee characterized by a distinctive broad band of golden yellow hair across two segments of the abdomen. The species only occurs in North America and is known to be present in every province in Canada. It is a habitat generalist, occupying a wide variety of open habitats, including meadows within coniferous, deciduous, and mixed-wood forests and woodlands; riparian zones; urban parks, gardens, and agricultural areas; and along roadsides (COSEWIC, 2015).

Primary threats facing this SAR include pathogen transmission and spillover from managed bumble bee populations in greenhouses; pollution (the use of insecticides, herbicides and fungicides in agriculture and silviculture); intensification of agriculture; and climate change (habitat shifting and alteration, and temperature extremes). Canada aims to manage this population through the restoration activities (i.e., plant bee-friendly flowering plants, conserving foraging and overwintering habitat, etc.) and the reduced use of pesticides and herbicides.

The yellow-banded bumble bee was observed on two occasions within the Project Area (Figure 3.1.3-24), during avian surveys. A dedicated survey will be conducted in August 2024.



Figure 3.1.3-24 A Young *Bombus terricola* Queen in the Project Area.

3.1.3.9 Geology

Geological desktop analysis and interpretation has been conducted on the Project Area, which includes the Argentia Peninsula, and the Argentia Backlands. The purpose of the study was to review, interpret, and predict within reason possible geological hazards of the Project Area and suggest possible and reasonable mitigation measures to reduce the effects of any unpredicted hazardous events. Review of topographic, surficial and bedrock mapping, geological research, and all publicly available material was used to complete this assessment.

The surficial geology of the Project Area is primarily shaped by the latest glaciation period, the late Wisconsin, resulting in a thin sediment layer or till veneer covering most of the Project Area (AMEC, 2013). Surficial geology mapping from the Newfoundland and Labrador Geological Survey (Catto, 1998) indicates that the majority of the Project Area in the western sections of the Argentia Backlands is covered by thin veneers of glacial till, primarily composed of diamicton and was transported and deposited by the receding glaciers. The eastern side of the Badlands is mostly bog, with poorly drained accumulations of peat, peat moss, and other organic matter, as the area contains a topographic low and has poor drainage (Taylor *et al*., 1994). Areas on both sides also contain smaller wedges of glacial till and bog. There are areas of exposed bedrock as well.

The POA area is characterized as a long, level terrace with gently inclined step-like surface, bounded by the waters of Placentia Bay. Marine sediments of clay, silt, sand, gravel and diamicton are generally

moderately to well sorted and are commonly stratified, and make up the surface of the terrace. A combination of glaciation, coastal erosion and delta-like deposition were involved in the moulding of the landscape of the Argentia Peninsula (Taylor, 1994). The terrain of the Backlands is similar to a hummocky-type with a level landscape along the coast and the Argentia Peninsula. The hummocky characteristic of the Project Area is greatly bedrock controlled, with areas of dense to sparse vegetation within the topographic lows. The north side of the Project Area steeply descends into the waters of Placentia Sound.

The underlying bedrock of the Argentia Backlands Project Area, which is either exposed at surface in locations of higher topography or covered beneath the thin layer of glacial till in lower areas, consists of major rock units of the Bull Arm Formation within the Musgravetown Group These rock units are each comprised of three major rock-types: 1) Mafic flows, which includes minor felsic flows and clastic sedimentary rocks; 2) Predominantly crystal and lithic tuffs; and 3) Mafic to felsic variegated flows, and pyroclastic and clastic sedimentary rocks (King, 1988). These rock-types are examples of a subaerial volcanic formation. These bimodal volcanic rock sequences are some of the oldest rocks on the Avalon and were formed during the Ediacaran of the Neoproterozoic era, dated approximately 605 million years ago (Mills 2023).

Deformation processes during the bedrock formation, caused the rock units to create a dome like structure of an anticline (King, 1988) during what is known as the “Avalon Orogeny”, the first of three major deformation periods of the Avalon associated with the eastern margins of the Appalachians (Hughes, 1970, 1972).

The Project Area of the Argentia terrace, the future plant location, is underline by a clastic sedimentary rock unit which is one of the two members of the Big Head Formation. This formation is described as wavy bedded, gray to green tuffaceous siltstone and arkose with local inclusion of the Whiteway Member, which consists of red sandstone and siltstone (King, 1988). This unit is younger than the Bull Arm Formation and is believed to have formed during the Gaskiers glaciation period, approximately 580 Ma (million years) ago. The glacial origin is derived as the unit contains diamictites, a generalized term for any poorly sorted sedimentary rock unit of any depositional origin. Also, the unit shows the presence of sedimentary tillites Mills *et al*., 2021. Brückner (1977) concluded that the diamictites within the Big Head Formation more then likely originated from the Bull Arm Formation. Even though no glacial striae were found, the author noted that as the poor sorting of both clasts and matrix material, the range of clast lithology, shape and size, and the general appearance of the Long Harbour diamictite, which “so closely resemble those of the Gaskiers tillite”, are sufficient criteria upon which to interpret the former as “genuine tillite” (Mills *et al*., 2021).

3.1.4 Land and Resource Use

Land and resource use (LRU) is selected as a valued component (VC) for the assessment and mitigation of Project associated effects on ecological and societal values. This section considers the five key indicators (KI) through which the LRU VC and the Project interact: private and municipal designated land use, commercial and industrial resource use, recreation and subsistence land and resource use, protected sensitive areas, and Indigenous land use. A secondary source study was conducted to compile the existing LRU in the RAA. The scope of this assessment follows the Project Area, LAA, and RAA as outlined in Chapter 2, Section 2.1.1.1.

3.1.4.1 Zoning

The Project Area is located in Argentia, NL, a seaport and industrial park located on the brownfield Argentia Peninsula of a former American military base, and it extends eastward to encompass 3,578 hectares of private land (owned by the POA) into the Argentia Backlands of Placentia. Argentia Green Fuels production and export facility will be constructed on the Argentia Peninsula along with six wind turbines (out of the preliminary 46 turbines). Four turbines will be located just south of Highway 102 near Cooper Drive, and the remaining thirty-six turbines will be distributed throughout the Argentia Backlands (Figure 2.1-1). New Linear infrastructure associated with the Project will include a network of secondary roads to each turbine, collector lines, Project Gen-Tie, and a series of water supply pipelines connecting the PPWSA to the Argentia Green Fuels Facility. In addition, a new Project Interconnect Line, approximately 25 km long, may be required, pending further studies, to be constructed largely parallel to an existing line and will connect to the Long Harbour terminal station. This section would be constructed on Crown Land. The existing transmission line is on leased crown land (title number 23010). The remainder of Project components (Argentia Wind Facility, Argentia Green Fuels Facility, laydown areas, collector lines) are on POA Property.

There are no federal government owned lands, including national parks or Canadian forces bases, proximate to the Project Area and the Project is located wholly within the province of NL.

The RAA overlaps with three municipal planning areas, Town of Placentia, Fox Harbour, and Town of Long Harbour – Mount Arlington Heights (Figure 3.1.4-1). Each of these towns are incorporated, by order, under the **Municipalities Act, 1999** and is the subject of a municipal plan registered under the **Urban and Rural Planning Act, 2000**. Placentia as it is seen today is the result of an amalgamation of the following communities, Placentia (“Townside”), Southeast Placentia, Freshwater, Dunville, and Jerseyside. Placentia also includes the Argentia Industrial Park in its Municipal planning. Within the RAA, there are three unincorporated communities of Iona, Little Barasway, and Ship Harbour.

The Project is slated to occur predominantly within the Town of Placentia. The registered municipal land use map for the Project Area is a combination of industrial and rural zoning. At the time of Registration, the Argentia Backlands portion of the Project is zoned as rural under the Town of Placentia Municipal

Plan 2014-2024 (D.W. Knight Associates., 2015). However, in discussion with the Town of Placentia on March 20, 2020, the following modifications were considered based on the existing Municipal Land Use Plan:

- Substation location must be classified as industrial, or rules for rural must be amended to allow substations.
- Turbine locations must be classified as industrial, or rules for rural must be amended.
- If the Argentia Green Fuels Facility is considered regular industrial, no amendment required as it fits existing zoning of the Argentia Peninsula. However, if hazardous industrial, Argentia Green Fuels location must be classified as hazardous industrial, or rules for general industry must be amended.

In this discussion, the two options for getting the correct municipal zoning to accommodate the Project are an amendment to the Municipal Land Use Plan and a filing of a new Land Use Plan; based on the associated timelines of 3-4 months and up to 18 months, respectively, it was agreed, between the Project and the Town, that an amendment is the preferred option to ensure rezoning is completed promptly following Environmental Assessment approval.

In addition, the Project Interconnect Line will be substantially located on Crown Lands until joining the substation in Long Harbour. The Long Harbour substation is zoned as special industrial.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.4 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Municipal Planning Zones in the Project and Assessment Areas	NOTES: Municipal land use and protected road zone data sourced from the NL Government Land Use Atlas.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-024-Rev0

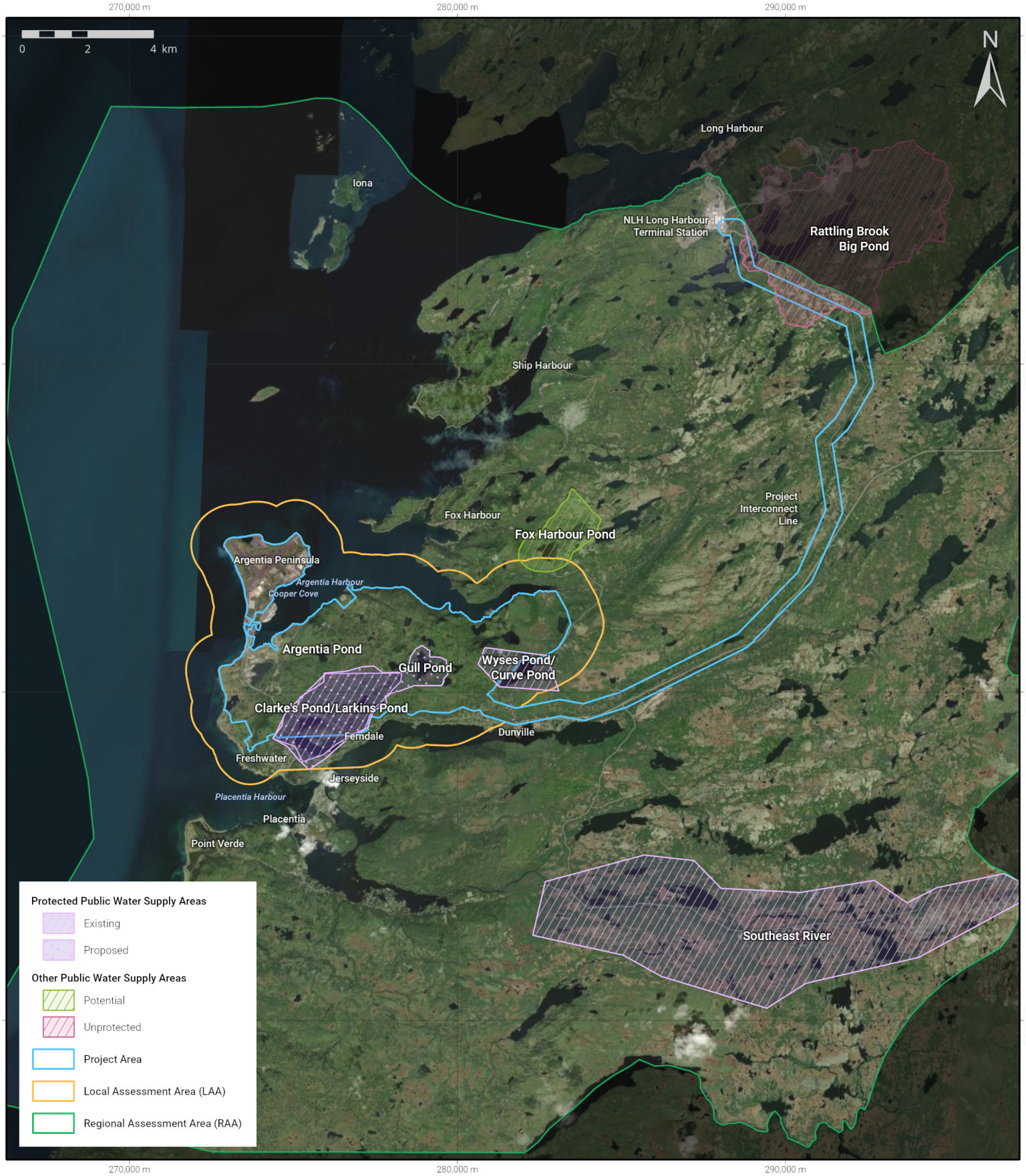
Protected Public Water Supply Areas

Within the Project RAA, there are three PPWSAs and two unprotected watersheds included in the Town of Placentia's Municipal Plan (D. W. Knight Associates, 2015). Two of the protected watersheds are located within the LAA include Clarke's Pond/Larkins Pond and Wyses Pond/Curve Pond, the third is Southeast River located south of Placentia in the Projects RAA (Figure 3.1.4-2). The three unprotected watersheds include Argentia Pond and Gull Pond, both of which are located within the LAA, and Rattling Brook Big Pond.

- Clarke's Pond/Larkins Pond watershed is partially located within the Argentia Backlands and is located within a significantly developed section of Freshwater and Jerseyside (D. W. Knight Associates, 2015). This watershed provides water to the amalgamated communities of Placentia including Southeast Placentia, Freshwater, Jerseyside, and Ferndale (PEC, 2024). Existing development is allowed to continue, provided water quality is not affected. At the discretion of Council, new single dwellings may be permitted on an infill (between two developed lots) basis along existing public roads (D. W. Knight Associates, 2015).
- Wyses Pond/Curve Pond watershed remains protected as a water reserve, and no longer provides water services to Dunville. The municipality intends to keep this water supply substantially undeveloped, limiting developments to land use activities and structures associated with the future provision of domestic water supply and passive recreation (D. W. Knight Associates, 2015).
- Southeast River was developed as a water supply for the former community of Placentia (D. W. Knight Associates, 2015). Mineral workings or forestry activity may be permitted subject to the controls on mineral workings set out in this Municipal Plan and subject to the approval of the Departments of Environment and Conservation and Natural Resources (D. W. Knight Associates, 2015).
- Argentia Pond no longer supplies water to the Industrial Complex and is not a protected watershed.
- Gull Pond and Barrows Pond are watershed reserves that are being added to the Clarke's/Larkins Pond system and will be protected under the PPWSA (PEC, 2024). See figure 3.1.4-2 for the proposed Gull Pond PPWSA.
- Rattling Brook Big Pond Watershed marginally overlaps with the projects RAA at its northern extent next to Long Harbour South. This watershed is managed by the Municipality of Long Harbour and its intended use is to support any large industry on the south side of the harbour.

As per the municipal plans, no development is permitted in these watersheds without approval by the Department of Environment and Climate Change – Water Resources Management Division. However, the construction of roads as well as transmission lines are permitted and will be developed within the

PPWSA as part of this Project. These watersheds are managed for the purpose of preserving water quality for the residents and the surrounding environment. A description of municipal water supply infrastructure and availability appears in the Source Water Hydrology Report (Appendix C1).



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.4 - 2	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Public Water Supplies in the Project and Assessment Areas	NOTES: Public Water Supply data sourced from the NL Government Land Use Atlas.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-025-Rev1

Protected Roads

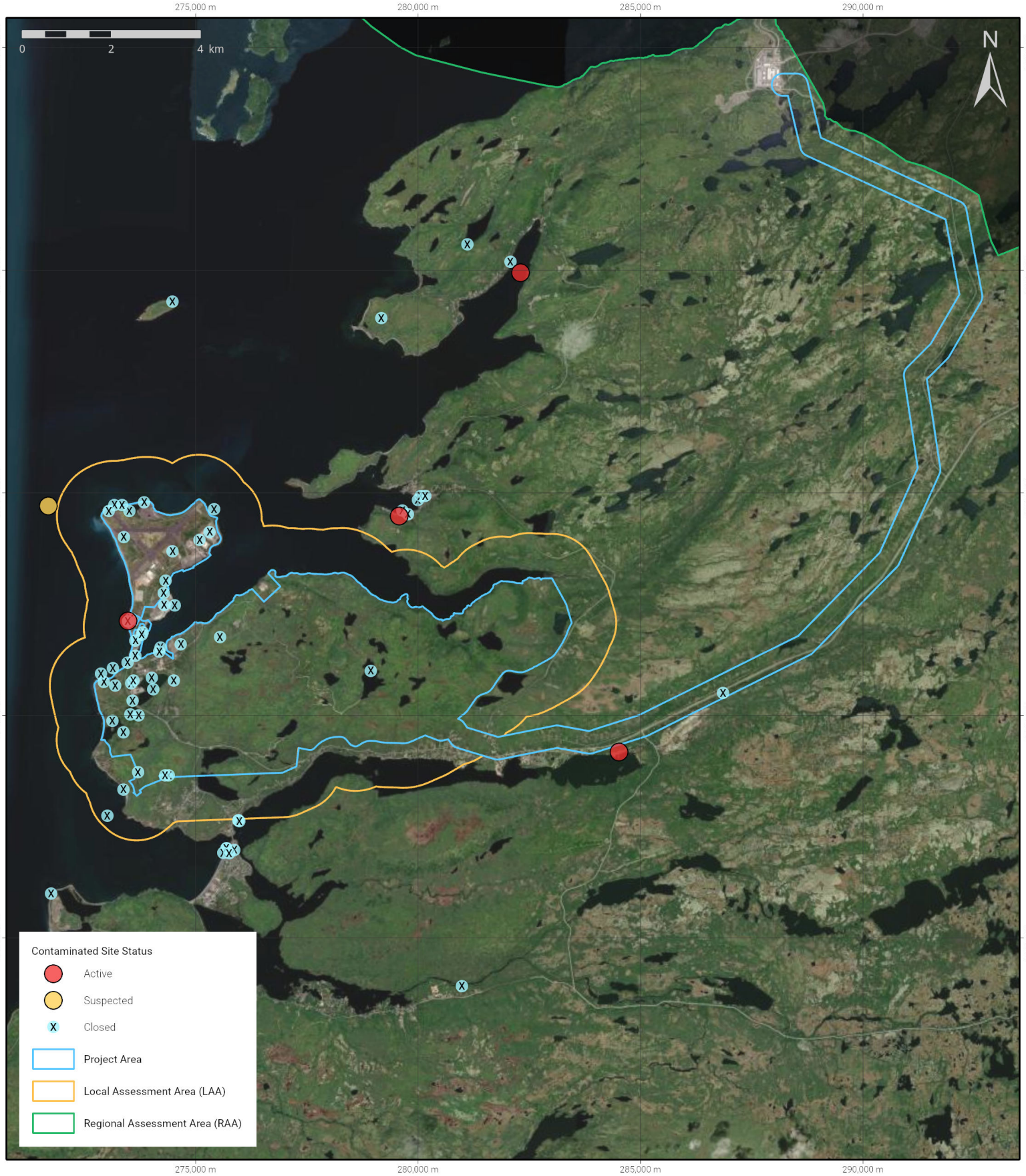
Protected road designations exist under Section 61 of the **Urban and Rural Planning Act** (2000) to control the development within a buffered area along roadways in both Crown Lands and private lands. Within the RAA, where the Project Interconnect Line twins the existing transmission line along Route NL-100 there are two areas of protected roads. The first begins at the Southeast Placentia Road and extends east approximately 4.2 km and buffers 100 m on either side of the highway (Figure 3.1.4-2). This section of protected road runs through an approved Municipal Plan for the Town of Placentia under the provisions of the **Urban and Rural Planning Act**. The second section abuts the first on the eastern Project boundary and continues along NL-100 extending to the Trans Canada Highway (TCH). With the only exception near the Town of Whitbourne, the protected road area buffers the road 400 m on either side. This section of protected road regulates the permit allocation for building development within the protected area with an exception for signs which are permitted to be erected and displayed in accordance with the **Highway Sign Regulations**.

3.1.4.2 Commercial and Industrial Resource Use

Port of Argentia

The Argentia Peninsula was established as a US Naval Base during WW II (1941) as part of a 99 year Lend-Lease agreement between Great Britain and the United States. After its final closure (starting in 1974 and finally completed in 1994) the Government of Canada (Public Works and Government Services – PWGSC) took over the property and completed a massive decommissioning starting with an extensive Environmental Site Assessment in 1993/94 (Janes & Worthman, 2005). In 1995 the Argentia Management Authority (AMA) was formed, and a decade-long Remediation Project commenced, with project completion in 2006/07 (Janes & Worthman, 2005). In 2001 the Government of Canada property and “Port” were transferred to the AMA (Port of Argentia, 2023). In 2015 the property was rebranded and renamed the Port of Argentia (POA) (Port of Argentia, 2015).

Most of the POA property can be considered a “brownfield site”. The peninsula is heavily developed and lacks native vegetative cover. Within the POA Property boundaries, there are a number of secured contaminated sites that are well defined and for which some restrictions may remain in place (Figure 3.1.4-3) (Treasury Board of Canada Secretariat, 2023). A Project Environmental Site Assessment will be completed and, as appropriate, Project infrastructure may be adjusted based on report findings.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.4 - 3	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Federal Contaminated Sites in the Project and Assessment Areas	NOTES: Contaminated Site data sourced from the Treasury Board of Canada Secretariat Federal Contaminated Sites Inventory (April 24, 2024).	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-026-Rev0

The 3,578 ha comprising the POA landmass (Project Area in Figure 3.1.4-1) includes the Argentia Peninsula (1,191 ha) as well as adjacent land, referred to as the Argentia Backlands (2,387 ha) . The POA currently exercises full care, custody, and control over its diverse range of assets and facilities (Dillon Consulting, 2023). The Argentia Peninsula portion of the property has a natural barrier of rolling hills that provide separation from residences, with the nearest structure 4 km away from the marine terminal at Cooper Cove (Dillon Consulting, 2023). Adjacent property owners include Marine Atlantic (ferry terminal), Government of Canada (Canadian Coast Guard - CCG Vessel Traffic Centre), Province of Newfoundland and Labrador (Argentia Ferry Access Road, Tourist Information Centre), and US Government (United States Navy/TE Building).

The POA operates as an industrial hub serving a variety of users and tenants (Port of Argentia, 2023). A network of roads provides access throughout the property, and electricity is available throughout the port facility (Dillon Consulting, 2023). Water is supplied from the Placentia municipal water supply (Dillon Consulting, 2023). The POA can accept vessels up to 300 metres in length and up to 11 metres draft. As a heavy industrial seaport, the POA facilities include:

- 319 ha of harbour lands which are composed of:
    - 70 ha of paved runways (for use as a marshalling yard for Wind Turbine Monopiles).
    - 40 ha secured marine terminal with quayside storage yard.
    - 3 km ice-free, deep-water harbour, with a wide turning basin.
    - 630 m length of docking facilities with up to 11 m / 36 ft of draft.
    - Experienced stevedore crews trained in off-loading numerous types of cargo and certified to handle hazardous material, including explosives.
    - Extensive land zoned for industrial use.
    - Pilotage services.

In addition to Argentia Renewables Wind LP, there are 40 existing users/tenants at the POA. Currently, Argentia Capital Inc. (a joint venture between POA and Torrent Capital) is planning to expand the services available at the port by expansion of the docking facilities and related upgrades to attract more business. Other infrastructure enhancements are proposed for features such as in-ground utilities and port electrification, as well as a mobile harbour crane and ancillary warehouses. The POA serves a series of domestic and international container shipping lines. Eimskip provides Trans-Atlantic container service between European ports and North America, calling weekly at Argentia on its Green Line. TMSI offers short-sea container service with weekly calls at Argentia, Halifax, and St. Pierre.

The POA is establishing North America’s first and only monopile marshalling port in support of US offshore wind projects. Argentia’s strategic location and proximity to US offshore wind developments are key factors in securing contracts to receive monopiles for laydown and storage. Grieg Seafood NL has selected Argentia as its preferred site for a feed distribution hub to supply its sea cages in Placentia Bay.

POA is expanding its support to this sustainable industry with a new aquaculture dedicated wharf development, complete with supply warehouses laydown acreage quayside.

Vessel traffic associated with the POA has been reported by Dillon Consulting (2023); see Table 3.1.4-1. The ten-year average (2013 – 2022) was 173 vessels (range 137 – 217). The monthly average ranges from 12 (Dec, Jan, Feb) to 18 (May). The overall range by month is from six (Feb 2013) to 34 (Apr 2017). This reflects an average of less than one vessel movement per day. The values in Table 3.1.4-1 represent vessel transit arrivals only, departures are counted separately. Marine Atlantic vessel movements are also tracked separately and can be seen in Table 3.1.4-2, where each arrival and departure count as a combined single sailing.

Table 3.1.4-1 Port of Argentia Vessel Traffic 2013 – 2023.

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	TOTAL
2013	15	6	13	15	17	11	9	10	15	17	10	12	150
2014	9	7	12	12	12	15	11	15	21	13	10	9	146
2015	7	8	9	12	13	11	12	13	14	12	14	12	137
2016	12	14	15	22	14	14	12	14	15	15	15	11	173
2017	14	19	14	34	20	14	15	12	9	13	13	11	188
2018	7	8	12	18	18	14	14	10	17	16	15	9	158
2019	14	10	15	16	19	15	19	22	13	17	19	18	197
2020	14	18	22	16	29	22	16	19	17	16	15	13	217
2021	16	12	14	12	18	17	17	20	16	18	9	12	181
2022	15	14	14	18	24	12	17	16	16	16	11	16	189
2023	15	16	14	16	15	-	-	-	-	-	-	-	76

Table 3.1.4-2 Marine Atlantic Ferry Traffic 2014-2023

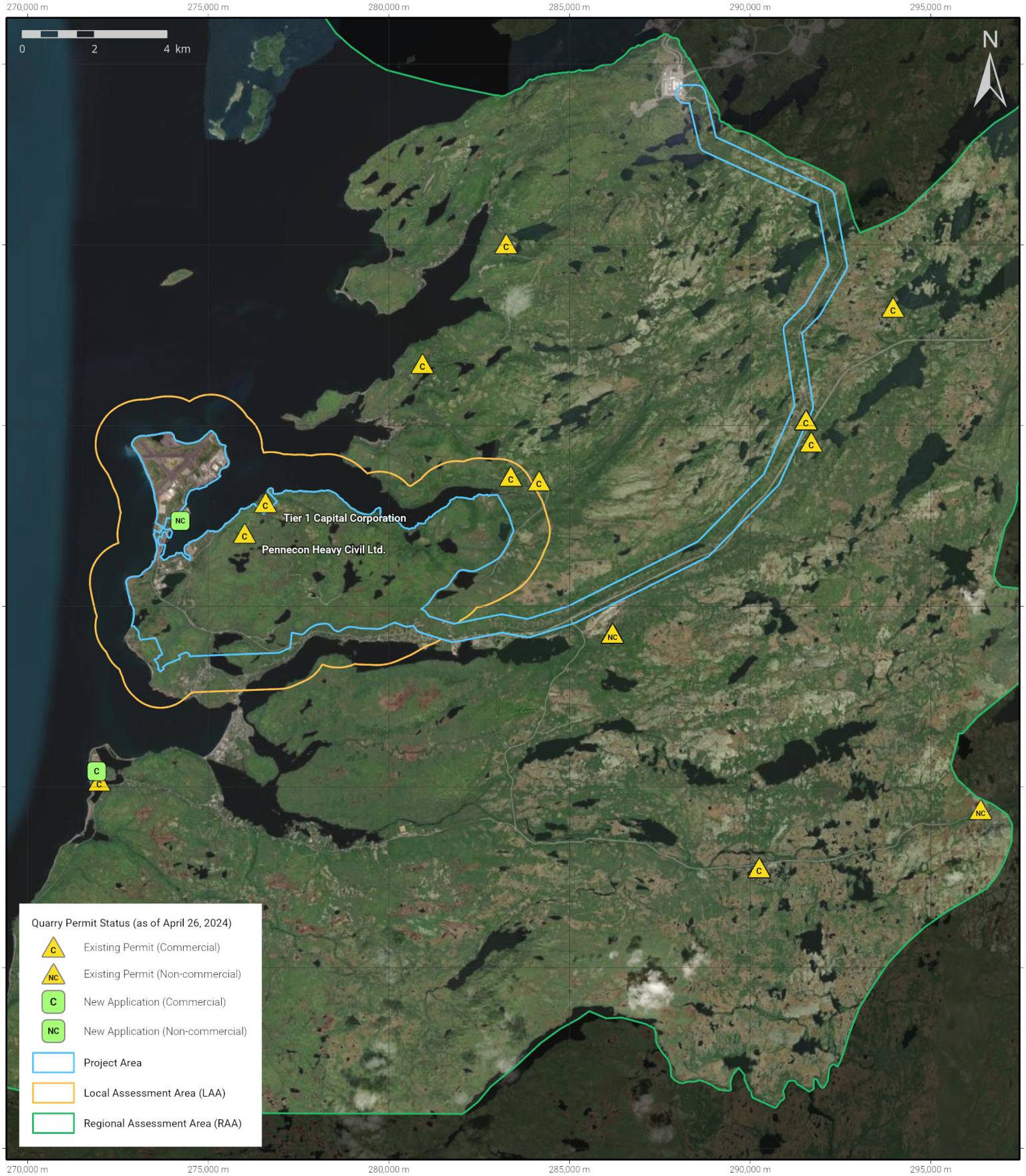
Year	June	July	Aug	Sept	Oct	Nov	Dec	TOTAL
2014	10	24	27	15	-	-	-	76
2015	10	27	25	18	-	-	-	80
2016	12	27	26	17	-	-	-	82
2017	13	27	26	16	-	-	-	82
2018	14	26	27	17	-	-	-	84
2019	9	26	27	14	-	-	-	76
2020	0	0	0	0	-	-	-	0
2021	0	16	18	10	-	9	2	55
2022	12	27	24	13	-	-	-	76
2023	13	27	26	16	-	-	-	82

Mining, Quarrying, and Petroleum

Within the extents of the RAA, there are currently 16 issued quarry permits and two new permit applications (retrieved from the NL GeoScience Atlas, April 26th, 2024). Of the 16 issued permits, 14 are considered 'Commercial' and two are considered 'Non-commercial' while the two new permit applications include one 'Commercial' and one 'Non-commercial'. Permitted quarry activity (including new applications) within the outer RAA extent covers an area of 55.51 hectares being held by 13 different companies (Newfoundland and Labrador Mineral Lands Division, 2024b). Figure 3.1.4-4 below shows the locations of all quarry activity within the RAA extent with details provided in Table 3.1.4-3.

Table 3.1.4-3 List of Current Quarry Permits within the RAA (as of April 26, 2024).

Permit ID	Permit Class	Company Name	Purpose	Size (Ha)
149057	Quarry Permit	M.J. Hickey Construction Ltd.	Commercial	0.98
148767	Quarry Permit	Tier 1 Capital Corporation	Commercial	3.17
148025	Quarry Permit	Oldridge Holdings Ltd.	Commercial	2
148704	Quarry Permit	Maher's Heavy Equipment Ltd.	Commercial	0.5
148002	Quarry Permit	Edward Meade	Commercial	1
148582	Quarry Permit	J & E Enterprises Ltd.	Commercial	1
149056	Quarry Permit	M.J. Hickey Construction Ltd.	Commercial	5.78
147924	Quarry Permit	Dept. of Transportation and Infrastructure	Non-commercial	2.5
148876	Quarry Permit	Meade's Services & Storage Ltd.	Commercial	1
147798	Quarry Permit	M.J. Hickey Construction Ltd.	Commercial	0.98
147800	Quarry Permit	M.J. Hickey Construction Ltd.	Commercial	5.78
149055	Quarry Permit	M.J. Hickey Construction Ltd.	Non-commercial	5
148793	Quarry Permit	RJG Construction	Commercial	1
148602	Quarry Permit	Pennecon Heavy Civil Ltd.	Commercial	3.87
147894	Quarry Permit	Meade's Services & Storage Ltd.	Commercial	1
148365	Quarry Permit	KJH Dirtwork's	Commercial	1
148296	New Application	Port of Argentia Inc	Non-commercial	9.95
146651	New Application	Farrells Excavating Ltd.	Commercial	9



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.4 - 4	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Quarry Permits in the Project and Assessment Areas	NOTES: Quarry Permit data sourced from NL Mineral Lands Division GeoScience Atlas on April 26, 2024.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-027-Rev0

Two quarries currently located on the POA Property are being considered for use for the Project. One is permitted to Tier 1 Capital Corporation located on Broad Cove Head, Argentia and encompasses 3.17 ha. The second is permitted to Pennecon Heavy Civil Ltd. located on Silver Mine Rd, Argentia and encompasses 3.87 ha. If additional quarry materials are required beyond what these two quarries can supply, the Project will assess potential quarry sites and give preference to a single site provider, rather than multiple smaller quarry sites.

No active mines are located within the RAA. One historical mine, Silver Cliff Mine, was located on the Argentia Backlands. Since its discovery in 1882, intermittent operations continued until 1925 (Prospector Resource Room, 2014). The original nine veins are polymetallic Ag-Pb-Zn^{+}/-Au^{-} rich, only two of which have been developed, the Fowler Vein and MacKay Vein, have since increased to 20 recorded veins on the property (Prospector Resource Room, 2014). The property became restricted from 1941-1994 because of the US Military base, and then the land became privately owned the mineral claims have not been further developed (Prospector Resource Room, 2014).

As of April 26, 2024, there are 15 mineral licences listed within or overlapping with the outer extents of the RAA totalling an area of approximately 2,024 Ha. While some licences do occur outside the Project area, eight licences are contained within the Project Area, with a total of approximately 775 ha. Figure 3.1.4-5 and Table 3.1.4-4 below illustrate and list the current active mineral licences within the outer extents of the RAA (Newfoundland and Labrador Mineral Lands Division,2024a). The Project recognizes that residents of NL have the right to apply for mineral licences within the province, and the company will consult and work with the Mineral Lands Division of the Newfoundland and Labrador Department of Industry, Energy and Technology (NLDIET) to ensure that Project site safety is maintained while mitigating any issues from the mineral licences and their holders.

While the RAA has not seen any exploration activities for petroleum, the POA has actively supported the growth and development of the province’s offshore Oil and Gas industry infrastructure through projects including Cenovus Energy, Cooper Cove Development, and Bay du Nord.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.4 - 5	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Mineral Licenses in the Project and Assessment Areas	NOTES: Mineral License data sourced from NL Mineral Lands Division GeoScience Atlas on April 26, 2024.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-028-Rev0

Table 3.1.4-4 List of Mineral Licences within the RAA (March 2024).

Mineral Licence Number	Licence Holder	Number of Claims	Licence Status	Issued Date	Expiry Date	Permit Area (Ha)
037594M	Bond Rideout	4	Issued	2024-03-28	2029-03-28	100
017107M	Jason White	1	Issued	2004-06-03	2024-06-03	25
023018M	Jason White	3	Issued	2010-04-08	2025-04-08	75
023019M	Jason White	5	Issued	2012-12-03	2027-12-03	125
030867M	Jason White	3	Issued	2020-05-31	2025-05-31	75
033181M	John Cochrane	6	Issued	2021-07-26	2026-07-26	150
035574M	John Cochrane	1	Issued	2023-06-23	2028-06-23	25
036436M	Maxine Cochrane	10	Issued	2023-08-31	2028-08-31	250
036917M	Maxine Cochrane	2	Issued	2024-01-02	2029-01-02	50
031930M	Nathan Fleming	10	Issued	2021-01-29	2026-01-29	250
033034M	Nathan Fleming	3	Issued	2021-07-05	2026-07-05	75
035021M	Stephen Sheppard	11	Issued	2022-09-22	2027-09-22	275
035023M	Stephen Sheppard	4	Issued	2022-09-22	2027-09-22	100
036883M	Stephen Sheppard	4	Issued	2023-12-15	2028-12-15	100
025659M	Vulcan Minerals Inc.	14	Issued	2018-01-02	2028-01-03	350

Forestry

The province is divided into 24 Forest Management Districts (FMD), 18 in Newfoundland and six in Labrador, which are managed by the Forestry Service of NL under the Provincial **Forestry Act** (1990). District 1 encompasses the Avalon Peninsula east of Come by Chance and contains numerous forestry managed crown lands for the use of silviculture. There is no active industrial forestry within or near the RAA, however there are eight silviculture areas.

Agriculture

Within the RAA there is one area of regional pastureland along the Argentia Access Rd, and one area of agricultural crown reserve on the eastern extent of NL Route 100. These areas are managed by the Agriculture and Lands Branch of the Department of Fisheries, Forestry, and Agriculture. Lands, including agricultural areas of interest, are offered by the branch to famers through a request for proposals process for an Agricultural Crown Land Lease. The Project will not be interacting with agricultural land.

Hydro and Electrical Infrastructure

Within the RAA, NLH owns the 230 kV transmission line from Long Harbour to the Western Avalon substation (TL208), and Newfoundland Power owns the 69 kV transmission line and equipment on the Avalon Peninsula, including the transmission line 55L, which extends from Blaketown to Clarke's Pond. All medium and/or low voltage collector lines within the RAA are owned and operated by NL Power, in addition to terminal stations used for switching operations, or stepping up/down the voltage. While the

Project will own the Project Interconnect Line, following its construction NLH will operate the Interconnect Line.

Industrial Effluent

The NL DECC Water Resources Portal identifies 17 outfalls in the Placentia and Dunville areas, most of these are well to the south of the POA Property (Water Resources Management Division, 2023). Two outfall sites exist at the POA Property. Outfall 3800-37 (located at the northern end of Cooper Cove) is listed as a treated effluent outfall associated with the Argentia Inco Demonstration Plant. A Blivet (all-in-one packaged sewage treatment plant) treatment system handles domestic sewage as well as "lagoons for industrial effluent". Outfall 3800-38 is located on the Argentia isthmus and may discharge to the west side of the isthmus. It is described as "not a municipal outfall". What appears to be the same site (or one very close by) is shown on the Federal Contaminated Sites Inventory (Site # 00018124) and is described as "Argentia Harbour Rear Range" (Treasury Board of Canada Secretariat, 2023).

Canadian Coast Guard Radar Station

The Canadian Coast Guard (CCG) infrastructure occupies two locations within the Project Area. One is the Freshwater Hill VHF tower located just outside the southern extent of the POA Property. The second is the Pearce Peake Radar tower, which is located on the western side of the Argentia Backlands. The operation by CCG of the Vessel Traffic Centre includes use of a radar system whose effectiveness could be hampered by the presence of physical structures within its viewing arc. The preliminary layout consists of 12 turbines located within the line-of-sight where they are anticipated to interfere with the radar's marine traffic monitoring functions. The initial affected Project infrastructure includes turbine sites 1, 2, 4, 5, 6, 7, 21, 34, 44, 45, 46, and 47, and meteorological tower 2. Through consultation with the CCG, wind turbine sites 7, 22 and 47 have been removed from the Project. Wind turbine site 21 has been microsited east to avoid the line-of-site of the Pearce Peake Radar Tower. Meteorological tower 2 is a temporary installation that will be removed during construction and will not cause long term interference. Given these changes, the affected Project infrastructure now includes turbines 1, 2, 4, 5, 6, 34, 44, 45, and 46. Argentia Renewables continues to engage the CCG to develop a plan to reduce interference on the remaining infrastructure. A variety of measures are being developed between Argentia Renewables and the CCG that can be applied to reduce potential interference including masking, blanking, antenna quaint, and tracking. Mitigation measures that are being explored include:

- Existing capabilities in the radar and the CCG's tracking and display system to mitigate false returns due to wind turbine clutter and any loss of detection downrange due to shadowing; and
- In the extreme, further relocation of wind turbine sites.

3.1.4.3 Recreational and Subsistence Resource Use

Tourism

The Argentia Provincial Visitor Information Centre is located on route NL-100, 3 km from the Marine Atlantic Ferry Terminal. The Information Centre is open from May to October to help guide tourists on the local events, tourist attractions and operators, and regional history. Seasonally, the POA operates the Sunset RV Park on the Argentia Backlands, 2 km southeast of the Marine Atlantic Ferry Terminal. The park provides 40 serviced sites with amenities including water, sewer, 30- and 20-amp electrical hookups, washrooms, showers, and a picnic area. Additionally, the Argentia Backlands includes 15 km of prepared walking trails available to campers. Additional camping is available at the privately owned Fitzgerald's Pond Park located adjacent to the Provincial Park Reserve, 25 km from the POA.

In addition to the natural attractions of the area, the RAA is home to the Castle Hill National Historic Site. Located on the bluff overlooking the Town of Placentia, walking trails throughout the site, the visitor centre exhibit, gift shop, picnic facilities, and bilingual guide services are available.

Hunting and Trapping Wildlife Management Areas

Subsistence hunting is a large part of NL culture and attraction, and more than tens of thousands of licenses (including big game, small game, birds), are awarded/sold each year. All license holders must comply with regulations set forth by NLDFFA, Wildlife Division, and the federal **Migratory Birds Hunting Regulations** (Environment and Climate Change Canada, 2023). It is important to note that hunting and trapping is prohibited to occur on the POA and Argentia Backlands at the discretion of the private landowners (i.e., POA).

Big game animals of insular Newfoundland include caribou, moose, and black bear are managed by the NLDFFA, Wildlife Division. Management areas overlapping with the RAA include Moose Management Area (MMA) 31-Placentia and 32-Capeshore, Black Bear Management Area (BBMA) 31-Placentia and 32-Capeshore, and Caribou Management Area (CMA) 77-Cape Shore Newfoundland. In total, the quotas for moose in both MMA 31 and 32 totals 575 in the 2023-24 season (Province of NL, 2023). Black bear hunting in BBMA's 31 and 32 are closed, meaning no hunting season occurs. The same is true for the remainder of the Avalon due to low black bear populations in the region. Elsewhere in the province, black bears are hunted and trapped in both spring and fall (Province of NL, 2023). Only the southern extent of the RAA overlaps with CMA 77. However, the likelihood of the caribou interacting with the RAA is low, given that in the 2023-24 season only 10 caribou licences were issued in CMA 77, thus indicating a small population (Province of NL, 2023).

As a result of there being no non-resident big game hunting licenses available in the RAA, there are no registered outfitting companies located within the RAA boundaries. The nearest outfitting company is

Deep Country Lodge, Deep Bight, NL, 90 km north of the Argentia Peninsula (*Deep Country Lodge - Deep Bight*, n.d.).

Non-migratory birds and small game animals of insular Newfoundland include several species of ptarmigan, grouse, and snowshoe hare, which are managed by NL Wildlife Division. The seasons and bag limits vary for each species, hunting method, and is area dependent. The RAA overlaps with the Avalon/Swift Current area for ptarmigan, the “Remainder of Island” area for snowshoe hare, and the island-wide area for grouse (Province of NL, 2023). Generally, non-migratory birds and small game animals are hunted in the fall and winter.

Migratory birds including waterfowl and snipe are regulated federally via migratory game bird hunting permits**.** In the RAA, migratory bird hunting zones include Avalon-Burin Inland and Avalon-Burin Coastal, overlapped by Murre/Turr hunting zone 3. The seasons and bag limits vary for each species and are zone dependent. For the RAA, most seasons occur September to December except for some duck species and Murres which extend until March.

Furbearer trapping in NL is held to the performance standards of the Agreement on International Humane Trapping Standards (AIHTS) and is managed by the Department of Fisheries, Forestry and Agriculture (Department of Fisheries, Forestry and Agriculture, 2018). Furbearing species that are present in the RAA include beaver, fox, lynx, coyote, mink, muskrat, and otter. While generally the optimum furbearer harvesting season is the fall and winter, seasons may vary for each different species. The RAA is in management zone 2. For beavers, zone 2 is further subdivided into 49 traplines, five of which overlap with the RAA. Only two traplines, beaver fur zone 2 trapline 14 (Argentia) and zone 2 trapline 24 (Long Harbour), overlap directly with the Project Area.

Fishing/Angling

Salmon fishing in NL is a license regulated sport managed by DFO. The RAA is located within the greater Salmon Fishing Area 10, which extends from Cape St. Mary’s to Point Crew, encompassing Placentia Bay. The RAA includes two of the 20 salmon rivers in this area includes Southeast River (Placentia), tributary streams, and Northeast River (Department of Fisheries and Oceans Canada, 2023a).

Trout fishing is also managed by DFO, and insular Newfoundland is regulated as a single unit (Zone 1). Trout fishing season varies based on the species and whether the water in which you are fishing is scheduled or non-scheduled, however anglers may angle for trout year round in coastal waters (Fisheries and Oceans Canada, 2023b). Commonly fished species include brook trout, brown trout, rainbow trout, and ouananiche. Trout angling season for non-scheduled waters runs from February 1 to April 15 and May 15 to September 7 in the 2023-24 season. There are no scheduled trout waters or special trout areas located within the RAA.

Domestic Wood Harvesting

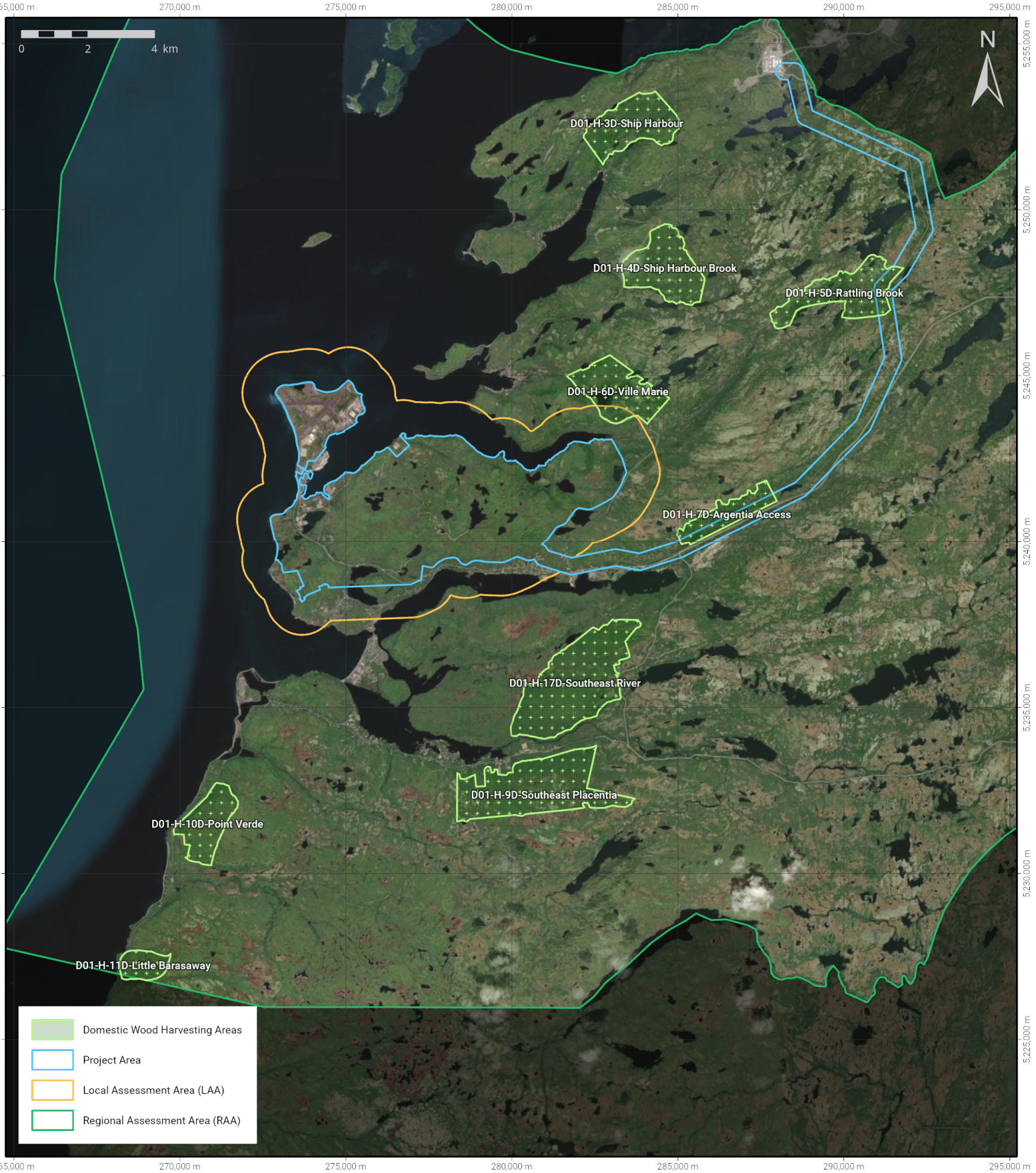
The Project is in Domestic Harvesting District 01-Avalon, and is managed by the NL DFFA. This area encompasses Avalon Peninsula east of Come by Chance. Permits are required for wood harvesting on Crown Lands. The surface area of the Avalon Peninsula is approximately 969,000 hectares (ha), where 628,800 hectares of Crown Land are included in the intensive forest inventory of the Avalon (NL DFFA, 2016). With the exception of private land, the entire land area located in Domestic Harvesting District 01-Avalon is currently managed by the Crown (NL DFFA, 2016). There is no ownership of land by Corner Brook Pulp and Paper (NL DFFA, 2016). Most Project activities will occur on POA Property; in which case, permitting of domestic wood harvesting is not applicable.

There are nine domestic cutting zones in the RAA, two of which are located within the LAA (Figure 3.1.4-6). The domestic wood harvesting zone D01-H-5D and D01-H-7D runs along Route NL-101 and Route NL-100 respectively, and both are within the vicinity of the preliminary Project Interconnect Line right-of-way.

In addition to the designated cutting zones in the area, within domestic harvesting District 01-Avalon there are special considerations for roadside wood harvesting. Excluding designated cutting zones, private lands, protected areas, parks, and outlined exclusion areas (not in RAA), domestic wood harvesting is permitted within 100 m from the center of a provincial highway or an NLH transmission Line Right-of-Way (ROW) (NL DFFA, 2022). Within this area, people must only harvest dead and/or blowdown timber and only existing accesses may be used to reach the site (NL DFFA, 2022).

Swimming

Given the province’s abundance of natural water resources, it is a common summer recreation activity to swim in local ponds and rivers. Recreational outdoor swimming can occur in designated and undesignated locations that are only know through popularity amongst the community. Within the RAA there are 9 known swimming locations, only one is located with the Project Area (Young, n.d.). The site is located at Barrow’s Pond which is located within the PPWSA in the Argentia Backlands.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.4 - 6	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Domestic Wood Harvesting in the Project and Assessment Areas	NOTES: Domestic Harvest Area data sourced from NL Government Land Use Atlas on April 26, 2024.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-029-Rev0

Berry Picking and Plant Harvesting

Foraging in NL has become an increasingly popular recreational activity. Preferred activities include the culturally important berry picking in late summer and early fall, and emerging public interest in fungi harvesting. Residents of the greater-Placentia area usually pick berries along both sides of the Long Harbour Road turn-off, near Fitzgerald's Pond Park, and on the Argentia Backlands (Jacques Whitford Limited, 2007). Berries in Newfoundland include but not limited to low-bush blueberries, partridge berries, blackberries, cloud berries or bakeapple, raspberry, currants, cranberries and strawberries (Gov NL, 2022)

Trails and Unique Sites

The Town of Placentia strongly supports heritage in sports and recreation, with 15 parks and recreation facilities across the community, listed below. The Municipal Plan also outlines the potential for the construction of the East Coast Trail, in addition to pursuing the construction of a community swimming pool in partnership with the Placentia Lions Club.

- Unity PARC Arena
- Community Allied Youth
- Skate Park/Green Gym
- Regatta Grounds
- Wayne John Searle Memorial Recreation Complex
- Willard Hatfield Memorial Ball Field
- William Hogan Ball Field
- Jeff Jones Memorial Soccer Pitch
- Coalyard Playground
- Ferndale Veterans' Park Playground
- Mount Pleasant Playground
- Freshwater Playground
- William Hynes Memorial Playground
- Mount Pleasant Playground
- Heritage Walking Trails and Boardwalk

An additional trail system has been recently registered by Hike Placentia Inc (Registration Number: 2257). The development will extend from Point Verde to the previous American Naval Base located within the Argentia Backlands. Argentia Renewables commits to working with Hike Placentia on their trail development in the Argentia Backlands.

3.1.4.4 Protected, Special, and Sensitive Areas

Parks and Reserves

Municipal parks are located throughout Placentia and the surrounding areas including playground and natural areas. In Placentia, there are 12 outdoor playgrounds, heritage walking trails, and boardwalks. The existing and proposed designated trails will be protected by a suitable buffer, within which any development application shall be referred by the Town to the Heritage Trail Committee and other relevant agencies, prior to the granting of a permit (D. W. Knight Associates, 2015). If a link with the East Coast Trail is developed in future, any development within a certain distance of the Trail shall be subject to review and approval by the Town after consultation with the East Coast Trail Association and relevant Provincial Government agencies (D. W. Knight Associates, 2015). The intent will be to protect the Trail as a hiking/walking facility in a largely natural environment (D. W. Knight Associates, 2015).

Provincial Park Reserves are former provincial camping parks (pre 1997) where the campground area was de-proclaimed and privatized while the remainder of the provincial park was retained to protect natural features (ParksNL, 2020). Within the RAA, located 25 km from the Argentia Ferry, Fitzgerald's Pond Provincial Park on the Avalon Peninsula protects a population of rare boreal felt lichen.

Proposed Protected Areas

There are no proposed protected areas within the RAA. The nearest proposed area is Halls Gullies, approximately 17 km from the Project RAA (Wilderness and Ecological Reserves Advisory Council, 2020).

Historic Sites

Castle Hill historic site is located on the bluff overlooking the Town of Placentia. This historic site protects the remains of the 17th century French fortification along with the surrounding trails connecting Fort Royal to the two redoubts located on site. This tourist stop offers views of both Placentia and Argentia, and provides guests with tours, information, and activities during its summer operating months of June – October. All plant life is protected within National Parks and Historic Sites. In reference to the Historic Resources Overview Assessment (Appendix F), there are minimal interactions with the Project.

Sensitive Wildlife Areas

Sensitive wildlife areas identify habitat suitable for the presence of SAR and are managed by the NL Wildlife Division. Two sensitive wildlife areas occur within the Project Area which are established due to the historic occurrence of endangered plants located on the Argentia Peninsula. These sites were also identified in the AC CDC report conducted as part of the terrestrial baseline survey. The two sites are located on the former military airstrip and include observations of water pigmy-weed (*Tillaea aquatica*) and are incorporated into the Species at Risk Impact Monitoring and Mitigation Plan (Appendix R).

In addition, two sensitive wildlife areas are identified in the RAA. One is an area identified for endangered plants and is located 2.7 km south of the community of Dunville. This area is known to have blue felt lichen which is listed as a vulnerable under **NL Endangered Species Act** (NL ESA), special concern under SARA. The second is the Cape Shore woodland caribou area located along the southern extent of the RAA extending south 27 km.

3.1.4.5 Indigenous Land Use

The Island of Newfoundland is the ancestral unceded homelands of the Beothuk and Mi'kmaq. On the island there are two federally recognized First Nation Bands including the Miawpukek First Nation (Conne River) and Qalipu First Nation (a landless band representing 67 communities throughout the Island) (Pike, n.d.). Neither Band identifies as being represented nor do they avail of the land resources within the RAA, the closest being Miawpukek First Nation located in Conne River.

3.1.5 Heritage and Cultural Resources

A desktop Historic Resources Overview Assessment (HROA) was conducted in 2024 and researched the cultural / historical sequence of Newfoundland with a focus on Placentia Bay and the Project Area. A description of the selected study areas appears in Section 3.2 (Baseline Studies) and in Appendix F.

The background and contextual data compiled indicates a human presence in the Placentia Bay region extending back at least 3,500 years ago and includes occupations by several different First Nations and Pre-Inuit Indigenous cultures during the Precontact, Early and later Historic Periods, and by Europeans and peoples of European decent starting sometime after 1,500 CE and continuing at various degrees of intensity to this day. Given the longstanding human usage of the region, as confirmed from the review of archaeological data, historic and current documentation and aerial imagery, there is theoretical potential that sites and historic properties deriving from one or more of the cultural groups mentioned above could be present within the Project Area.

One archaeological site (ChAl-14) registered within the Project Area and is comprised of 13 structures reportedly associated with the mid-twentieth century US Military presence in the region. There is also one registered architectural resource of built-heritage significance known as the 282 Coastal Defense Battery, and it too is related to the US military presence in the area. A map showing the registered archaeological sites in the region (including ChAl-14) and the one architectural resource situated within the Project Area is presented in Figure 3.1.5-1. The Castle Hill National Historic Site is described above in Section 3.1.4 (Land and Resource Use) and is not included in the below map.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.5 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/28
	FIGURE TITLE: Registered Archaeological Sites and Architectural Resources	NOTES: Registered Archaeological Site data provided by the NL Government's Provincial Archaeology Office (PAO). Registered Heritage Structure provided by Heritage NL. The 'LAA' predates the current Regional Assessment Area (RAA) and covers a 50 km-diameter circle that centers on a point near the community of Placentia.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

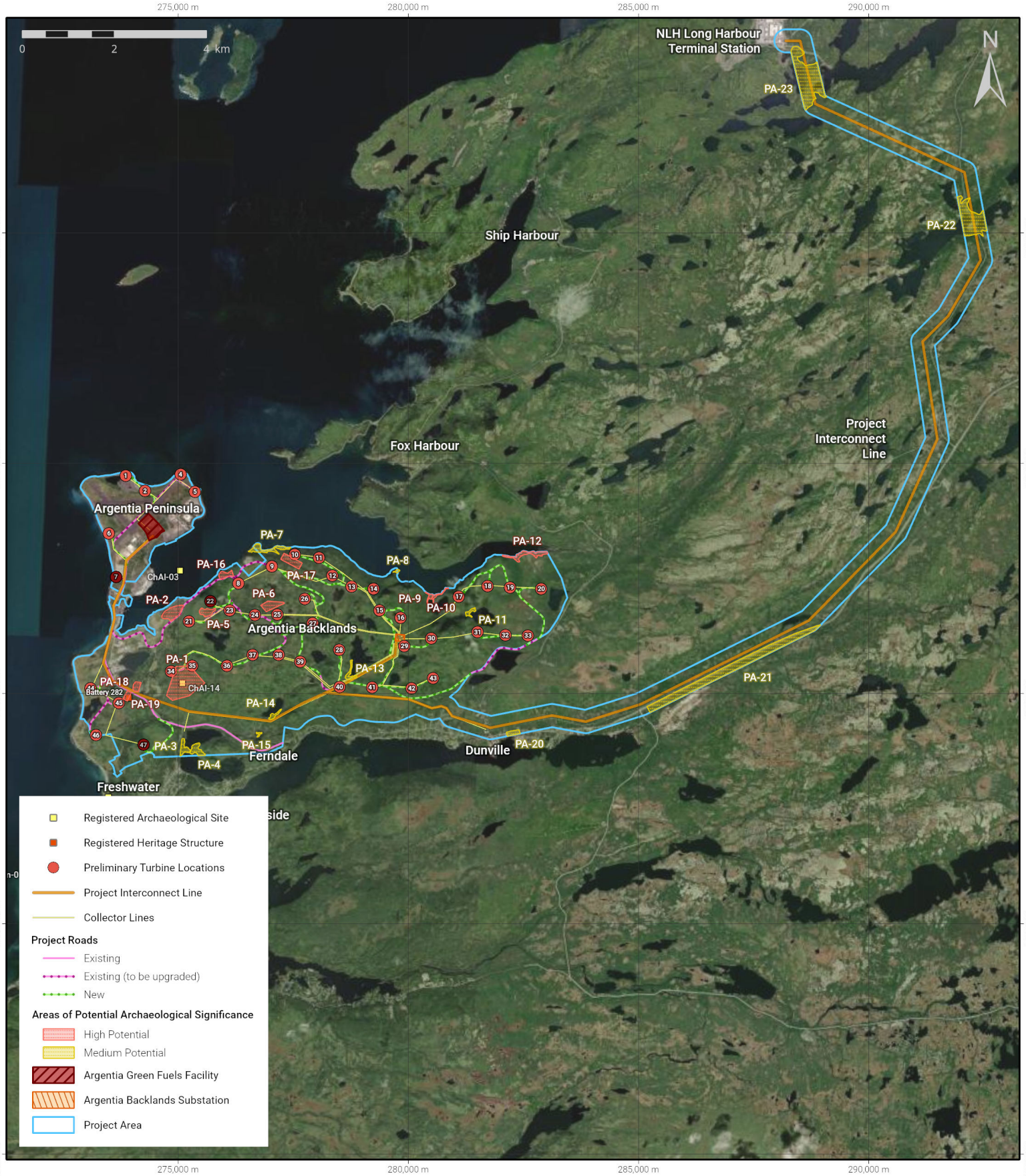
SEM MAP ID: 238-005-GIS-030-Rev0

During the HROA, twenty-one other locations of potential archaeological significance were identified in the Argentia Backlands and along the Project Interconnect Line. Six of these in the Argentia Backlands are rated as having High potential, as they do or could contain structural and/or artifactual objects associated with late-nineteenth to early-twentieth century mining activities, or military remains dating to the same period as those located at ChAl-14. An additional four locations in the Argentia Backlands are also rated as having High potential, as they are situated in environmental settings that may have been used during the Precontact and/or Historic Periods for temporary settlement or other forms of land-use. Seven locations in the Argentia Backlands and along the Project Interconnect Line, with similar yet less pronounced and attractive landscape attributes, are rated as having Medium potential. All other terrain within the Project Area is rated as Low potential. A maps indicating areas of High and Medium historic resources / archaeological potential are presented in Figure 3.1.5-2. A summary of information regarding each area of High potential is presented below in Table 3.1.5-1. No locations with historic resources / archaeological potential have been delineated for the Argentia Peninsula.

Although fossils are protected under the **Historic Resources Act (1985)** and are inventoried by the PAO, the potential for any such resources to be present within the Project Area is Low.

Table 3.1.5-1 Areas of High Historic Resources Potential within the Project Area.

Reference Code	Area Description	Metres above sea level (mASL)	Potential Rating
PA-1	Registered archaeological site – ChAl-14 – 13 WWII military bunkers (PAO SRF)	120	High
PA-2	WWII military ordnance – 281 Coastal Defense Battery.	40	High
PA-5	Possible WWII military structures	110	High
PA-6	WWII Military bunkers (6)	110	High
PA-9	Pond frontage along waterway (Outside Shalloway Pond) and coastal shoreline	0-10	High
PA-10	Pond frontage along waterway (Outside Shalloway Pond) and coastal shoreline	0-10	High
PA-12	Coastal shoreline	0-10	High
PA-16	Possible WWII military structure	40	High
PA-17	Late-19 – early-20th century, above-ground mining infrastructure associated with Silver Cliff Mine	20	High
PA-18	WWII command bunker	45	High
PA-19	WWII military ordnance – 282 Coastal Defense Battery (architectural resource)	25	High



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.5 - 2	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Areas of Potential Archaeological or Historic Significance	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-031-Rev1

3.1.6 Socio-Economic Environment

A socio-economic baseline report was prepared for the purposes of effects assessment. It is included as Appendix G. The Project Area considered in the assessment is described in Section 2.1, and is 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 Project Area will encompass the collective spatial footprint of the wind turbines, the Argentia Green Fuels Facility, ammonia storage infrastructure, electrical substation(s), turbine-interconnected transmission lines, a transmission line to the main electrical grid in Long Harbour, and associated roads for elements of the Project. A 100-metre buffer was added to either side of the transmission line to Long Harbour.

The Local Study Area selected for the socio-economic environment coincides with data and information that are available from Statistics Canada (Census of Canadian Population) and NL Statistics Agency (Community Accounts) for the Town of Placentia, which includes the POA and the communities of Freshwater, Dunville, Southeast Placentia and Jerseyside – amalgamated with Placentia in 1991 (Town of Placentia 2024). NL Statistics Agency also provides data (not available for the Town of Placentia) for Local Area 2: Placentia-St. Bride's Area, which includes Placentia along with Fox Harbour and Ship Harbour to the north and the communities of Point Verde, Big Barasway, Ship Cove, Patrick's Cove-Angels Cove, Cuslett, St. Bride's, Point Lance and Branch to the south.

The Regional Study Area selected for the socio-economic environment coincides with census data for the Avalon Peninsula Economic Region or Census Division (CD) No. 1, Avalon, both of which include the Avalon Peninsula and the Isthmus. Data was also obtained from NL Statistics Agency for Economic Zones: 17, 18, 19, 20, which encompass the Avalon Peninsula but not the Isthmus. Where data were not available, the census also supplies data for Eastern Health, which encompasses a larger area including the Avalon Peninsula, Bonavista Peninsula and Burin Peninsula. Avalon is the area anticipated to supply labour for a large construction project at Placentia. For some aspects of the human environment such as economic benefits, provincial royalties / taxes, and effects on gross domestic product, the Regional Study Area is the province of NL.

3.1.6.1 Communities and Community Life

The following provides a summary of key issues related to the Communities and Community Life VC as identified through the baseline study, issues identified by regulators, or concerns expressed by the public or stakeholders during engagement activities for the Project.

Population Demographics

The 2021 population of Placentia was 3,289 residents showing a decline of 5.9% from the previous census (Statistics Canada 2023a). The median age had risen from 50.5 years in 2011 to 56.4 years in

2021 (Statistics Canada 2012, Statistics Canada 2023a). The largest age cohort (25.8%) was 50 to 64 years in Placentia (Statistics Canada 2023a), reflecting an ageing workforce and / or a high proportion of younger retirees. Placentia showed a small increase in the proportion of in-migrants (75 people in 2021).

Community Health and Wellbeing

Key social determinants of health were selected to help describe vulnerable areas with regards to community health and wellbeing, including education, income, housing, food security, health and social services, diversity, equity, and inclusion. The following provides a summary of these key social determinants.

Education

Primary to secondary and post-secondary education is available in Placentia. Capacity is likely available in the school system. Placentia has two schools, which had a total enrolment 433 in the 2021-2022 school year, showing a net loss of five students in 2023 (NL Education 2023a). The College of the North Atlantic Placentia campus offers programs in Early Childhood Education, Heavy Duty Equipment Technician / Truck and Transport Mechanic, Heavy Equipment Operator, Machinist, Industrial Mechanic (Millwright), Personal Care Attendant and Welder (CNA, 2023a). In 2021, the population of Placentia had a higher rate of individuals without a high school diploma or equivalent compared to Avalon or NL and a lower rate of individuals with a university degree (Statistics Canada, 2023a). A higher proportion of residents had an apprenticeship diploma, which is often suitable for employment in rural areas. Major fields of study tended to align with gendered roles. Women+ were more likely to have university education at 13.3%. Men+ showed higher tendency (17.8%) towards education in apprenticeship or a trades certificate or diploma.

Income

The 2020 median after-tax income of individuals and households in Placentia was lower than in the other jurisdictions and in Canada (Statistics Canada, 2023a). Notably, the median income of women+ was lower than men+ in Placentia, Avalon and NL but the income of women+ grew by higher rates than that of men+ between 2015 and 2020 (Statistics Canada, 2023a). In 2020, the Canadian wage gap was $7,200 (Statistics Canada 2023a). The wage gap in Avalon ($6,400) was lower than NL ($7,400) and Placentia ($7,800). The low-income rate was higher for women+ in Placentia (19%), Avalon (13.7%) and NL (16.3%) compared to men+. The same was true for Canada with 11.6% women+ having low income (Statistics Canada 2023a). In each of the three jurisdictions, single parents were about four times as likely to be women+ than men+. In Placentia, women+ aged 65 and older were most likely to experience low income in 2020.

Housing

The rate of homeownership in Placentia (81.5%), Avalon (73.3%), and NL (75.7%) was higher than Canada (66.5%) in 2021 (Statistics Canada, 2023a). Consequently, the rate of household renters was lower in Placentia compared to Avalon and NL. For each of the three jurisdictions, a high proportion of housing was considered suitable (98.2%-99.4%) and low percentages were considered unsuitable (0.06%-1.9%) or in need of major repairs (4.6%-7.4%). Between 2016 and 2021, the number of private dwellings in Placentia decreased by 25 and the number of private dwellings occupied by usual residents decreased by 16 (Statistics Canada 2023a). The reason is unknown though it may be attributable to changes in the classification of dwellings – meaning a private dwelling in one census might be classified as a collective dwelling (e.g., rooming or boarding house) in another census. Regions with a higher number of temporary residents may experience more fluctuations. The median value of dwellings in Placentia was lower than the Avalon and NL in 2021 (Statistics Canada, 2023a). Median value increase was limited between the last two censuses for Placentia (+0.08%) and Avalon (+0.31%) (Statistics Canada, 2018). For NL, housing prices increased by 26% between 2011 and 2016 and 9.48% between 2016 and 2021 (Statistics Canada 2018, 2012). In 2021, renters in Canada were approximately four times as likely (20%) as homeowners to be in core housing need (Statistics Canada, 2022a). In 2021, 8% of NL households were in core housing need compared to 10.1% in Canada. In 2021, the median monthly shelter costs for rented dwellings ($665) in Placentia had increased but remained lower than Avalon and NL (Statistics Canada, 2023a). The proportion of individuals spending 30% or more of their income on housing decreased between 2016 and 2021 in Placentia, Avalon and NL. The proportion of tenant households spending 30% or more of income on shelter was lowest in Placentia compared to the other jurisdictions though a higher percentage of tenant households in Placentia lived in subsidized housing.

Food Security

Data were not available to describe food insecurity in Placentia, but it generally increased in NL. The cost of the NL nutritious food basket (NLNFB) increased by 12% between 2021 to 2022 (NL Statistics Agency, 2021).

Health and Social Services

Access to health and social services: In NL, access to a regular health care provider and hip fracture surgery are on par with Canadian averages (Canadian Institute for Health Information, 2024). The Placentia Health Centre offers in-patient and out-patient services including three emergency care beds and diagnostic services (Eastern Health 2023a). Patients are referred to regional or provincial facilities in Carbonear or St. John’s for further care (Government of NL, 2023b). Placentia has a private ambulance service. Placentia has one Family Child Care Provider with six spaces (NL Education, 2023b). It is likely that childcare is provided on an informal basis.

Diversity, Equity, and Inclusion

Population diversity is low but increasing in NL. In 2021, about 30 people (0.9%) in Placentia self-identified as being part of a visible minority and originated from countries in Asia, Europe, the Americas, Africa and the Philippines (Statistics Canada, 2023a). Between 2020 and 2021, the number of race or ethnically motivated police-reported hate crimes in Canada increased by 6% (1,723 incidents), following an 83% increase in 2020 (Statistics Canada, 2023d). Black, indigenous and people of colour (BIPOC) were subjected to hate crimes by at least 50% more than other groups. Fewer than ten (10) hate crimes were reported in NL in 2020 (Justice Canada, 2023). The Anti-Racism Coalition of NL believes racist incidents have also increased in NL (CBC, 2022).

Water and Sewer

Infrastructure and services are provided by the Municipality of Placentia, provincial government agencies and industrial / commercial service providers. The municipality of Placentia manages water and sewer infrastructure and services. Three surface water supplies provide treated drinking water (NL Environment and Climate Change, Water Resources Management Division 2023). Waste water and storm water are collected in a sewerage system with multiple coastal outfalls, but Placentia does not have sewage treatment facilities (Town of Placentia 2023a).

Waste Management

The municipality of Placentia provides curbside collection of household solid waste, recycling and bulk garbage (Town of Placentia, 2023b). Eastern Waste operates a local waste recovery facility for residential drop-off of non-recyclable waste materials (ERSB 2023). Businesses are expected to deliver their own waste or use contracted services. Solid waste and recycling materials are delivered to the Robin Hood Bay Regional Waste Management Facility in St. John’s (Robin Hood Bay 2024).

Transportation

Ground, air and marine transportation are governed by provincial and federal authorities. Placentia is accessed via Route 100 from Trans-Canada Highway 1. The nearest airport is St. John’s International. The seasonal Marine Atlantic ferry service operates from mid-June to late September (Marine Atlantic, 2024). The ferry arrives at Argentia at approximately 9:30 AM Monday, Thursday and Saturday and departs 5:00 PM the same day. Placentia Bay is one of seven Canadian Coast Guard vessel traffic services zones in Atlantic Canada (CCG, 2022). The Coast Guard’s Marine Communications and Traffic Services (MCTS) monitors marine traffic in Placentia Bay from Argentia.

Utilities and Communications

Placentia receives electricity from the Clarke’s Pond Terminal Station, which is connected by a 69-kV transmission line to the Holyrood Thermal Generating Station (NLH 2022). Nearby Long Harbour is

served by the Voisey's Bay Nickel Terminal Station, which is connected to TL208, a 230-kV transmission line connected to the Muskrat Falls Generating Station via the Western Avalon Terminal Station (NLH 2022; NLH 2023). Major providers offer mobile and landline telephone services, Internet, wireless networking, cable or satellite television and home security in NL (Bell Aliant 2023; Rogers 2023a). Other providers supply mobile phone services. Cellular service is insufficient in parts of rural NL, which may create an issue for mobile customers as well as during emergencies. The Government of NL's 2023 Cellular Service Improvement Initiative aims to improve coverage especially for communities with no or limited cellular access (NLIET 2023). Meanwhile, alternative communication services (e.g., satellite phone, InReach) are available.

Prevention and Emergency Services

The Royal Canadian Mounted Police (RCMP) Placentia detachment with support from the Whitbourne detachment serves communities from Ship Harbour to Cape St. Mary's (RCMP 2024). An increase in reported incidents including violent crimes in Placentia has been attributed to drug activity and individuals with criminal backgrounds moving into the community (CBC, 2023b). NL experienced a nearly 20% increase in the crime severity index between 2021 and 2022 (Statistics Canada, 2022b). Approximately 88% of police-reported crimes in NL were attributed to the St. John's CMA (Statistics Canada 2023c), indicating the crime rate is generally much lower outside of the St. John's area. The municipality of Placentia provides fire prevention and response services (Town of Placentia 2024). A 2015 report rated Placentia Volunteer Fire Department as Acceptable for offensive interior fire suppression / rescue (i.e., firefighters have the training, equipment and resources to enter a structure and provide search and rescue operations and interior fire suppression (NL Fire and Emergency Services 2015). The Fire Department also rated Acceptable for defensive exterior (i.e., firefighters do not enter structures to supress fires or rescue individuals). Emergency health services are available at the Placentia Health Centre, Carbonear and St. John's (Province of NL 2023b).

Recreation

The municipality of Placentia provides playgrounds for small children with facilities and programs for various sports and activities including hockey, curling, skating, skateboarding, basketball, rowing, softball, soccer, tennis and walking (Town of Placentia 2024). The facilities are in the built-up areas of the Town. The Argentia Sunset RV park (seasonally operated by the POA) features 40 serviced and two un-serviced sites along with washrooms / showers and a picnic area in the Argentia Backlands area of the POA lands (Port of Argentia 2024, NL Tourism 2023). The Argentia Backlands Trail is 16 km of hiking trails (Port of Argentia 2024). Hike Placentia Inc. has proposed to link the Backlands Trail to a larger 22 km network for the Placentia area (Hike Placentia Inc. 2023). No national or provincial parks or proposed parks are in Placentia. Fitzgerald's Pond Provincial Park Reserve (on Route 100) has 24 privately operated camp sites (Campendium 2023).

3.1.6.2 Economy, Employment, and Business

The following sections provide a summary of key issues related to the Economy, Employment and Business VC as identified through the baseline study, issues identified by regulators, or concerns expressed by the public or stakeholders during engagement activities for the Project. More detailed information can be found in the socio-economic baseline report (Appendix G).

Economy

Newfoundland and Labrador's gross domestic product (GDP) was 40.72 billion in 2022 (NL Statistics Agency, 2023b). The largest four contributors to NL GDP were "Mining and Oil Extraction" (25%) followed by "Real Estate and Rental and Leasing" and "Health Care and Social Assistance" (both 10%) and "Public Administration" (9%). Together, these make up 54% of GDP. Placentia is a regional hub for government and commercial services including secondary and post-secondary educational institutions, health care facilities, seniors' care facilities and municipal / provincial / federal government offices. The POA, Vale NL's Long Harbour Processing Plant and the Cenovus West White Rose Expansion Project are important in terms of employment and procurement though the latter is a temporary construction project to be completed in 2025. In 2021, the largest economic sectors in Placentia were "Health Care and Social Assistance" (21.2%), "Retail Trade" (10.9%), "Construction" (10.9%), "Transportation and Warehousing" (7.3%) and "Education Services" (7.3%) (Statistics Canada, 2023a).

Employment

In 2020, the employment rate in Placentia was similar for men+ and women+ though the unemployment rate for men+ was 7% higher than for women+ (Statistics Canada 2023a). Men+ were more likely to be engaged in part-time, casual, short-term or seasonal work and women+ were more likely to be employed in full-time, year-round and permanent positions. This could be attributed to the higher tendency for men+ to participate in industries such as construction (short-term) and fishing (seasonal). The rate of self-employment is relatively low but remains three times higher for men+ than women+.

Labour Supply

In 2021, most employed residents of Placentia worked within the census subdivision (CSD) of residence (i.e., Placentia) compared to those in the Avalon or NL. Small proportions of workers in each jurisdiction commuted to a different census subdivision (CS) and census division (CD) within NL, to a different province or territory or worked outside of Canada. While most workers (around 80%) in Placentia, Avalon and NL had commute times of 30 minutes or less in 2021, a larger proportion of workers living in Placentia (12.3%) experienced commute times of 60 minutes or greater, which may indicate a tendency for some to accept longer commutes for employment. The proportion of men+ commuting more than an hour for work was twice as high in Placentia compared to NL, which may be linked to certain traditional work sectors for men+ (e.g., construction or industrial sites). Employment in the NL non-residential construction sector increased in 2022 over 2021 due to a post-pandemic commercial recovery, ongoing

institutional projects and the restart of construction at the West White Rose project (BuildForce Canada, 2023). Some capital investment eased in 2023, resulting in a more balanced situation for many trades and occupations. Weaker markets are anticipated in 2024 and 2025 for some trades, though those engaged in heavy-industrial activities could experience tight labour markets in 2025. Labour markets for all trades are expected to weaken by 2031. However, several proposed large-scale resource projects (e.g., hydrogen, mining) could be under development at that time. Due to the anticipated number of retirements, it is expected that competition for younger workers will be intense in NL (BuildForce Canada, 2023). Competition for labour in all sectors will continue to be strong in NL until at least 2027. From present to 2032, demand will be highest for construction trades in 2025 though only for certain trades (i.e., boilermakers, construction managers, construction millwrights and industrial mechanics, contractors and supervisors, crane operators, electricians, heavy equipment operators, heavy-duty equipment mechanics, insulators, plumbers, steamfitters, pipefitters and sprinkler system installers and truck drivers). The construction industry and other sectors will need to expand recruitment programs to attract workers. Recruitment of individuals from groups (e.g., women, Indigenous Peoples and immigrants) who have been traditionally under-represented in the construction sector will have a positive impact on labour supply.

Employment Equity and Diversity

The construction industry and other sectors will need to expand recruitment programs to attract workers. Recruitment of individuals from groups (e.g., women, Indigenous Peoples and immigrants) who have been traditionally under-represented in the construction sector will have a positive impact on labour supply. In 2022, approximately 1,780 women (about 10% of total workers) were employed in the NL construction industry, of which 60% worked directly on construction projects (BuildForce Canada, 2023). Women made up only 7% (1,070) of the 15,200 tradespeople employed in the construction industry. Women had higher participation in non-residential construction and were most often employed as electricians (22% of total women), trade helpers and labourers (19%), construction managers (7%), painters and decorators (6%) and heavy-duty equipment mechanics (5%). In 2021, Indigenous workers accounted for approximately 9% of the NL construction labour force (BuildForce Canada, 2023), which was the same as 2016 Indigenous employment in construction. Meanwhile, the general labour force increased its share of Indigenous workers between 2016 to 2021. In 2021, new Canadians accounted for approximately 8% of NL's workforce, which is below that of Canada (BuildForce Canada, 2023). In 2021, the proportion of immigrants (1.9%) in the NL construction labour force was less than one-quarter of the immigrant share in the general NL labour force. NL is anticipated to receive 37,700 new immigrants between 2023 and 2032, who will make up an increasing share of the NL working-age population.

Business

Businesses are in the Port of Argentia industrial park and in the commercial areas of the municipality. The Port of Argentia industrial park has about 40 businesses offering a variety of services (Port of Argentia 2023). Along with serving its tenants, the Port is focused on expansion and new developments in marshalling, renewable energy, aquaculture, offshore energy and critical minerals.

Culture and Tourism

Placentia has a variety of cultural interpretation sites and activities in the built-up areas of the municipality. Three key elements of Placentia's tourism infrastructure and services are on industrial park lands. These are the seasonal Marine Atlantic ferry terminal, the Argentia Sunset RV Park and the Argentia Backlands Trail. Fitzgerald's Pond Provincial Park Reserve is on Route 100). Twelve nationally, provincially and / or municipally recognized heritage sites, structures and events in Local Area 2: Placentia-St. Bride's Area. One, the Argentia 282 Coastal Defence Battery, is in the POA industrial park. Placentia has approximately 100 rooms available to tourists. About 50 rooms were identified in hotels, efficiency apartments and bed and breakfast guest homes (NL Tourism 2023; Town of Placentia 2021; Placentia Area Chamber of Commerce 2023; Castle Landing 2018; Rosedale Manor 2023). Approximately 20 short-term rentals with a total of more than 50 rooms were also identified (Airbnb 2023; Baycation 2023; Bay Chalets 2023).

Capacity and Growth

Though not all businesses are members of the Placentia Area Chamber of Commerce, the Chamber has 106 members (Placentia Area Chamber of Commerce 2023). Services offered include accommodations, cargo and storage, construction, electrical, food services, printing / signage, recruitment, safety, security, telecommunications, waste management) but the capacity of the businesses is unknown. Some businesses are present due to the facilities and major construction project at the POA. The seafood sector is supported by various core fishing harbours, aquaculture sites and processing facilities in Placentia Bay.

3.1.6.3 Project Occupations

Construction

The Project will employ approximately 1,097 full-time equivalent (FTE) positions (50 hr/week) for construction and on-site assembly work during peak construction activities. It is projected that 4,063,800 person-hours will be required over the course of the construction phase. In fostering the development of infrastructure associated with the Argentia Wind Facility and the Argentia Green Fuels Facility, a diverse range of employment opportunities become available. This workforce is expected to comprise

predominantly construction-related trades, reflecting the hands-on nature of the Project. Construction employment positions also encompass a proficient management team, an array of professionals and administrators, and technical occupations in applied sciences and engineering. The duration of employment for construction of the Argentia Green Fuels Facility and the Argentia Wind Facility is expected to be 29 months and 22 months, respectively.

Construction workers and tradespeople would fall under code 7, trades, transport and equipment operators and related occupations, according to the National Occupation Classification (NOC; Statistics Canada, n.d.). Office and administrative roles are designated under code 1 in the NOC, specifically falling within the broad category of business, finance and administration occupations. Project management positions are categorized under code 0 as per the NOC, specifically falling within the domain of legislative and senior management occupations. Project and Field Engineers, Quality Control Managers and Coordinators, Safety Coordinators, and Environmental Coordinators are classified under code 2 in the NOC, explicitly natural and applied sciences and related occupations.

Tables 3.1.6.-1 and 3.1.6-2 provide an overview of the construction phase employment. The breakdown of occupations and duration of employment are derived from an existing Project schedule. While subject to modification, this estimate displays the magnitude and timing of the workforce needed for Project Construction. As the Project advances and becomes more refined in its design and planning, updates to these estimates will be developed and available. The workforce requirements, the estimated number of workers required by NOC code, and the employment targets by occupational group are outlined in the Workforce and Employment Plan (Appendix Q).

Table 3.1.6-1 Construction Phase Labour Forecast for the Argentia Green Fuels Facility.

NOC Code	Category	Description	Peak Construction FTEs
0	Legislative and senior management occupations	Project Manager	1
1	Business, finance and administration occupations	Human Resources Manager	1
		Recruiters	4
		Contract Administrator	2
		Financial Manager	1
		Purchasers	4
2	Natural and applied sciences and related occupations	Project Engineers	4
		Field Engineers	14
		Quality Control Manager	2
		Quality Control Coordinators	5
		Safety Manager	1
		Safety Coordinators	8
		Environmental Coordinators	4
7		Construction Manager	1

	Trades, transport and equipment operators and related occupations	Superintendent	14
		Foreman	69
		Tradespeople	682

Table 3.1.6-2 Construction Phase Labour Forecast for the Argentia Wind Facility.

NOC Code	Category	Description	Peak Construction FTEs
0	Legislative and senior management occupations	Project Manager	1
1	Business, finance and administration occupations	Human Resources Manager	1
		Recruiters	2
		Financial Manager	1
		Purchaser	1
2	Natural and applied sciences and related occupations	Project Engineers	2
		Field Engineers	5
		Quality Control Manager	1
		Quality Control Coordinator	1
		Safety Coordinators	3
		Environmental Coordinator	1
7	Trades, transport and equipment operators and related occupations	Construction Manager	1
		Superintendent	5
		Foreman	21
		Tradespeople	234

Operation

The Project will employ an estimated 51 full-time positions for Operation and Maintenance of the Argentia Green Fuels Facility and 14 full-time positions for Operation and Maintenance of the Argentia Wind Facility. Table 3.1.6-3 provides a summary of the Project operations phase employment.

Green Fuels Facility Maintenance Technicians, Green Fuels Facility Managers, and Wind Turbine Technicians are categorized as NOC code 7, trades, transport and equipment operators and related occupations Green Fuels Facility Operators, and Wind Site Managers are designated as NOC code 9, occupations in manufacturing and utilities. Green Fuels Facility Engineers are classified as NOC code 2, natural and applied sciences and related occupations.

Table 3.1.6-3 Operations Phase Labour Forecast.

NOC Code	Category	Description	Operation
1	Business, finance and administration occupations	Administration	5
2	Natural and applied sciences and related occupations	Green Fuels Facility Engineer	2
7	Trades, transport and equipment operators and related occupations	Green Fuels Facility Maintenance Technicians	15
		Green Fuels Facility Manager	2
		Wind Turbine Technicians	10
9	Occupations in manufacturing and utilities	Green Fuels Facility Operators	30
		Wind Site Manager	1

3.2 Baseline Studies

Table 3.2-1 provides a summary of baseline studies conducted for the Project to generate information and data required to support the evaluation of environmental effects, to develop mitigation measures, or to provide baseline for follow up monitoring programs. In many cases, a study addressed more than one of these purposes. Summaries of each original baseline study are provided in the following subsections, as well as a brief description of plans for further and ongoing studies.

Table 3.2-1 Index of Baseline Studies Completed for the Argentia Renewables Project.

Valued Component	Key Indicator	Desktop Research Completed (Y/N)	Desktop Modelling Completed (Y/N)	Original Baseline Study Conducted (Y/N)	Corresponding Appendix (Letter – Title)
Atmospheric Environment	Regional Climate	Y	N	N	N/A
	Greenhouse Gas (GHG) Emissions	Y	Y	N	H - Energy and Emissions Study
	Air Quality	Y	Y	Y	A - Atmospheric Environment Baseline Study, H - Energy and Emissions Study
	Light	Y	Y	N	I – Light Impact Assessment
	Sound Quality (Noise)	Y	Y	Y	J – Noise Impact Study
	Vibration	Y	N	N	NA
Aquatic Environment	Surface Water Resources	Y	Y	Y	C1 -Source Water Hydrology

alued Component	Key Indicator	Desktop Research Completed (Y/N)	Desktop Modelling Completed (Y/N)	Original Baseline Study Conducted (Y/N)	Corresponding Appendix (Letter – Title)
Aquatic Environment	Freshwater Environment	Y	Y	Y	B1 - Aquatic Environment Component Study
	Marine Environment	Y	Y	Y	B2 - Ocean Dispersion Model Report
	Fisheries and Aquaculture	Y	N	N	B1 - Aquatic Environment Component Study
	Species at Risk	Y	N	N	N/A
	Habitats of Conservation Concern	Y	N	N	N/A
	Marine Biosecurity	Y	N	N	N/A
Terrestrial Environment	Wetlands	Y	Y	Y	D3 - Ecological Land Classification Component Study
	Vegetation and Rare Flora	Y	Y	Y	D6 - Rare Plants Component Study, D5 - Rare Lichens Component Study
	Avifauna	Y	Y	Y	D1 - Avifauna Component Study
	Bats	Y	Y	Y	D2 - Bat Component Study
	Mammals	Y	N	Y	D4 - Mammals Component Study
	Species at Risk	Y	Y	Y	Terrestrial Environment Baseline Studies D 1-2, 5-6
	Areas of Conservation Concern	Y	N	N	N/A
	Soils and Terrain	Y	N	N	N/A
Land and Resource Use	Zoning	Y	N	N	N/A
	Commercial and Industrial Resource Use	Y	N	N	N/A
	Recreational and Subsistence Resource Use	Y	N	N	N/A
	Protected, Special and Sensitive Areas	Y	N	N	N/A
	Indigenous Land Use	Y	N	N	N/A
Heritage and Cultural Resources	Historic and Archaeological Resources	Y	Y	N	F - Historic Resources Overview
	Paleontological Resources	Y	N	N	

Valued Component	Key Indicator	Desktop Research Completed (Y/N)	Desktop Modelling Completed (Y/N)	Original Baseline Study Conducted (Y/N)	Corresponding Appendix (Letter – Title)
Heritage and Cultural Resources	Architectural Resources	Y	N	N	F - Historic Resources Overview
Socio-Economic Environment	Population Demographics	Y	N	N	G - Socioeconomic Baseline
	Community Health and Wellbeing	Y	N	N	
	Infrastructure and Services	Y	N	N	
	Economy	Y	N	N	
	Employment	Y	N	N	
	Business	Y	N	N	
Human Health and Quality of Life	Shadow Flicker	Y	Y	N	K – Shadow Flicker Impact Assessment
	Ice Throw	Y	Y	N	L – Ice Throw Analysis

3.2.1 Atmospheric Environment Baseline Studies

The potential effects of climate change for NL were projected using available observations and regional climate models (Finnis, 2013; Finnis & Daraio, 2018), these are included in Section 3.1.1.

A GHG inventory was developed for the Construction and Operation and Maintenance phases of the Project. The GHG inventory calculated the emissions produced from direct and indirect sources including, but not limited to, stationary combustion, mobile equipment, blasting, electricity consumption, and marine transport. Annual Operation and Maintenance phase emission estimates were compared to the threshold of 15,000 tonnes of CO_2e set out in the **Newfoundland and Labrador Management of Greenhouse Gas Act** (MGGA) to determine whether the Act and associated regulations are applicable to the Project. An air release inventory for the Construction and Operation and Maintenance phases of the Project was also developed. The air release inventory includes all releases generated by combustion and non-combustion processes including, but not limited to, stationary combustion, mobile equipment, blasting, wind erosion of exposed surfaces, material handling, flare stacks, and marine transport. Air releases were computed in terms of annual emissions for the Construction and Operation and Maintenance phases, and as emission rates for the Operation and Maintenance phase of the Project. Emission rates were used in an air dispersion modeling exercise via the latest CALPUFF dispersion modeling system (version 7.2.1) as per the Guideline for Plume Dispersion Modelling issued by NL DECC. Modeling was performed to predict maximum ground level concentrations of air contaminants of potential concern during operation of the Argentia Green Fuels Facility; steady air releases are not anticipated during operation of the Argentia Wind Facility. Concentrations, modeled as maximum hourly, maximum daily and annual average emissions, were predicted in relation to ambient air quality in the LAA and RAA during normal operation of the Project. Modelled concentrations of air contaminants of potential concern

were compared to the Newfoundland and Labrador Air Quality Standards (NL AQS) per the **Air Pollution Control Regulations, 2022**, and the Canadian Ambient Air Quality Standards (CAAQS), as developed by the Canadian Council of Ministers of the Environment (CCME). Further details regarding methods and results of the modelling are provided in Appendix H (Energy and Emissions Study).

In the absence of an Ambient Air Quality Monitoring (AAQM) station in the Study Area, a baseline ambient air quality survey was conducted in the summer of 2023 to characterize background concentrations of air contaminants of potential concern of the Project. Such air contaminants included $PM_{2.5}$, total suspended particulate (TSP), metals, ammonia (NH_3), NO_2 and SO_2. Sampling was conducted at two locations: one in a residential area on Power Street in Dunville and another within the Project Area and between the POA and a seasonal camping area (Sunset RV Park). The baseline ambient air quality survey methods and results are summarized in Section 3.1.1, and details regarding the study appear in Appendix A (Atmospheric Environment Baseline Study).

Regional levels of ambient light were assessed using modelling data and satellite observations of artificial light (Falchi *et al*., 2016a, 2016b). GHD completed an effects assessment of light based on the arrays associated with similar projects. After determining luminous flux estimates for each light source, the effects of the incident light at the identified sensitive receptors were determined. Baseline studies of ambient light were not necessary due to the siting of Project infrastructure and the industrial (Argentia Peninsula) and rural (Argentia Backlands) nature of the area. Further information is provided in Section 3.1.1 and Appendix I (Light Impact Assessment – GHD).

Ambient noise levels in the Project Area are considered to range between quiet rural to urban residential (Health Canada, 2017). A baseline noise assessment was conducted in July 2023 and December 2023 to support this classification, whereby ambient noise levels and presence of Low Frequency Noise (LFN) were measured at four monitoring locations: one at the closest sensitive receptor for Project infrastructure noise in Dunville, NL, and three proximate to other potential receptors in the surrounding communities of Freshwater, Ferndale and Fox Harbour, NL. A 3-D acoustical model was used to evaluate the potential noise levels on receptors during Construction and Operation and Maintenance. The model utilized a conservative “worst-case scenario” approach in which the noise model input was based on specifications of the largest model of wind turbine and the maximum number of wind turbines being considered for the Project, along with maximum anticipated noise outputs from the Argentia Green Fuels Facility. The baseline noise assessment methods and results are summarized in Section 3.1.1, and details regarding the study appear in Appendix J (Noise Component Study).

Baseline levels of vibration were not measured due to the siting of Project infrastructure and anticipated low levels of ambient vibration in the Project Area; vibrations occur intermittently based on ongoing construction and industrial activities in the region.

3.2.2 Aquatic Environment Baseline Studies

A desktop surface water resources study was conducted and supplemented with baseline field studies in 2023. Baseline water quality sampling of the potential source water in the PPWSA for the Argentia Green Fuels Facility was conducted May 23-24 and October 19, 2023. Details of field methods and water quality results are provided in Appendix B1 (Aquatic Environment Baseline Study).

Hydrologic conditions for the RAA were evaluated based on analyses of publicly available streamflow monitoring data (Water Survey of Canada) to determine monthly unit runoff rates and regional streamflow patterns. A Source Water Hydrology Report (Appendix C1) was conducted to evaluate the potential to supply the Project from watersheds and ponds that comprise the Town of Placentia PPWSA. A two-system water balance model was devised to assess the monthly water balance of system reservoirs (Clarke's Pond, Larkins Pond, Barrows Pond, and Gull Pond) and watersheds. The water balance incorporated both the existing water withdrawal and the projected Project water withdrawal rates. These analyses examined the water balance in the studied watersheds on both annual as well as an ongoing (continuous) temporal interval. The analyses used long term historical data (1950 to 2013) and incorporated projected climate change influence (from 2014 to 2095). The full report is provided in Appendix C1 (Source Water Hydrology Report).

The review of groundwater resources in the RAA comprised a desktop exercise only. Groundwater has little influence on the overall water balance in the region, and the direct Project interactions with groundwater will be minimal.

Potential freshwater stream crossings associated with proposed access roads, wind turbines, and transmission line within the Project Area were first identified via desktop analysis followed by assessment in the field. Aquatic habitat characterization and fish population assessments of stream crossings were conducted between August 24 and September 20, 2023. Aquatic habitat characterization and fish population assessment of Larkin's Pond outlet was performed on October 24, 2023. No amphibians were captured or observed during the 2023 baseline study when conducting fish surveys or habitat assessments. Further details regarding the aquatic baseline studies are provided in Appendix B1 (Aquatic Environment Baseline Study).

Desktop review of marine environment encompassed marine geology, geomorphology, physical oceanography, marine navigation, marine fish and fish habitat, marine mammals, marine reptiles, and shellfish of the LAA and RAA. This data was supplemented with baseline studies between August 26 to December 10, 2023, in Argentia Harbour. The marine baseline field studies included measurement of water column conductivity/temperature/depth (CTD) and temperature profiling, water quality sampling, sediment sampling, and zooplankton, phytoplankton, and benthic communities sampling. Further details regarding the aquatic baseline studies are provided in Appendix B1 (Aquatic Environment Baseline Study).

Dispersion modelling of the proposed Argentia Green Fuels Facility outfall was conducted in 2024 and further described in Appendix B2 (Effluent Dispersion Model Report).

Information on freshwater and marine fisheries (commercial, recreational, aquaculture, and Indigenous) was collected through a desktop review that included commercial harvest data by species supplied by DFO for 2018-2022. Additionally, at the suggestion of Fish Food and Allied Workers Union (FFAW), and with their cooperation, an online survey was conducted to gather feedback from local fish harvesters on harvest activities in and near the Project Area. The survey was distributed in February 2024 to FFAW members in the Placentia Bay area but received limited response. The survey responses are included in Appendix U4.

Desktop review of freshwater and marine Species at Risk (SAR) comprised a review of AC CDC data, examination of species range maps, and review of available DFO data. Field crews recorded all incidental observations and other evidence of SAR while conducting baseline studies in 2023. SAR observed during the 2023 field studies were limited to a single visual observation of American eel (*Anguilla rostrata*).

Habitats of conservation concern were examined via desktop review and during baseline habitat surveys. No critical habitats (as defined by SARA or NL ESA) for aquatic species were identified in the RAA. No discrete spawning habitats were documented during the baseline survey in 2023. Detailed results are provided in Appendix B1 (Aquatic Environment Baseline Study).

Marine biosecurity and known occurrence of aquatic invasive species were examined via desktop review of information for Placentia Bay.

3.2.3 Terrestrial Environment Baseline Studies

Detailed Ecological Land Classification (ELC) mapping was completed for the Project Area, utilizing results from a comprehensive field verification program conducted from September 26 to December 8, 2022, followed by several minor adjustments for lichen habitat based on surveys conducted in 2023. The ELC was used in planning and as a resource for several surveys of the other VCs included in this Registration. For example, it provided a model for delineating the extent of wetlands at a higher resolution than standard 1:50 k topographic maps. As well, specialized ecotypes shown on the ELC were targeted during the SAR and rare plant surveys. Details and ELC maps are provided in Appendix D3 (Ecological Land Classification Component Study).

A desktop rare flora study was conducted to compile historical records of rare plants. The collected information, supplemented by ELC mapping was used in the design of baseline field studies to catalogue rare species in the Project Area. The rare plant survey was conducted in early September 2023 and covered all the high-potential areas as described in Appendix D6 (Rare Plants Component Study). In addition to rare plants, rare lichens are known to be present in the Avalon region. Preliminary surveys for

lichens were conducted concurrently with other field studies such as the ELC ground-truthing, bird surveys, and mammal surveys. Targeted surveys were conducted intermittently for lichen SAR beginning on September 26, 2022, and finished on March 21, 2023. Details regarding lichen survey methods and results are provided in Appendix D5 (Rare Lichens Baseline Study).

Desktop avifauna studies included a review of AC CDC data, eBird and the NL birds lists as well as species range maps. These data informed the program of baseline field studies that were carried out in appropriate habitats as indicated by the ELC. These surveys served to establish current use patterns. Comprehensive field studies were conducted on avifauna year-round beginning in 2022 (September 26, October 11, December 1, and December 8, 2022) and extending to spring 2024 using a combination of study methods designed to maximize the number of detections spatially and temporally. Point counts were primarily employed during the breeding season and transect surveys during the rest of the year, supplemented with two autonomous recording units (ARUs) (i.e., 'Songmeters') that operated year-round from April 22 to October 18, 2023. Observations were recorded weekly during spring migration from May 7 to May 25, 2023, biweekly during fall migration from Sept 26 to January 3, weekly during the breeding season from June 7 to June 27, 2023, and biweekly during the overwintering period for resident birds from January 15 to April 11, 2024. To detect raptor species, a series of ground-based sky-scans were conducted. Additionally, a RPAS flight in July 2023 collected high-resolution imagery that could detect raptor species as well as nests of large raptors. Detailed avifauna survey methods and results can be found in Appendix D1 (Avifauna Component Study). Mitigation measures applicable to interactions with the Project are discussed in Appendix R (Species at Risk Impacts and Mitigation) and Appendix S (Post-construction Monitoring Plan). Additional avifauna surveys will be conducted through the winter season of 2025 and additional SAR observations will be recorded.

Targeted studies for avifauna SAR were conducted in addition to, or concurrent with, the above-described year-round avifauna studies. Species targeted included:

- Short-eared Owl (*Asio flammeus*) within the wetland and meadow habitat types. None have been observed to date; a follow-up survey was conducted in July 2024 based on consultation with Wildlife Division (WD).
- Red Crossbill *percna* (*Loxia curvirostra percna*) within the mature coniferous habitat ecotype. Multiple observations have been recorded to date.
- Gray-cheeked Thrush (*Catharus minimus)* within coniferous scrub and regenerating coniferous forest habitat ecotypes. Three observations isolated to the breeding season have been recorded to date.
- Harlequin Duck (*Histrionicus histrionicus*) within the marine coastline habitat ecotype. None have been observed to date.

- Rusty Blackbird (*Euphagus carolinus*) within the wetland habitat ecotype. None have been observed to date.
- Olive-sided Flycatcher (*Contopus cooperi*) within the mature coniferous forest, regenerating coniferous forest, and mixedwood forest habitat ecotypes. None have been observed to date.

Baseline surveys were conducted for all bat species since the fall of 2022, with Anabat Swift detectors sited within the Project Area, adjacent to waterbodies/wetlands deemed to be suitable foraging habitat. Detectors were deployed initially in three locations from September to October 3, 2022. In 2023, detectors were deployed in three locations starting on April 18, with another two locations added on June 27. All five detectors were retrieved on November 16, 2023. Monitoring is ongoing in 2024 with the deployment of eight detectors, beginning in mid-April and with a temporal window extending to November. Detailed bat survey methods and results can be found in Appendix D2 (Bat Component Study). Bat SAR detected to date include Northern myotis (*Myotis septentrionalis*), little brown myotis (*Myotis lucifugus*), and hoary bat (*Lasiurus cinereus*).

Survey teams opportunistically recorded evidence of mammals including tracks, scat, browsing, and auditory detections while in the field throughout 2022-2024. Although there were no dedicated field surveys, provision was made for incidental observations and results were included in the appended report in Appendix D4 (Mammals Component Study). Opportunistic observations of arthropods were also recorded. Two observations of the SAR yellow-banded bumble bee (*Bombus terricola*) occurred concurrently with summer avian surveys.

3.2.4 Land and Resource Use Baseline Studies

A secondary source study was conducted to compile the existing land and resource uses within the Project Area, LAA, and RAA as presented in Section 2.1. This information was supplemented by comments received via engagement with stakeholders, Indigenous Peoples, and the public in various forms as detailed in Chapter 8.

3.2.5 Heritage and Cultural Resources Baseline Studies

A desktop review of archaeological sites registered for Placentia Bay was conducted, and a desktop terrain model was constructed to infer as to whether any structures or features of potential archaeological value may be found. Methods and results of the desktop review and modelling are summarized in Section 3.1.5, and details appear in Appendix F (Historic Resources Overview Assessment).

Slight modifications were made to the Study Areas as presented in Section 2.1 for this VC. A desktop review of Precontact and Historic Period archaeological sites registered for Placentia Bay was conducted, comprising the Regional Assessment Area (RAA) for Heritage and Cultural Resources assessment. The LAA selected for Heritage and Cultural Resources comprised a circular area measuring 50 km in diameter

centered on a point near the Town of Placentia. The Project Area as presented in Section 2.1.1 was divided into three principal sectors based on the potential for direct interaction with Project activities and infrastructure. The three sectors of the Heritage and Cultural Resources Project Area are the Argentia Peninsula, the Argentia Backlands, and a 500 m wide linear corridor (i.e., 250 m on either side of a centreline) along the Project Interconnect Line. No part of the marine environment of Placentia Bay, either within Argentia Harbour or Placentia Sound, was included as part of the Heritage and Cultural Resources Project Area.

3.2.6 Socio-Economic Baseline Studies

A desktop study was conducted by GHD to examine the baseline socio-economic environment within the Project Area, LAA, and RAA. Methods and results of the desktop study are summarized in Section 3.1.6, and details appear in Appendix G (Socio-Economic Baseline Study - GHD).

Study areas for this VC were selected based on available data and known concerns regarding the Project and the potential for effects on the communities, the region, and the province. The Project Area considered in the socio-economic effects assessment is presented in Section 2.1.1.1. However, the LAA identified in Section 2.1.1.2 is not significantly different from the Project Area from a socio-economic assessment perspective. Therefore, the Socio-Economic LAA uses data and information which are available from Statistics Canada (Census of Canadian Population) and NL Statistics Agency (Community Accounts) for the Town of Placentia, which includes the Port of Argentia and the communities of Freshwater, Dunville, Southeast Placentia and Jerseyside – amalgamated with Placentia in 1991 (Town of Placentia 2024). Where data are not available for Placentia, NL Statistics Agency data may be substituted using Local Area 2: Placentia-St. Bride's Area, which includes Placentia along with Fox Harbour and Ship Harbour to the north and the communities of Point Verde, Big Barasway, Ship Cove, Patrick's Cove-Angels Cove, Cuslett, St. Bride's, Point Lance and Branch to the south. The Socio-Economic LAA corresponds with the RAA presented in Section 2.1.1.3.

Therefore, the Socio-Economic RAA includes census data for the Avalon Peninsula Economic Region or Census Division (CD) No. 1, Avalon, both of which include the Avalon Peninsula and the Isthmus. Data may also be obtained from NL Statistics Agency for Economic Zones: 17, 18, 19, 20, which encompass the Avalon Peninsula, but not the Isthmus. Where data are not available, the census also supplies data for Eastern Health, which encompasses a larger area including the Avalon Peninsula, Bonavista Peninsula and Burin Peninsula. Avalon is the area anticipated to supply labour for this Project during construction. For selected aspects of the socio-economic environment, such as economic benefits, provincial royalties / taxes, and effects on gross domestic product, the Socio-Economic RAA is the province of NL.

3.2.7 Human Health and Quality of Life Baseline Studies

Studies of various aspects of the Project that may interact with the Human Health and Quality of Life VC are discussed above in Atmospheric Environment (air quality, light, sound quality (noise), vibration), Land and Resource Use (domestic wood harvesting, viewscapes, and traditional, cultural, recreational, and Indigenous activities), Aquatic Environment (groundwater and surface water, fish and fish habitat), and Terrestrial Environment (animals, birds or plants and their habitats). For brevity these are not repeated here.

An analysis to determine the extent and duration of shadow flicker caused by moving shadows cast by wind turbines was conducted by APG. The model utilized a conservative “worst-case scenario” approach in which the model inputs were based on specifications of the largest model of wind turbine and the maximum number of wind turbines being considered for the Project. A digital elevation model (DEM) derived from the Aerial Lidar database was used as the terrain model for the analysis. Further details regarding the modelling study are provided in Appendix K (Shadow Flicker Impact Assessment – APG).

An analysis to determine the risk of ice fall or throw for wind turbine operations in cold weather was conducted by GHD. The model utilized a conservative “worst-case scenario” approach in which the specifications of the largest model of wind turbine and the maximum number of wind turbines being considered for the Project were input to the model. Climate data for the model was sourced from the Argentia meteorological station, and blade heating technology was not considered in the model. Further details regarding the modelling study are provided in Appendix L (Ice Throw Analysis – GHD).

3.2.8 Data Gaps

There are no information gaps that could impair the ability to make effects predictions for the Argentia Renewables proposed Project. Where Project description details are not yet available (or alternatives are still under consideration), mitigation measures (e.g., bat curtailment protocol, avoidance and minimization of impacts to boreal felt lichen) have been applied coupled with conservative assumptions have been made that would overstate any potential negative environmental effects. As Project planning proceeds, there will be a continuing process of identification and refinement of both mitigation and monitoring measures for all Project phases.

Land disturbance during Project construction will result in land use changes, thereby resulting in changes to and losses of carbon sinks in the Project Area. Carbon sink effects were not quantified for the Project as the study is not stipulated in the Guidance Document, nor is it provincially/federally required from a GHG accounting perspective. It is listed as a requirement per the Strategic Assessment of Climate Change (SACC) in the Draft Technical Guide Related to the Strategic Assessment of Climate Change (August 2021; https://www.strategicassessmentclimatechange.ca/), however the SACC is only applicable to federal assessments.

No field studies have been completed regarding local groundwater, and there is a notable absence of publicly available data sources on groundwater characteristics in this region, which limits detailed analysis. Groundwater in the region likely plays a minor role in the overall water balance, primarily due to the low to moderate yield of the volcanic bedrock and the shallow nature of the groundwater system. This limited role of groundwater suggests that its exclusion from detailed field studies does not affect the ability to make effects predictions.

The road layout in the Argentia Backlands will be adjusted as design specifics are developed (e.g., Wind generation sites). The field work component of the freshwater aquatic assessment, including the consideration of required new stream crossings was based on the routing as defined at that time. Thus, some locations will require site specific assessment (P1-P6). However, the collected information on streams and waterbodies provides a good representation of general regional characterization of the aquatic habitat in the Project Area. Argentia Renewables will carry out site – specific aquatic surveys for crossings P1-P6 as well as others as required prior to construction.

The quantity of data collected on avifauna and bats has been adequate for the purposes of describing the existing environment and to support effects assessments. However, a full two-year cycle of observation data collection has not been completed. Hence, surveys are ongoing and will continue through 2024. Bat monitoring is ongoing in 2024 with the deployment of eight detectors, beginning in mid-April and with a temporal window extending to November, and with two on meteorological towers to survey the airspace of the swept area of the turbines. Avifauna surveys will include point counts, acoustic monitoring, short-eared owl, and raptor surveys. All results will be shared with regulators and resource managers, and the information incorporated into ongoing plans for mitigation and monitoring.

Rare plants and lichens will continue to be surveyed in 2024. The rare plant survey was conducted late in the growing season (September 2023) and prior to the definition of a corridor for the Project Interconnect Line. Additional surveys will be conducted in 2024, including for rare plants along the Project Interconnect Line, further delineation of the yellow birch stands and the distribution of blue felt lichen prior to any construction activities if they will possibly interact with Project infrastructure. Further explanation of the how the Project will interact with rare plants and lichens including proposed mitigations are discussed in the SAR IMMP (Appendix R).

A muskrat survey will be conducted in fall 2024 as per discussions with NL WD regarding a suspected decline of this species in the region. A dedicated, yellow-banded bumblebee survey will be conducted in August 2024, as a supplement to the limited information collected in 2023.

3.3 Predicted Future Condition of the Environment Without the Undertaking

This section describes the predicted future condition of the environment over the expected lifespan of the Project if it were not to proceed. This analysis aids in distinguishing between environmental changes attributable to the Project and those arising from natural processes. It should be noted that it is reasonably likely that in the foreseeable future a wind generation and green hydrogen and ammonia facility would be developed in the area of the Project if the Project itself does not proceed, but for the purposes of this analysis, this possibility is disregarded. This analysis also assumes that the Project Area is not utilized for a different purpose not already being undertaken that could have a future impact on the environment.

As noted in Section 6.0 (Cumulative Effects), there are several ongoing activities and undertakings that can reasonably be assumed to continue in the area and interact with the natural and human environment. These include:

- Commercial traffic to and from Argentia Port, including marine shipping and road traffic associated with Port activity.
- Marine Atlantic ferry seasonal passenger traffic.
- Cenovus White Rose Extension Project.
- Dandy Dan's Fish Market Ltd. Seafood Processing Plant.
- Argentia Gold Corporation Cannabis Production Facility.
- Government services and infrastructure, including federal, provincial and municipal (Town of Placentia) activities. These include water and sewer supply/maintenance, roadway upkeep, building construction and facilities maintenance.
- Local tourism industry, including sites operated and maintained by Government (e.g., Castle Hill National Historic Site, Argentia Visitor Information Centre), and private tourism accommodations (such as AirBnB).
- Inshore and nearshore fisheries in the Argentia Harbour.
- Vale Nickel Processing Plant in Long Harbour.

The following discussion considers the continued effects of ongoing interactions along with natural environmental processes.

Atmospheric Environment

If Project development does not proceed, air contaminant concentrations in the LAA would be similar to the established baseline concentrations discussed in Section 3.1.1. The current air quality in the LAA is

characterized by low background levels, and any increases would likely be attributed to the introduction of other developments that generate substantial emissions.

Government initiatives, guided by specified targets, aim to mitigate the effects of climate change. If the Project does not move forward, it is expected that the current trajectory of decreasing GHG emissions at both federal and provincial levels of government would persist. This downward trend is primarily attributed to ongoing initiatives and strategies implemented by governments to meet their specified reduction targets. The proposed Project is expected to contribute to the global reduction of carbon emissions by replacing fossil fuel consumption with renewable energy sources. Specifically, the Project utilizes wind energy to produce green hydrogen and ammonia. The continuation of fossil fuel usage could persist in the absence of the Project, resulting in a missed opportunity to reduce global GHG emissions.

If the Project area remains in its current state, it is anticipated that the future condition of the acoustic environment will closely resemble the conditions documented in Section 3.1.1.

Climate change phenomena (e.g., storm surge, sea level rise, and altered precipitation patterns) are expected to continue in the absence of the Project. While the Project is intended to be a contributor to global efforts of carbon reduction, the effect of the loss of the Project on local climate change parameters will be negligible, albeit negative, given the scale of anticipated change.

Aquatic Environment

In the absence of the Project, the local environment is likely to remain in its current state. The future condition of the freshwater aquatic environment – groundwater and surface water resources, and fish and fish habitat – is expected to closely resemble the existing environment discussed in Section 3.1.2.

The primary sources of demand for the Municipal Water System are from residents, local businesses, and commercial users in the Town of Placentia, including the POA. This source is also proposed to supply potable water to the Argentia Green Fuels Facility. If the Project does not proceed, the result would be slightly reduced growth in demand on the Municipal Water System.

In the absence of the development of Project infrastructure (linear facilities, wind turbine foundations) in the Argentia Backlands, the natural flow of surface runoff, hydrology, and water quality would remain relatively unchanged. There would be no disturbance to aquatic habitat and species.

If the Project does not proceed, the anticipated future state of the marine environment would remain largely consistent with the description of the existing environment outlined in Section 3.1.2. In the absence of the Project, the negligible to low potential effect on the marine environment from discharge of treated water generated during hydrogen and ammonia production would not materialize.

The existing ongoing undertakings and activities interact with marine habitat and biota, namely via discharges to the marine environment. There is a pattern of outfalls associated with the existing municipal and POA water and sewer systems. Some outfalls are relatively short term (e.g., the Cenovus White Rose Extension Project) and will cease once the Construction Phase is complete; however, it is the nature of the POA operation that other users/tenants will be identified as business opportunities wishing to utilize the Port facilities. In the absence of the Project, water quality conditions in the marine environment near the Project area will continue to experience low potential negative effects.

The area currently has a modest level of vessel activity associated with commercial and recreational fisheries, Marine Atlantic ferry traffic, and POA marine traffic. The predicted increase in marine vessel movements will be slightly moderated in the absence of the Project. Effects associated with vessel traffic, including local, Canadian, and international vessel movements will experience little change in the absence of Project related traffic. The Project is not anticipated to have any effect on marine resource harvesting, so there will be no change in the potential effects on local fish populations in the absence of the Project. The continuation of the Cenovus White Rose Extension Project will involve channel dredging and other interactions with the nearshore marine environment; however, the associated potential effects from this Project have been subjected to thorough environmental assessment and appropriate mitigation and monitoring programs developed to address potential negative effects on the marine environment.

Effects resulting from the planned Marine Terminal Expansion Project at the POA are considered in Section 6.0 (Cumulative Effects).

Terrestrial Environment

If Project development does not proceed, the predicted future state of the terrestrial environment (avifauna and bats, wildlife and wildlife habitat, wetlands and vegetation) would remain mostly unchanged from what was described in the existing environment portion of this assessment in Section 3.1.3.

Project activities associated with wind energy development have the potential to adversely affect avifauna and bat species through habitat alteration or loss, injury and mortality, and disruption to movement. Habitat alteration or loss resulting from site preparation and the Construction Phase will reduce habitat quality and quantity in the Argentia Backlands. Habitat use will be reduced because of vegetation clearing and edge effects. In the absence of the Project, these losses in quantity and reductions in quality of habitat will not occur. The risk of injury and mortality to birds and bats increases due to collisions with wind turbine blades and other Project infrastructure (transmission infrastructure, meteorological towers, and overhead collector lines). In the absence of the Project this threat to bird and bat populations is eliminated. It is unlikely that other, ongoing activities and Projects (such as hiking trail development) would pose a similar level of risk to bats, birds or their habitat. Disruption to movement is another concern as the presence of wind turbines can impede the regular migratory pathways or daily movements of birds. If the Project does not proceed and the Argentia Backlands are maintained in an undeveloped state, the

potential negative effects previously mentioned would be avoided and the existing ecological balance, habitat structure, and biodiversity of birds and bats would remain intact.

The execution of Project activities related to the Argentia Wind Facility may have negative effects on wildlife through changes in behaviour and sensory disturbances. Disturbances arising from Project activities encompass heightened levels of noise, increased artificial light, elevated dust levels, and the intensified human presence in the Project Area. Heightened levels of noise can disrupt the auditory environment for wildlife, affecting communication, navigation, and breeding behaviours. Increased artificial light may interfere with nocturnal species, potentially disrupting feeding and mating patterns. The intensified human presence can lead to changes in wildlife behaviour, including stress and avoidance responses. If the Project does not proceed and the Argentia Backlands are maintained in an undeveloped state, the aforementioned negative effects would be avoided. If the Project does not move forward, it is expected that safeguards for species listed under SARA Schedule 1 or NL ESA would persist, thereby ensuring continual protection of the designated species. In the absence of Project related effects, it is predicted that habitat quality within areas of conservation concern will remain unaffected.

Land and Resource Use

If Project development does not proceed, the envisioned future state of the environment concerning land and resource use is foreseen to exhibit minimal deviation from its current condition. The abundance and utilization of commercial resources play a central role in shaping the environmental landscape. Furthermore, the availability of harvested species and the use of sustainable management practices serve to protect the prospective state of the environment.

The proposed Project location on the POA (a seaport and industrial park on a brownfield site) is designated for commercial and industrial use. It is probable that development would occur in this area even if this Project were not to proceed. Industrial land and resource use may include wind farm development, mineral exploration, aquaculture, inshore and nearshore fishery, petroleum exploration and development, and wood harvesting.

Planning and development of a network of hiking trails in Placentia and surrounding communities is currently underway by the Placentia Trails Committee. The hiking trail will extend from the former US military base through the community of Placentia. Should the Argentia Backlands area remain undeveloped by the Project, the trail extension will result in improved accessibility to recreational land and resources for the community and visitors. In the absence of the proposed Project the synergies associated with optimal use of the Project’s linear features and the possibility of cost savings for trail construction would be lost.

Heritage and Cultural Resources

The existing heritage and cultural resources are fixed and limited, therefore, without implementation of the Project, the distribution and abundance of heritage and cultural resources will remain unchanged. A historic resources overview assessment (a desktop survey of archaeological records) has been completed as a requirement of the Registration document. It is unlikely that such an assessment would have been produced if the Project had not been proposed. As such, in the absence of the proposed Project there is a diminished probability of identifying, locating, and characterizing heritage and cultural resources within the Project area and subjecting these resources to provincial management, regulation, and protection measures.

Socio-Economic Environment

In the absence of the Project a continued decline in community populations in the region can be expected due to aging and residents relocating. This population decline would, in turn, reduce the demand on infrastructure and services, creating surplus capacity, but also the decreased population and smaller tax base would result in diminished investment in local community services and essential infrastructure, such as health services and social programs, education and training facilities and programs, and fire and emergency services. If the Project does not proceed, the current economic decline in local communities will exacerbate the downward trend in population, leading to a diminished demand on facilities and services, such as housing, accommodations, health services and social programs, education and training facilities and programs, and prevention and emergency services. This intricate interplay highlights the balance between populations demographics, community needs, and financial resources available for sustaining and enhancing local communities and industries, as well as family life, recreation, and culture.

In the absence of the Project, the anticipated economic boost for the area and the prospective employment opportunities directly tied to the Project would be forfeited, resulting on a loss of employment opportunities and absence of economic growth. The Project seeks to create local employment opportunities that would not otherwise be possible without a comparable venture. With an increase in employment opportunities and an influx of people relocating to the area for Project-related work, there is an increased demand for accommodations, food services, education and training, healthcare and social assistance, and retail trade industries.

The Cenovus White Rose Extension Project in Argentia is a temporary construction project expected to be completed in 2025, while the Argentia Renewables Project is scheduled to commence the Construction Phase the same year. This sequencing would make a good fit for Construction Phase related employment and economic activity and offset the “boom-bust” cycle associated with major project construction. The completion of construction activities associated with the Cenovus Project is likely to result in a decline in demand and employment opportunities for construction labourers and trade workers in the labour market. In the absence of the Argentia Renewables Project, there would be a notable

downturn associated with the completion of the Cenovus project and layoffs of trades, transportation, equipment operation, and related occupations.

The absence of the Project would also diminish the potential to diversify the economy of the area. The Project aims to promote a more resilient and varied economy, thereby lessening the vulnerabilities associated with an economic dependence on a relatively narrow array of industry sectors.

4.0 Environmental Effects

The purpose of environmental effects assessment is to identify, predict, and reduce or avoid potential negative environmental effects associated with a proposed Project, and predict the significance of residual negative effects.

This evaluation enables a determination to be made as to whether a project is likely to result in significant adverse impacts on the environment. The methods described below are generally compatible with other current environmental assessments and conform to the Province of Newfoundland and Labrador **Environmental Protection Act**, the associated **Environmental Assessment Regulations** as well as the guidelines issued by NLDECC.

Two general types of effects have been considered:

1) Effects of the environment on the Argentia Renewables Project (the Project).
2) Effects of the Project on the environment, including the biophysical and human environments.

Both planned and unplanned (i.e., accidents and malfunctions) aspects of the Project were assessed. The predictions process also accounts for the Project's cumulative effects by considering other ongoing and planned projects. Other "likely" undertakings include only those registered in accordance with the Environmental Assessment Regulations under the **Environmental Protection Act** (https://www.gov.nl.ca/ecc/env-assessment/projects-list/).

A general statement will be presented on the predictions that would apply in the absence of the Project. As with cumulative effects prediction, it is challenging to make firm predictions on future speculation.

Figure 4.0-1 presents the stages involved in conducting this effects assessment. A description of each step is presented below.

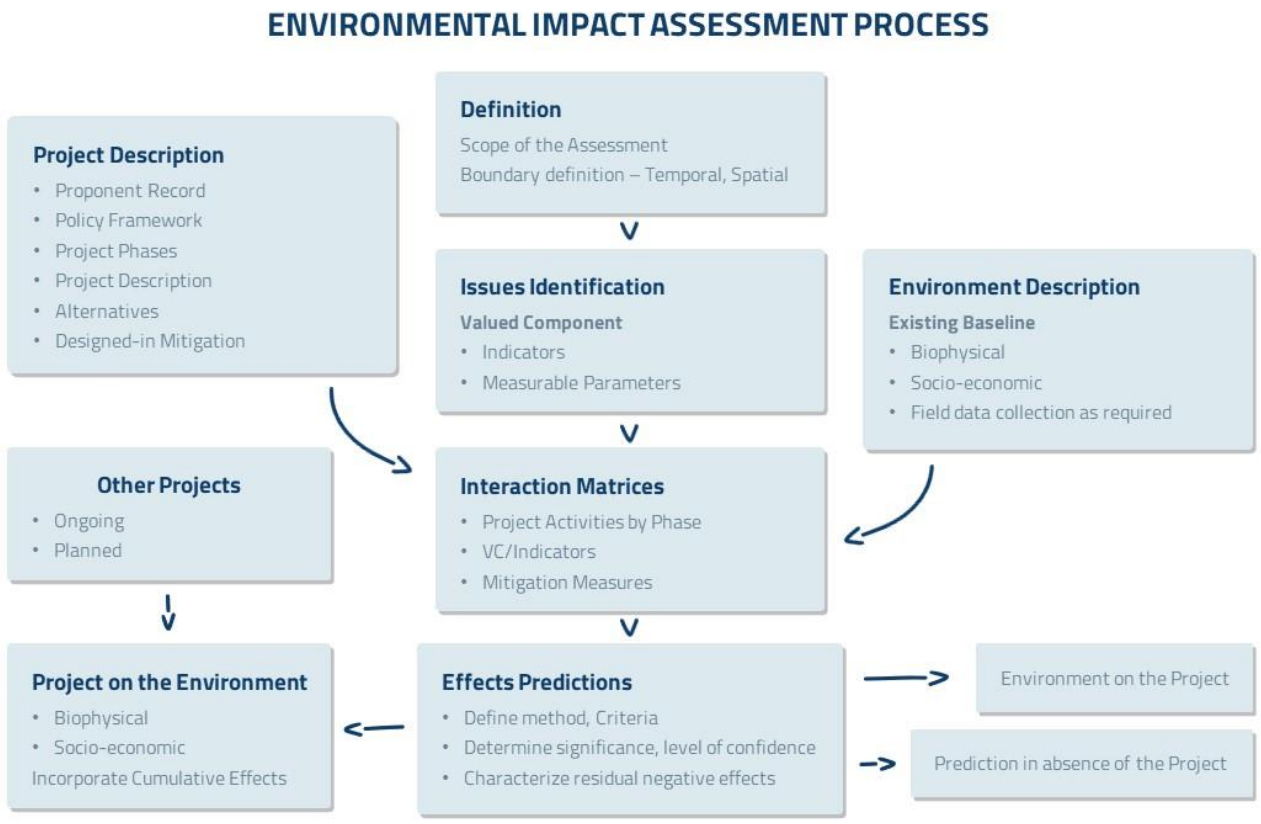


Figure 4.0-1 Staged Approach to Environmental Impact Assessment Process.

4.1 Effects Assessment Methodology

4.1.1 Definition of Scope

As a first step, the scope of the assessment is defined to place boundaries around the exercise and to delineate limitations on the material to be addressed. This exercise also serves to provide evidence of compliance with the requirements of applicable regulations, guidelines, and current practice.

Scoping encompassed the following actions:

- Review of the generic and category-specific guidelines issued by NLDECC for Registration of undertakings.
- Literature review of relevant information on Project elements and environmental effects of similar undertakings.

- Consultations with key interested parties, the public, and Indigenous Peoples to identify issues of concern.
- Consultations with regulatory and resource management agencies.
- Establish the scope of the Undertaking that is to be assessed.

Spatial and temporal boundaries are established to set maximum limits within which the environmental assessment will be conducted. The duration of interaction between the Project (and its associated activities) and potentially affected biophysical and socioeconomic components of the environment constitutes the temporal boundaries. Temporal boundaries have been assigned to Project phases: Construction Phase (29 months), operation phase (nominally 30 years), and decommissioning (one year). Temporal boundaries are therefore from 2025 to 2058.

The starting point for defining the spatial boundaries is the delineation of the Project Area, i.e., physical footprint of the undertaking. These areas conservatively define the Project footprint to account for the possibility of minor changes to the location of Project infrastructure that might occur as the Project moves through detailed engineering and construction. Sections 2.1-2.3 provide greater detail on Project physical and temporal boundaries.

Geographic extent refers to the geographic extent of interaction between the Project and a receptor (species, species group or their habitats). It varies according to the timing and type of Project activity and the sensitivities being assessed. Geographic boundaries are set with the aid of existing literature, modeling exercises, and baseline data collection. Study Areas have been defined to encompass the furthest extent of Project potential influence. Study areas vary by ecosystem, VC, and indicator. Other boundaries to be considered include administrative boundaries such as water supply watersheds, municipal boundaries, statistical areas, and planning zones.

4.1.2 Issues Identification and VC Selection

Key to the conduct of any environmental impact assessment is the thorough identification of issues and concerns related to and flowing from the proposed undertaking. In addition to the guidance provided by NL DECC, an exhaustive program of consultation has been in place by Argentia Renewables over the past two years and has generated interactions with all identified stakeholders, including Indigenous Peoples, community organizations, special interest groups, and regulators. Consultation activities has been designed to facilitate the flow of information out and information in through various mechanisms to provide interested or potentially affected stakeholders with the information required to understand the Project and identify issues or concerned to be addressed during Project planning.

Chapter 8 includes a list of consultation tools and activities as well as a comprehensive list of issues and concerns resulting from these consultations. In conducting the effects assessment, and where possible,

the identified issues have been employed to help define the indicators and measurable parameters that comprise the effects assessment.

In addition to the Argentia Renewables consultation process, both biophysical and socio-economic issues of concern were identified through several other sources, including:

- Media monitoring;
- Interest group interactions;
- Input from subject matter experts;
- Government, regulatory, and resource management agencies; and
- Guidelines issued by the EA Division NL DECC.

The identification of Valued Environmental Components (VECs) and Valued Socio-Economic Components (VSECs) was a concept pioneered by Beanlands and Duinker (1983) to provide focus to an Environmental Impact Assessment. For Onshore Wind Energy Generation and Green Hydrogen Production Projects, a set of Guidelines have been developed (NLDECC 2023) for preparation of a Registration. The Guidelines provide a listing of the following broad categories of Valued Components (VCs), and these have been adopted for this environmental effects assessment:

- Atmospheric Environment;
- Aquatic Environment;
- Terrestrial Environment;
- Land and Resource Use;
- Heritage and Cultural Resources;
- Socio-Economic Environment; and
- Human Health and Quality of Life.

The identified issues and concerns have been categorized in accordance with the broad suite of candidate VCs that require evaluation.

To carry out detailed consideration of potential environmental effects, key indicators are selected for each VC to serve as subjects of close examination. For each key indicator, one or more measurable parameters are then identified to enable measurement/quantification and prediction of changes related to interaction with the Project. Table 4.1.2-1 presents a list of key indicators for each VC utilized in this effects assessment. Further details regarding the selection of each key indicator are provided in Sections 4.2.1-4.2.7.

Table 4.1.2-1 Index of Key Indicators Utilized in Effects Assessment.

Valuable Component	Key Indicator
Atmospheric Environment	Air Quality
	Greenhouse Gas (GHGs) Emissions
	Light
	Sound Quality (Noise)
	Vibration
Aquatic Environment	Surface Water Resources
	Ground Water Resources
	Freshwater Environment (Fish and Fish Habitat)
	Marine Environment (Fish and Fish Habitat)
	Fisheries and Aquaculture
	Species at Risk
	Habitats of Conservation Concern
	Marine Biosecurity
Terrestrial Environment	Flora (Rare Plants and Lichens)
	Wetlands
	Fauna (Mammals)
	Avifauna
	Species at Risk
	Habitats of Conservation Concern[1]
Land and Resource Use	Zoning
	Commercial and Industrial Resource Use
	Recreational and Subsistence Resource Use
	Protected, Special and Sensitive Areas
	Indigenous Land Use
Heritage and Cultural Resources	Historic and Archaeological Resources
	Paleontological Resources
	Architectural Resources
	Burial, Cultural, and Heritage Sites
Socio-Economic Environment	Population Demographics
	Community Health and Wellbeing
	Infrastructure and Services
	Economy
	Employment
	Business
Human Health and Quality of Life	Shadow Flicker
	Ice Throw
	Air Quality[2]
	Light[2]
	Sound Quality (Noise)[2]
	Vibration[2]
	Recreational and Subsistence Resource Use[3]
	Indigenous Land Use[3]

NOTES
[1]Assessed under Land and Resource Use – “Protected, Special and Sensitive Areas”
[2]Assessed under Atmospheric Environment.
[3]Assessed under Land and Resource Use.

4.1.3 Project Description

A full description of the Project has been developed with emphasis on material relevant to the effects prediction process. This includes a description of the Proponent's experience in environmental management, their policy framework applicable to the proposed undertaking, and the network of plans applicable to each Project phase. The level of detail provided has been designed to support the development of interaction matrices as described below in Section 4.1.5.

Information on other projects and undertakings has been developed to support the inclusion of cumulative effects assessment. A challenging aspect of this type of assessment is the inclusion of undertakings that are "likely to proceed". The information provided in Chapter 6 informs the cumulative effects predictions.

Because planning and design is an iterative process, some decisions on Project features remain to be resolved. In such cases, the currently preferred choice will be presented, and possible alternatives (within the undertaking) described in the appropriate section.

4.1.4 Environmental Description

The existing biophysical and socio-economic environment has been described based on available existing information, supplemented by an ongoing field studies program. The relevant information has been presented in Chapter 3, with detailed reports included as appendices. This information and data have been used to support the development of interaction matrices.

4.1.5 Interaction Matrices

To identify the aspects and phases of the Project that could interact with an element of the environment, interaction matrices have been prepared. One axis consists of a listing of project activities by phase including Construction, Operation and Maintenance, Decommissioning, and Unplanned Events. These are summarized below in Table 4.1.5-1. The other axis of the interaction matrices lists environmental elements organized by VC. Timing and location of potential interactions are identified for further consideration.

Identified interactions were then evaluated and grouped into the applicable VC or indicator for more detailed evaluation. This process enables the assessment to focus on key issues and substantive environmental interactions.

For biophysical factors, an interaction was considered to be a potential effect if it could change abundance or distribution of a VC or alter habitat and food chain relationships. The socio-economic VCs were considered for the potential to change socio-economic status of communities or affected populations, as well as the potential to degrade health or quality of life.

Table 4.1.5-1 Summary of Project Components Considered in Effects Assessment.

Phase, Component	Description
Construction	
Site Preparation	Vegetation clearing, grubbing, surface grading and fill placement at: work sites, building and structures sites and laydown areas
Roads	Construction of new access roads, and widen and resurface existing roads, quarrying operations
Staging and Laydown	Installation of temporary facilities including Wind Turbine staging areas, construction compounds, and laydown areas
Material Transport	Road and marine transportation of construction vehicles, equipment, and materials
Wind Turbine Foundations	Installation of Wind Turbine foundations and crane pads (involves necessary blasting, excavation, and construction)
Electrical Infrastructure	Installation of electrical collector lines, substations, and transmission infrastructure
Wind Turbine Installation	Wind Turbine Installation: tower, rotor blades, and nacelle are assembled, and turbines are anchored to the foundations. Met tower installation
Electrolyzer Plant	Install electrolyser plant and associated works to produce hydrogen
Ammonia Plant	Install ASU, ammonia synthesis unit, and compression and refrigeration system to produce ammonia
Ammonia Storage/Transfer	Install ammonia storage tanks and install pipeline to transfer ammonia to shipping vessels
Flares	Install storage and process flare stacks to manage Project emissions
Admin Buildings	Installation of O&M building infrastructure
Operation and Maintenance	
Wind Turbine Operation	Wind turbine operation – noise generation, vibration, flicker, lighting, ice throw,
Wind Turbine Maintenance	Preventative and unplanned maintenance of wind farm components
Electrical Infrastructure	Maintenance of the collector system and transmission lines
Venting and Flaring	Release of product, byproduct either as flares or release to air.
Road Maintenance	Access road, TL road maintenance
Plant Operations	Hydrogen electrolyzer and ammonia plant operations; ammonia storage and transfer to vessels for shipment; Water consumption, discharge; fuel/lubricant storage and transfer;
Ammonia Handling	Ammonia storage, transfer, and product shipment
Decommissioning and Rehabilitation	
Electrical Infrastructure	Disassembly and removal of electrical collector lines and transmission infrastructure
Wind Turbine Removal	Disassembly and removal Wind Turbine infrastructure and met towers
Building Removal	Disassembly and removal of O&M building infrastructure
Plant Removal	Disassembly and removal of hydrogen and ammonia plant facility

Phase, Component	Description
Terrain Reclamation	Reclamation of disturbed areas
Unplanned Events	
Spills and releases	Release of hydrogen, ammonia, chemicals, pesticides or other hazardous substance on land, in air or water
Flaring and venting	Flaring or venting of hydrogen, ammonia, or other gases in the event of a malfunction
Fire or explosion	Any incident involving a fire and/or explosion
Traffic accident	Any Project-related vehicle collision or loss of control that threatens people or property on land or water
Wind Turbine collapse	Any unintended dislodging of a wind tower or turbine blade
Water supply failure	Failure of industrial water supply with subsequent harm (or threat of harm) to equipment, personnel
Wildlife emergency	Any threatened or actual harm to wildlife (birds, mammals, SAR)
Human hazard or injury	Any event which presents a danger or risk in which physical harm or damage may be inflicted upon a person.

4.1.6 Effects Prediction

Given the breadth of this assessment, a variety of methods have been applied to support effects predictions. These include:

- Modelling and statistical analysis;
- Regulatory standards and limits on emissions/discharges;
- Professional judgement and consultation with experts and specialists;
- Examination of baseline information and identified patterns of change;
- Reliance on literature for similar undertakings; and
- Precedents/experience.

The evaluation of each identified interaction concentrated on significant environmental effects by disregarding interactions where the potential was deemed unlikely or incidental. This approach allowed a focused assessment on key issues and substantive environmental effects. An interaction was considered to be a potential effect if it could change the abundance or distribution of VCs directly or indirectly. The potential for an effect was assessed by considering six criteria:

1. The location and duration of the interaction;
2. The existence of any pathways between the project activity and the receiving environment;
3. Modelling exercises;
4. Existing literature on similar interactions and associated effects (including previous environmental assessments);
5. Consultation with experts; and
6. Results of monitoring done in other areas.

In some cases, predictions have been made based on professional judgment. In all prediction statements the associated uncertainty is documented. All effects predictions are premised on the implementation of mitigation measures that have been proven effective and are often mandatory or standard practice.

4.1.7 Evaluation Criteria

Six criteria, as described below in Tables 4.1.7-1 and 4.1.7-2, were used in evaluating the nature and extent of biophysical and socio-economic environmental effects. The definitions and applicability of each of these criteria were customized as necessary for each VC-specific assessment.

Table 4.1.7-1 Biophysical Effects Assessment Evaluation Criteria.

Evaluation Criteria	Rating	Descriptor
Magnitude	1	Negligible – not detectable.
	2	Low – within the range of natural variability and affecting less than 10% of individuals / receptors in an effected area.
	3	Moderate – affects 10 to 25% of individuals / receptors in an affected area.
	4	High – affects between 25 to 50% of individuals / receptors in an affected area.
	5	Very High – affects greater than 50% of individuals / receptors in an affected area.
Frequency	1	Single event – residual effect occurs once.
	2	Infrequent, irregular events- residual effects occur rarely, but more than once.
	3	Multiple irregular events – residual effects occur irregularly but more than once.
	4	Multiple regular events – residual effects occur regularly.
	5	Continuous – residual effects are continuous.
Geographic Extent	1	Spatial extent of an interaction is isolated to brownfield sites inside the Project Area.
	2	Spatial extent of an interaction is limited to the Project Area.
	3	Spatial extent of an interaction is limited to the Local Assessment Area (LAA).
	4	Spatial extent of an interaction is within the Regional Assessment Area (RAA).
	5	Spatial extent of an interaction is beyond the RAA.
Duration	1	Interaction lasts one day or less.
	2	Interaction lasts one to seven days.
	3	Interaction lasts one to four weeks.
	4	Interaction lasts one to twelve months.
	5	Interaction lasts longer than one year.
Reversibility	1	Highly reversible – residual effect is likely to be reversed following end of Project Phase or Project.
	2	N/A
	3	Partially reversible.
	4	N/A
	5	Irreversible – residual effect is likely permanent.
Context	1	Brownfield site.
	2	N/A
	3	Evidence of utilization but with natural features.
	4	N/A
	5	Relatively pristine area.

Table 4.1.7-2 Socio-Economic Effects Assessment Criteria.

Evaluation Criteria	Rating	Descriptor
Magnitude	1	Low – no perceptible impact on the integrity and / or quality of VC or its use by people.
	2	N/A
	3	Moderate – integrity and / or quality of VC or its use by people is affected, but not compromised.
	4	N/A
	5	High – integrity and / or quality of VC or its use by people is compromised.
Frequency	1	Single event – residual effect occurs once.
	2	Infrequent, irregular events- residual effects occur rarely, but more than once.
	3	Multiple irregular events – residual effects occur irregularly but more than once.
	4	Multiple regular events – residual effects occur regularly
	5	Continuous – residual effects are continuous.
Geographic Extent	1	Residual effects limited to Project Area.
		N/A
	3	Residual effects extend to LAA.
	4	N/A
	5	Residual effects extend to RAA.
Duration	1	Short term – residual effects limited to construction.
	2	N/A
	3	Medium term – residual effects extend to operations and maintenance and decommissioning.
	4	N/A
	5	Long term – residual effects extend beyond the life of the Project.
Reversibility	1	Highly reversible – residual effect is likely to be reversed following end of Project Phase or Project.
	2	N/A
	3	Partially reversible.
	4	N/A
	5	Irreversible – residual effect is likely permanent.
Socio-Economic Context	1	Low – not identified by regulators or stakeholders as an issue related to the Project.
	2	N/A
	3	Medium – identified by regulators or stakeholders as an important issue to be addressed / resolved.
	4	N/A
	5	High – Has regulatory protection.

Where a regulatory standard is applicable and compliance can be demonstrated, this will justify an assignment of low or negligible effects magnitude.

4.1.8 Residual Environmental Effects

Once potential environmental effects have been identified and characterized along with the identified mitigation measures, the residual environmental effects are identified and noted for significance with respect to:

- Each Project activity or accident scenario;
- Cumulative effects of Project activities within the Project; and
- Cumulative effects of combined projects within the RAA, with emphasis on the Project Area.

The analysis and prediction of the significance of residual environmental effects encompasses three criteria:

1. Determination of the significance of residual environmental effects;
2. Establishment of the level of confidence in the prediction; and
3. Evaluation of the likelihood of a predicted significant environmental effect occurring and the scientific certainty and probability of occurrence of the residual impact prediction.

Significant environmental effects are those that are of such magnitude, frequency, geographic extent, duration, reversibility, and/or context as to cause a change in a VC that will alter its status or integrity beyond an acceptable level. The establishment of the criteria was based on professional judgment but was transparent and repeatable. Ratings are presented in summary tables of residual environmental effects.

Scientific uncertainty-associated effects predictions may be introduced when considering the accuracy and availability of baseline information, the accuracy of environmental effects predictions, and the expected level of effectiveness of mitigation measures. Confidence level and likelihood have been assessed using qualitative approaches (or quantitative as applicable) and professional judgment. The sources and nature of uncertainty are provided, including how any identified uncertainty may affect conclusions from the effects assessment. The level of confidence and likelihood of each prediction of significance are presented in summary tables using qualitative terms.

4.2 Predicted Environmental Effects of the Undertaking

A comprehensive analysis of the predicted environmental effects of the proposed Project according to each of the VCs is included in the following sections. This information is presented systematically in tabular form for enhanced clarity and accessibility. In addition, a detailed rationale for the presented

information is provided in narrative form to offer comprehensive context and justification. A detailed discussion and evaluation of adverse residual effects is provided, considering the mitigations presented in Section 4.4. A summary of significant residual effects is presented in Chapter 5. This analysis of environmental effects of the undertaking does not include environmental benefits associated with decarbonization as climate change mitigation.

4.2.1 Atmospheric Environment

Atmospheric Environment has been included as a VC because atmospheric conditions may be affected by construction, operation and maintenance, and decommissioning of the Project. There are five aspects through which the Atmospheric Environment VC and the Project interact: air quality, greenhouse gases, light, sound quality (noise), and vibration. While climate change is not considered a key interaction, the greenhouse gas indicator can be used as a proxy to illustrate potential interactions with climate change. Emitted GHGs trap and adsorb heat, thereby resulting in the greenhouse effect, the main driver of climate change.

Generally, Project activities across all phases will generate emissions to the atmospheric environment. Such emissions can have adverse effects on vegetation, wildlife and wildlife habitat, human health and wellbeing, and visual aesthetic of the Project Area. Table 4.2.1-1 lists Key Indicators (KIs) applicable to the Atmospheric Environment VC, as well as geographic scope and applicable measurable parameters for each KI.

Table 4.2.1-1 Scope & Measurable Parameters of Key Indicators: Atmospheric Environment.

Key Indicator	Scope	Measurable Parameters
Air Quality	RAA	Air contaminant concentrations (regulated standards)
Greenhouse Gases	Beyond RAA	GHG emissions in tonnes of CO_2e
Light	LAA	Illuminance
Sound Quality	LAA/RAA	Percent highly annoyed (%HA), indoor nighttime noise (in A-weighted decibels), low frequency noise (LFN)
Vibration	Project Area	Peak particle velocity (PPV)

4.2.1.1 Assessment Criteria

An overview of atmospheric environment effects assessment criteria is presented in Table 4.1.7-1 in Section 4.1.7. Criteria include context, reversibility, frequency, duration, geographic extent, and magnitude.

4.2.1.2 Existing Knowledge

Section 3.1.1 (Atmospheric Environment) summarizes existing knowledge of the Atmospheric Environment, while Appendix A (Atmospheric Environment Baseline) provides a more detailed description of air and sound quality (noise) based on desktop exercise and field studies.

4.2.1.3 Definition of Significance

For the Atmospheric Environment VC, a Significant Effect is defined as:

- Having a high magnitude; or
- A medium magnitude and characterized by either:
    - An extended duration affecting a geographic area that extends beyond the Project Area; or
    - A low level of confidence in the prediction.

Where a significant effect has been predicted, this evaluation then includes a determination of the likelihood associated with the predicted effect. “Likelihood” includes both the probability of occurrence as well as the scientific certainty of the predicted effect.

4.2.1.4 Potential Project-Environment Interactions

Potential interactions with identified KIs of the Atmospheric Environment VC are summarized in Table 4.2.1-2.

Table 4.2.1-2 Potential Project Environment Interactions Matrix: Atmospheric Environment.

Project Component and Activity Description	Key Indicators: Atmospheric Environment				
	Air Quality	GHGs	Light	Sound Quality	Vibration
Construction Phase					
Site Preparation	X	X	X	X	X
Roads	X	X	X	X	X
Staging and Laydown	X	X	X	X	X
Material Transport	X	X	X	X	X
Wind Turbine Foundations	X	X	X	X	X
Electrical Infrastructure	X	X	X	X	X
Wind Turbine Installation	X	X	X	X	X
Electrolyser Plant	X	X	X	X	X
Ammonia Plant	X	X	X	X	X
Ammonia Storage/Transfer	X	X	X	X	X
Flares	X	X	X	X	X
Admin Buildings	X	X	X	X	X
Operation and Maintenance Phase					
Wind Turbine Operation			X	X	X
Wind Turbine Maintenance	X	X	X	X	X
Electrical Infrastructure			X	X	
Venting and Flaring	X	X	X	X	
Road Maintenance	X	X	X	X	
Plant Operations	X	X	X	X	
Ammonia Handling	X	X	X	X	
Decommissioning Phase					
Electrical Infrastructure	X	X	X	X	X
Wind Turbine Removal	X	X	X	X	X
Building Removal	X	X	X	X	X
Plant Removal	X	X	X	X	X
Terrain Reclamation	X	X	X	X	X
Unplanned Events					
Spills and releases	X	X			
Flaring and venting	X	X	X	X	X
Fire and explosion	X	X	X	X	X
Traffic accident	X	X	X	X	X
Wind Turbine collapse				X	X
Water supply failure					
Wildlife emergency					
Human hazard or injury					

NOTES
X**:** Potential interactions that might cause an effect.
Blanks indicate that interactions between the Project and the VEC are not expected.

Air Quality

All aspects of the Construction Phase will result in air contaminant releases, namely due to the fact that fossil fuel-fired equipment (mobile and stationary) is required for construction. Additionally, fugitive emissions of air pollutants will be generated as a result of blasting, vehicular traffic on unpaved roads, wind erosion of exposed surfaces (e.g., stockpiles, laydown areas), material handling, and Project component transport. During Project operation and maintenance, air pollutant releases will be reduced significantly, and will arise from mobile equipment, flare pilot operations (continuously lit pilot), and marine transport of ammonia product. Additionally, periodic releases of air contaminants will occur during the operation phase; from use of an emergency generator in the event of a power loss to flaring as required at the plant. An Energy and Emissions Study (Appendix H) was developed to quantify air pollutant releases during construction and operation phases, and to predict ground level concentrations during Project operation. A summary of air pollutant release estimates for Project construction and operation is provided in Table 4.2.1-3.

Emissions in Table 4.2.1-3 do not consider background concentrations and are thus not an accurate depiction of ground level concentrations. Therefore, ground level concentrations were predicted relative to background concentrations using the CALPUFF dispersion modeling system to assess cumulative effects of the Project in consideration of ambient air quality, and thereby other air contaminant sources, in the LAA. Dispersion modeling used background concentrations developed in the Atmospheric Environment Baseline Study (Appendix A), whereby concentrations of air contaminants were processed to statistical metrics required by the CAAQS. Background concentrations were only available for SO_2, NO_2, CO, $PM_{2.5}$ and PM_{10} as they were developed from monitoring data. As such, it was assumed that background concentrations of all other air contaminants of interest were negligible. The air dispersion modeling approach, including inputs such as emission rates, source locations, sensitive receptor locations, and results are detailed in the Energy and Emissions Study (Appendix H). Predicted plus background concentrations were compared to NL AQS and CAAQS. Daily, hourly, and annual atmospheric discharge rates (otherwise known as emission rates) used in the CALPUFF dispersion modeling system are provided in Table 4.2.1-4. Air contaminants for which federal and provincial guidelines do not exist were omitted from Table 4.2.1-4 and provided in Appendix H (Energy and Emissions Study).

Table 4.2.1-3 Annual Air Release Estimate Summary.

Phase	Source	Annual Air Releases (tonnes)								
		CO	SO_2	NOx	VOCs (total)	TSP	PM_{10}	$PM_{2.5}$	Propane	NH_3
Construction	Blasting	4.250	0.125	1.000		0.123	0.064	0.004		
	Stockpile Erosion					1.568	0.784	0.118		
	Aggregate Handling and Transfers					2.494	1.180	0.179		
	Crushing and Screening					2.126	0.794	0.131		
	Laydown Areas					5.754	2.877	0.432		
	Unpaved Roads					2.254	0.645	0.065		
	Mobile Equipment	114.204	39.749	13.842		0.426				
	Stationary Combustion	2.852	0.871	13.238	1.081	0.931	0.931	0.931		
	Total Annual Construction	121.306	40.745	28.080	1.081	15.676	7.275	1.860		
Operation	Emergency Generator	4.287	0.509	16.138	0.413	0.313	0.250	0.242		
	Flare Stacks	0.767		0.283		0.031			1.299	0.667
	Marine Transport	0.248	0.106	2.171			0.040	0.037		
	Mobile Equipment	1.885	0.676	0.218		0.007				
	Total Annual Operation	7.187	1.291	18.810	0.413	0.351	0.290	0.279	1.299	0.667

Table 4.2.1-4 Atmospheric Discharge Rates: Project Operation.

Air Contaminant	Emission Rate (g/s)					
	Hourly		Daily		Annual	
	Flares	Emergency Generator	Flares	Emergency Generator	Flares	Emergency Generator
CO	1.22E-02	12.403	1.22E-02	12.4033129	1.22E-02	1.359E-01
SO_2		1.474		1.47380541		1.615E-02
NOx	1.51E-03 [1] / 26.2 [2]	46.695	1.51E-03 [1] / 1.09 [2]	46.694825	1.51E-03 [1] / 2.99E-03 [2]	5.117E-01
TSP	4.99E-01	9.047E-01	4.99E-01	9.047E-01	4.99E-01	9.915E-03
PM_{10}		7.238E-01		7.238E-01		7.932E-03
$PM_{2.5}$		6.990E-01		6.990E-01		7.660E-03
NH_3	92.6 [2]		3.86 [2]		1.06E-02 [2]	
[1] continuous propane pilots; [2] intermittent release of NH_3						

Based on estimated atmospheric discharge rates in Table 4.2.1-1, maximum ground level concentrations (i.e., background plus predicted) of air contaminants outside of the property boundary of the Argentia Green Fuels Facility are not predicted to exceed applicable guidelines (e.g., NL AQS, CAAQS), where available. Furthermore, guideline exceedances are not anticipated at identified sensitive receptors in the RAA. As detailed in the Energy and Emissions Study (Appendix H), assumptions were made to develop air release estimates that were carried over into air dispersion modeling. As such, atmospheric discharges, and hence maximum predicted ground level concentrations because of operation of the Argentia Green Fuels Facility, are considered conservative.

Air releases were not estimated for Project decommissioning or for Unplanned Events. Project decommissioning activities are anticipated to generate comparable, if not lower, levels of air releases to Project construction. Unplanned Events (e.g., flaring, fire and explosion) may generate air releases, but at levels lower than those generated during other Project phases.

Greenhouse Gas Emissions

Greenhouse gas emissions will arise during Project construction, operation and maintenance, and decommissioning. Due to the nature of Project activities, GHG emissions will be predominantly CO_2 with smaller quantities of CH_4 and N_2O. During construction, Scope 1 (direct) emissions will be generated from blasting and fossil fuel combustion in mobile and stationary equipment. Scope 3 (indirect) emissions will be generated because of marine transport of supplies (e.g., turbine blades, nacelles, tower segments) for Project construction. During operation and maintenance, Scope 1 emissions (direct) will arise from the continuously lit pilots in flare stacks as well as fossil fuel combustion in mobile and stationary combustion. Additionally, indirect emissions will be generated from electricity consumption (Scope 2) and marine transport of product to the global market (Scope 3) during operation and maintenance. GHG emissions for Project construction and operation and maintenance were estimated using preliminary engineering details, publicly available emission factors, and good practice guidelines. Annual Project construction and operation emission estimates are presented in Table 4.2.1-5. Calculation methodologies, inputs and assumptions are detailed in Appendix H (Energy and Emissions Study).

GHG emissions were not estimated for Project decommissioning or for Unplanned Events. Project decommissioning activities are anticipated to generate comparable, if not lower, levels of GHG emissions compared to Project construction. Unplanned Events (e.g., flaring, fire and explosion) may generate GHG emissions, but at levels lower than those generated during other Project phases.

Table 4.2.1-5 Annual GHG Emissions Estimate Summary.

Phase	Source	Annual GHG Emissions (t CO_2e)			
		Scope 1 (Direct)	Scope 2 (Indirect)	Scope 3 (Other Indirect)	Total Scope 1 + Scope 2
Construction	Blasting	24			24
	Stationary Combustion	1,531			1,531
	Mobile Equipment	6,426			6,426
	Marine Transport of Supplies			172,616	0
	Total Annual Construction [1]	7,981	0	172,616	7,981
Operation	Mobile Equipment	48			48
	Flare Stacks	228			101
	Emergency Generator	826			860
	Marine Transport of Product			19,587	0
	Electricity Consumption		1,489		1,489
	Total Annual Operation [2]	1,102	1,489	19,587	2,591

NOTES
[1] Project construction scheduled to occur over a two-year period, marine transport of supplies to occur in a single calendar year.
[2] Operational lifetime of the Project is 30 years.

Overall, Project related GHG emissions are projected to be generated at relatively low quantities, and thus the Project is not anticipated to measurably change atmospheric levels of GHGs. Project GHG emissions are projected to account for less than 1% of provincial GHG emissions when considering 2022 reporting data (Newfoundland and Labrador Department of Environment and Climate Change, n.d.). GHG emissions generated during the operation and maintenance phase will be generated at relatively low quantities and may be reduced with the integration of greener technologies (e.g., electric vehicles) over the lifetime of the Project. This Project, which aims to support the dissolution of fossil fuel reliance by offering a renewable energy source, is being proposed/developed in an opportune time when green technologies are becoming more commonplace and encouraged by regulatory authorities as part of Canada's 2023 Emissions Reduction Plan.

Light

Artificial lighting will be required for safe and efficient operation during all Project phases (i.e., construction, operation and maintenance, decommissioning). During construction and decommissioning, Project lighting will be temporary; limited to mobile equipment (e.g., heavy equipment, light duty vehicles, mobile floodlights) and will be removed when activity in a particular location is complete. During operation and maintenance, permanent Project lighting will be installed on buildings, wind turbines, and access roads. Due to the industrial nature of the POA and thus the location of the Argentina Green Fuels Facility, there will be limited potential interactions resulting from ambient light levels. The Argentia Wind Facility, however, is sited in a more natural area, rendering it more susceptible to potential interactions with ambient light levels. Unplanned Events, including flaring, fire / explosion, and traffic accidents, could also diminish ambient light levels temporarily.

Project lighting design has not been finalized; thus, a qualitative impact assessment (Appendix I) was conducted using best judgement of the study team, and in consideration of regulations, codes and guidance set forth by the Institute of Lighting Engineers (ILE) and Transport Canada, as well as provincial regulations, as required (The Institution of Lighting Engineers, 2005; Standard 621 - Obstruction Marking and Lighting - Canadian Aviation Regulations (SOR/96-433), 2021). Final Project lighting design will consider such regulations, codes, and guidance to negate generation of Project-related obtrusive lighting. Following decommissioning, ambient light levels are anticipated to return to pre-Project conditions.

The Light Impact Assessment (Appendix I) evaluated influence of Project lighting on sensitive receptors (i.e., the nearest residential receptors to Project infrastructure). As a conservative measure, it is assumed that 50% of incident light will not reach sensitive receptors due to directionality and line of sight obstructions, namely thick tree cover in the area. Based on surrounding woodland and topographic features, the true quantity of light blocked will be much higher (i.e., greater than 90%), especially when foliage is in full bloom. Total illuminance, the amount of light that covers a surface, for Project operation and maintenance is provided in Table 4.2.1-6. Calculations of total illuminance were performed for a scenario where all equipment is operated at the same time and at the closest sensitive receptor, and for pre- and post-curfew conditions (The Institution of Lighting Engineers, 2005). Methodology used to assess lighting effects on sensitive receptors is further detailed in Appendix I.

Table 4.2.1-6 Illuminance at Receptors: Project Operation & Maintenance.

Period	Illuminance (lux)		ILE Guidance Limit (lux)
	Argentia Green Fuels Facility	Argentia Wind Facility	
Pre-curfew (7:00 – 22:59)	2.42E-02	5.37E-02	5
Post-curfew (23:00 – 06:59)	2.42E-02	5.37E-02	1
ILE = Institution of Lighting Engineers			

Pre- and post-curfew illuminance represent 1.07% and 5.37% of guidance limits, respectively. For context, the post-curfew limit of 1 lux is equivalent to moonlight. Considering this, light effects for the duration of Project operation and maintenance will be two orders of magnitude less than the illuminance of the moon.

Sound Quality

The Project will generate noise emissions during all phases (i.e., construction, operation and maintenance, and decommissioning), thereby resulting in potential diminishment of sound quality. Construction Phase noise, while temporary, will be generated during activities such as earthmoving, pile driving, blasting, electrical infrastructure (e.g., transmission line) installation, and mobile equipment operation. During Project construction, potential interactions that may diminish sound quality will be limited to when noise generating activities occur. The Project will generate considerable noise emissions during the operation and maintenance phase. The Argentia Wind Facility will generate noise as a result

of wind turbine operation; noise emissions from wind turbines generally increase with increasing wind speed. Argentia Green Fuels Facility infrastructure (e.g., compressors, generators, flares) will also generate noise emissions during Project operation. Noise-generating infrastructure is permanent; thus, noise emissions may affect sound quality in the Local Assessment Area (LAA), particularly at locations closest to permanent infrastructure. Noise generated during decommissioning activities is anticipated to be less than construction and Operation and Maintenance Phases. Similar to the Construction Phase, potential interactions that may diminish sound quality will be limited and temporary; ambient sound quality is anticipated to return to pre-Project conditions when Decommissioning is complete. Unplanned Events (e.g., flaring and venting, fire and explosion, traffic accident, wind turbine collapse) will interact with ambient sound quality in a similar matter to the construction and decommissioning phases; noise emissions will be temporary and localized to the location of the unplanned event.

A conservative approach was used to evaluate operation and maintenance phase noise emissions in the Noise and Vibration Study (Appendix J); it was assumed that the largest potential model will operate at the maximum wind speed at the Argentia Wind Facility, while it was assumed that all infrastructure at the Argentia Green Fuels Facility will operate outdoors. The percent highly annoyed (%HA) is a measurable parameter that was assessed in the study, as well as indoor nighttime noise and low frequency noise (LFN). %HA is the percentage of the exposed population that would be annoyed by a particular day-night average sound pressure level l (L_{dn}). LFN is noise with frequency content in the range of 16 to 200 hertz (Hz). %HA was assessed for two Project construction scenarios: (1) wind turbine and Argentia Green Fuels Facility construction; and (2) electrical infrastructure and road construction. Additionally, %HA was assessed for Project operation and maintenance. Indoor nighttime noise and LFN were assessed for Project operation and maintenance only (i.e., construction and decommissioning were not considered). The study considered receptors with the greatest potential exposure to noise sources due to proximity and direct line of sight exposure. Receptor locations were selected in areas where people normally live, work, and take part in recreation; it did not consider workforce of a company. While many more receptor locations exist in the LAA, selected receptor locations are assumed to be representative of Project interactions with sound quality. Results of the %HA assessment in the 'Noise and Vibration Study' are summarized in Table 4.2.1-7.

Table 4.2.1-7 Noise Impact Study Results: %HA Assessment.

Project Component	Baseline		Project Predicted L_{dn} (dBA)	Total (Baseline plus Project)		Δ %HA (Between Total and Baseline)
	L_{dn} (dBA)	%HA		L_{dn} (dBA)	%HA	
Construction Scenario 1 [1]	43 - 61	0.8 - 8.7	21 - 60	43 - 61	0.9 - 8.8	0.0 - 6.0
Construction Scenario 2 [2]			20 - 70	43 - 70	0.8 - 23.2	0.0 - 20.9
Operation and Maintenance			20 - 51	43 - 61	0.9 - 8.8	0.0 - 1.2

NOTES
Δ %HA = change in %HA between total and baseline
[1] Construction of wind turbines and Argentia Green Fuels Facility
[2] Construction of electrical infrastructure and roads

Health Canada recommends that the maximum change in %HA due to Project activities be no more than 6.5% (Health Canada, 2017). Per Table 4.1.2-7, it was predicted that Construction Scenario 2 (construction of electrical infrastructure and roads) will not comply with the 6.5% limit. This instance of non-compliance will occur at a single receptor – %HA at all other receptors were predicted to comply with limits set forth by Health Canada.

In addition to the %HA assessment, an indoor nighttime noise assessment was conducted for Project operation and maintenance. As a conservative measure, 15 dBA was subtracted from outdoor Project noise at the plane of the dwelling window of sensitive receptors to obtain predicted indoor noise levels (Health Canada, 2017). The 15 dBA metric considers an outdoor-to-indoor transmission loss with windows at least partially open. Per Health Canada guidance, outdoor sound level targets for sleep disturbance are 45 and 57 dBA for partially open and fully closed windows, respectively. As a conservative measure, the sleep disturbance target was set to 45 dBA. The predicted indoor nighttime levels during Project operation and maintenance ranged from 0 to 29 dBA and are thus in compliance with the 45 dBA sleep disturbance target.

Additionally, as discussed in Section 2.4.2.1, the Project has taken into consideration a variety of turbine sizes, including a 6.8 MW and 7.2 MW wind turbine. A 6.8 MW wind turbine is the current preferred size; however, noise modelling studies were undertaken prior to this final selection. As such, modelling was completed with 7.2 MW size wind turbine to be conservative. The Argentia Wind Facility with 7.2 MW wind turbines was assessed for the potential to emit high LFN. The difference between A- and C-weighted sound pressure levels were calculated and found to be 12 dB, which is much lower than the 20 dB limit. As such, LFN is not anticipated to be an issue at surrounding receptors during Project operation and maintenance.

Vibration

The Project will generate vibrations during all phases (i.e., construction, operation and maintenance, and decommissioning) of the Project. During Project construction, vibrations will arise from activities such as blasting, earthmoving, pile driving, and vehicular traffic. Vibration emissions during the construction period will frequently occur but will be transient due to the nature of activities and construction schedule. Sources of vibration emissions during Project operation and maintenance will be much less than construction. Since sources of vibration at the Argentia Wind Facility and Argentia Green Fuels Facility will be set back from sensitive areas by 600 m, Project interactions with baseline vibration levels are not anticipated. Similar to the Operation and Maintenance Phase, Project decommissioning and Unplanned Events will also have fewer vibration sources than construction. Due to setbacks and the transient nature of decommissioning activities, interactions with baseline vibration levels are unlikely. Following decommissioning, vibration levels are anticipated to return to pre-Project conditions.

4.2.1.5 Mitigation Measures

Standard mitigation and enhancement measures applicable to the Atmospheric Environment VC are provided by phase in Table 4.2.1-8. Project-specific plans (e.g., the Explosives and Blasting Management Plan) will also include mitigation measures that are applicable to this VC.

Table 4.2.1-8 Mitigation and Enhancement Measures: Atmospheric Environment.

Atmospheric Environment			
Project Phase	**Key Indicator**	**Interaction**	**Mitigation**
Construction, Decommissioning and Rehabilitation	Air Quality	Project activities may diminish air quality.	• Where feasible, use mobile equipment with Tier 4 engines. • Maintain vehicles and equipment in good working order, ensuring that mufflers are functional. • Implement control measures such as road watering, application of approved chemical suppressants, or physical barriers, where appropriate, to reduce fugitive dust generation on exposed surfaces (e.g., unpaved roads, laydown areas, stockpiles). • The blasting contractor will develop an Explosives and Blasting Management Plan, which will include design measures to reduce dust generation. • Implement and maintain speed limits and, where necessary, speed bumps to limit dust generation. • Vehicles and equipment are to be turned off when left stationary for extended periods. The idling of engines will be avoided whenever possible. • Cover stockpiled material where feasible, to reduce fugitive dust generation.
Operation and Maintenance	Air Quality	Project activities may diminish air quality.	• Where feasible, use mobile equipment with Tier 4 engines. • Maintain vehicles and equipment in good working order, ensuring that mufflers are functional. • Implement control measures such as road watering, application of approved chemical suppressants, or physical barriers, where appropriate, to reduce fugitive dust generation on exposed surfaces (e.g., unpaved roads, laydown areas, stockpiles). • Vehicles and equipment are to be turned off when left stationary for extended periods. The idling of engines will be avoided whenever possible. • Implement control measures such that emissions generated from flare stacks are reduced.
Construction, Operation and Maintenance, Decommissioning and Rehabilitation	GHG Emissions	Project activities may increase atmospheric GHG levels.	• Where feasible, use mobile equipment with Tier 4 engines. • Maintain vehicles and equipment in good working order, ensuring that mufflers are functional. • Vehicles and equipment are to be turned off when left stationary for extended periods. The idling of engines will be avoided whenever possible.
Construction, Decommissioning and Rehabilitation	Light	Project lighting may diminish ambient lighting levels.	• Limit lighting to that which is necessary for safe and efficient Project activity.

Atmospheric Environment			
Project Phase	**Key Indicator**	**Interaction**	**Mitigation**
			• Where reasonable and feasible, construction should be carried out during standard daytime working hours. • Should nighttime work be required, lighting to be limited to what is necessary for safety and efficiency.
Operation and Maintenance	Light	Project lighting may diminish ambient lighting levels.	• Limit permanent lighting to that which is necessary to enable safe and efficient Project activity. • Install downward-facing lights on buildings, turbine bases and access roads. Where possible and permitted, equip downward-facing lighting with motion and heat sensors. • Set turbine and meteorological tower lighting levels to the minimum allowed by Transport Canada for aeronautical safety. • Use white or red strobe lights with the minimum allowable intensity and flashes per minute as required by Transport Canada.
Construction, Decommissioning and Rehabilitation	Sound Quality	Project activities may diminish sound quality.	• Develop and implement a Construction Noise and Vibration Monitoring Plan. • The blasting contractor will develop an Explosives and Blasting Management Plan, which will include design measures to reduce shock or instantaneous peak noise levels. • Incorporate blast design features (e.g., hole spacing, explosive charge weight, time delay) to meet required noise limits. • Where reasonable and feasible, construction should be carried out during standard daytime working hours. • Schedule high noise activities during normal working hours, and plan to complete such activities by 11:00 pm. • Where feasible, use quieter equipment, using only the necessary sized and powered equipment for Project activities. • Shield sensitive receptors from noisy activities. • Enclose or shield stationary noise sources. • Maintain vehicles and equipment in good working order, ensuring that mufflers are functional.

Atmospheric Environment			
Project Phase	**Key Indicator**	**Interaction**	**Mitigation**
Operation and Maintenance	Sound Quality	Project activities may diminish sound quality.	• Schedule high noise activities during normal working hours, and plan to complete such activities by 11:00 pm. • Where feasible, use quieter equipment, using only the necessary sized and powered equipment for Project activities. • Enclose or shield stationary noise sources. • Maintain vehicles and equipment in good working order, ensuring that mufflers are functional. • Maximize offset distance between the Argentia Green Fuels Facility and adjacent receptors. • Maintain a minimum setback distance of 600 m between the Argentia Wind Facility and sensitive areas.
Construction	Vibration	Project activities may increase vibration levels.	• Schedule activities during normal working hours, and plan to complete such activities by 11:00 pm. • Where feasible, use quieter equipment, using only the necessary sized and powered equipment for Project activities.
Operation and Maintenance	Vibration	Project activities may increase vibration levels.	• Maximize offset distance between the Argentia Green Fuels Facility and adjacent receptors. • Maintain a minimum setback distance of 600 m between the Argentia Wind Facility wind turbines and sensitive receptors (e.g., occupied residences).

4.2.1.6 Conclusion

Table 4.2.1-9 provides a summary of predicted adverse residual effects on the Atmospheric Environment VC.

Table 4.2.1-9 Potential Environmental Effect of the Undertaking: Atmospheric Environment VC.

Atmospheric Environment							
Project Phase	Key Indicator	Magnitude	Frequency	Extent	Duration	Reversibility	Context*
Construction	Air Quality	3	3	4	5	1	1,3
	GHGs	2	3	5	5	3	1,3
	Light	2	2	3	5	1	1,3
	Sound Quality	2	3	3	5	1	1,3
	Vibration	1	2	3	5	1	1,3
Operation and Maintenance	Air Quality	3	5	4	5	1	1,3
	GHGs	2	5	5	5	3	1,3
	Light	2	4	3	5	1	1,3
	Sound Quality	2	5	3	5	1	1,3
	Vibration	1	5	2	5	1	1,3
	Air Quality	3	3	4	5	1	1,3

Decommissioning	GHGs	2	3	5	5	3	1,3
	Light	2	2	3	5	1	1,3
	Sound Quality	2	3	3	5	1	1,3
	Vibration	1	2	3	5	1	1,3
Unplanned Events	Air Quality	2	1	3	2	1	1,3
	GHGs	2	1	4	2	3	1,3
	Light	1	1	3	1	1	1,3
	Sound Quality	1	1	3	1	1	1,3
	Vibration	1	1	2	1	1	1,3
*Context may be assigned more than one value.							

Table 4.2.1-10 Significance of Potential Residual Environmental Effects of the Project: Atmospheric Environment VC.

Project Phase	**Key Indicator**	**Significance of Predicted Residual Environmental Effects**		**Likelihood***	
		Level of Significance	Level of Confidence	Probability	Scientific Certainty
Construction	Air Quality	NS	3		
	GHGs	NS	3		
	Light	NS	3		
	Sound Quality	NS	3		
	Vibration	NS	3		
Operation and Maintenance	Air Quality	NS	3		
	GHGs	NS	3		
	Light	NS	3		
	Sound Quality	NS	3		
	Vibration	NS	3		
Decommissioning	Air Quality	NS	3		
	GHGs	NS	3		
	Light	NS	3		
	Sound Quality	NS	3		
	Vibration	NS	3		
Unplanned Events	Air Quality	NS	3		
	GHGs	NS	3		
	Light	NS	3		
	Sound Quality	NS	3		
	Vibration	NS	3		

*Only applicable to significant effects.
Significance
Level of Significance: S = significant; NS =not significant; P= positive
Level of Confidence: 1= low; 2= medium; 3= high
Likelihood (Only applicable for significant effect (rated as S)
Probability of Occurrence; 1= low; 2= medium; 3=high
Scientific Certainty: 1=low; 2=medium; 3=high.

4.2.2 Aquatic Environment

The Aquatic Environment has been included as a VC because aquatic habitat may be affected by all Project phases as well as Unplanned Events. There are eight aspects through which the Aquatic Environment VC and the Project interact: Surface Water Resources, Ground Water Resources, Freshwater Environment (Fish and Fish Habitat), Marine Environment (Fish and Fish Habitat), Fisheries

and Aquaculture, Species at Risk, Habitats of Conservation Concern, and Marine Biosecurity. Some aspects of the Aquatic Environment, such as surface water, provide a resource that can be utilized by the Project (along with other users). The Aquatic Environment also provides a pathway that links Project activities/elements to other environmental receptors. Aquatic resources such as fish and fish habitat interact with the Project and function as receptors. The Project Area is in Placentia Bay which is utilized by several species at risk and contains many biologically important habitats of conservation interest. Marine shipping associated with the Project may provide interactions with aspects of the marine environment and increase opportunity for introduction of aquatic invasive species (AIS).

The spatial boundaries for the assessment of potential Aquatic Environment effects include the Project Area, LAA and RAA as defined in Section 2.1.

The temporal boundaries for this assessment include three major Project phases: Construction (29 months), Operation (nominally 30 years), and Decommissioning (one year). Temporal boundaries therefore extend from 2025 to 2058.

Table 4.2.2-1 lists the KIs that apply to the Aquatic Environment VC, summarizes the geographic scope for each KI, as well as listing the applicable measurable parameters.

Table 4.2.2-1 Scope & Measurable Parameters of Key Indicators: Aquatic Environment.

Key Indicator	Scope	Measurable Parameters
Surface Water Resources	LAA	Water quantity (i.e., changes in mean annual flow and runoff, Protected Public Water Supply Area (PPWSA) capacity/usage), Water quality (i.e., concentration of chemical parameters compared to applicable guidelines),
Ground Water Resources	Project Area	Water quality (i.e., concentration of chemical parameters compared to applicable guidelines). Water quantity/level of utilization (i.e., reduction in baseflow (%) in surface water, change in well yield (L/min) for existing well users. Movement patterns, recharge zones.
Freshwater Environment (Fish and Fish Habitat)	LAA	Change in habitat quantity (area (m^2 or hectares) of habitat. Change in habitat quality (e.g., altered water quality, Total Suspended Solids (TSS); dissolved oxygen; water temperature; pH; metals; nutrients). Change in fish health and survival (e.g., abundance/biomass, community structure, growth and survival).
Marine Environment (Fish and Fish Habitat)	RAA	Change in habitat quality (i.e., concentration of chemical parameters compared to applicable guidelines at wastewater receiving locations, circulation patterns). Change in habitat quantity (i.e., area m^2 or hectares of habitat). Change in marine species health and survival (e.g., species presence/absence, abundance/biomass, community structure, growth and survival).
Fisheries and Aquaculture	RAA	Duration and extent of displacement of fishers. Change in harvest rates and/or production. Loss of income to fishers. Effects of AIS introductions on aquaculture.
Species at Risk	RAA	Designation under the **Species at Risk Act** (SARA), **Newfoundland and Labrador's Endangered Species Act** (NL ESA), and International Union for Conservation of Nature Red List

Key Indicator	Scope	Measurable Parameters
		of Threatened Species (IUCN Red List). Change in habitat quality, habitat quality and fish health and survival for American eel.
Habitats of Conservation Concern	RAA	Change in habitat area (m^2, hectares) or quality in habitats of conservation concern.
Marine Biosecurity	RAA	Records of new AIS or expansion of range of existing AIS. Effects and impacts of AIS on other marine species and habitats. Impact of AIS on aquaculture operations.

4.2.2.1 Assessment Criteria

An overview of aquatic environment effects assessment criteria is presented in Table 4.1.7-1 in Section 4.1.7. Criteria include magnitude, frequency, geographic extent, duration, reversibility, and context.

Significant negative residual environmental effects are those considered to be of sufficient magnitude, duration, frequency, and geographic extent to cause a change in the Key Indicator that will alter its status or integrity beyond an acceptable level. Establishment of the criteria values is based on professional judgement; however, they are transparent and repeatable. The determination includes allowance for application of the mitigation measures identified (and committed to) in this Registration and their known/proven effectiveness.

4.2.2.2 Existing Knowledge

Section 3.1.2 provides a summary of existing knowledge of the Aquatic Environment, while Appendix B-1 (Aquatic Environment Baseline) provides a more detailed description based on dedicated field surveys. Appendix B-2 (Effluent Dispersion Modelling) provides an assessment of how the Project effluent will interact with the marine environment. Appendix C provides a source water hydrology analysis to evaluate water withdrawal potential to supply the Project. Placentia Bay is a very well studied region of Newfoundland and there is a wealth of information on the aquatic environment to inform the effects assessment of the Marine Environment RAA. In general, there is an adequate knowledge of the key indicators upon which to base effects predictions.

4.2.2.3 Definition of Significance

For the Aquatic Environment VC, a Significant Effect is defined as:

- Having a high magnitude; or
- A medium magnitude and characterized by either:
  - An extended duration affecting a geographic area that extends beyond the Project Area; or
  - A low level of confidence in the prediction.

Where a significant effect has been predicted, this evaluation then includes a determination of the likelihood associated with the predicted effect. “Likelihood” includes both the probability of occurrence as well as the scientific certainty of the predicted effect.

4.2.2.4 Potential Project-Environment Interactions

Potential interactions with identified Key Indicators for the Aquatic Environment VC are summarized in Table 4.2.2-2. Certain KIs (e.g., Fisheries and Aquaculture, Habitats of Conservation Concern, Marine Biosecurity) will only have potential interactions in relation to Project related shipping activity in the context of the RAA.

Table 4.2.2-2 Potential Project Environment Interactions Matrix: Aquatic Environment.

Key Indicators: Aquatic Environment								
Project Component and Activity Description	Surface Water Resources	Ground Water Resources	Freshwater Environment	Marine Environment	Fisheries and Aquaculture	Species at Risk	Habitats of Conservation Concern	Marine Biosecurity
Construction Phase								
Site Preparation	X	X	X	X				
Roads	X	X	X			X		
Staging and Laydown	X		X			X		
Material Transport	X			X	X	X	X	X
Wind Turbine Foundations	X	X	X			X		
Electrical Infrastructure	X		X			X		
Wind Turbine Installation	X		X			X		
Electrolyser Plant	X	X		X	X			
Ammonia Plant	X	X	X	X	X			
Ammonia Storage/Transfer	X	X	X	X	X	X	X	
Flares				X				
Admin Buildings	X	X	X					
Operation and Maintenance Phase								
Wind Turbine Operation								
Wind Turbine Maintenance	X		X					
Electrical Infrastructure								
Venting and Flaring				X				
Road Maintenance	X		X					
Plant Operations	X			X				
Ammonia Handling				X	X	X	X	X
Decommissioning Phase								
Electrical Infrastructure	X		X			X		
Wind Turbine Removal	X		X			X		
Building Removal	X			X				
Plant Removal	X			X				

Key Indicators: Aquatic Environment								
Project Component and Activity Description	Surface Water Resources	Ground Water Resources	Freshwater Environment	Marine Environment	Fisheries and Aquaculture	Species at Risk	Habitats of Conservation Concern	Marine Biosecurity
Terrain Reclamation	X		X			X		
Unplanned Events								
Spills and releases	X	X	X	X	X	X	X	
Flaring and venting				X				
Fire, explosion	X	X		X				
Traffic accident	X		X	X				
Wind Turbine collapse	X		X					
Water supply failure	X		X					
Wildlife emergency								
Human hazard or injury								
NOTES X: Potential interactions that might cause an effect. Blanks indicate that interactions between the Project and the VC are not expected.								

Surface Water Resources

Surface water is likely to interact with the Project through several mechanisms, most of which will occur during Construction. The construction of the Project Interconnect and Green Fuels Project Gen-Tie Lines will have a minimal footprint on the aquatic environment due to the elevation of the electric lines. Therefore, the footprint associated with the presence of transmission lines on the aquatic environment will be limited to the grounded base for the support tower. However, there may also be transient effects from fording of streams during construction of transmission lines.

The Project will also require freshwater for operation of the Hydrogen and Ammonia plants, domestic consumption and for fire fighting. An evaluation of the available Protected Public Water Supply has indicated that there is an adequate supply available to meet the needs of the municipality, as well as Port of Argentia and Argentia Renewables. In addition to the planned water extraction during Operations, there is a limited possibility during Construction for other interactions, mainly related to the construction of access roads and turbine generator foundations.

The potential changes in water quality that can result from interactions with the Project are related to work in or near water, clearing and grubbing of vegetation, excavating and grading, construction and installation of stream crossing structures and fording, and introduction of particulate material (silt) from erosion and sedimentation. The operation of Construction equipment, as well as transport vehicles can alter water quality through the introduction of hydrocarbons (fuel, lubricants) solvents and salts. With the

application of proven mitigation measures, the Project may result in minor, temporary reductions in surface water quality that can be expected to occur infrequently during the Construction Phase.

Note, during Operations, there will be limited potential interactions that could alter or diminish freshwater quality. Effluent discharges will be to the marine environment and in compliance with regulatory limits. Operation and maintenance of the wind farms will require use and maintenance of access roads that could result in suspended sediments being carried into adjacent waterbodies.

Decommissioning activities will be similar to Construction, with a similar suite of potential interactions. Transportation along the access road roads during decommissioning, rehabilitation and closure could result in suspended sediments from the roadbed being carried into adjacent waterbodies.

Several scenarios associated with Unplanned Events could introduce contaminants that have the potential to alter water quality, e.g., spills/releases (hydrocarbons), fires/explosions (retardants).

Extensive regulatory guidance and limits have been established for water quality parameters, including for drinking water suitability for consumption, suitability for protection of aquatic life, and acceptability for discharge (water and sewer outfalls). Similarly, measures have been well developed for prevention and mitigation associated with construction activities.

Groundwater Resources

Argentia Renewables does not intend to access or utilize groundwater resources; therefore, interactions will be restricted to a limited number of Project activities, mostly during the Construction Phase. The potential interactions with groundwater could result indirectly from excavations and from alterations to surface water flow patterns and quality. During Construction, the only appreciable material excavations will be for wind turbine foundations, with excavation limited generally to the overburden layer. This could result in temporary lowering of the proximate water table. During Operations, there will be few, if any interactions between the Project and Groundwater. During Decommissioning, assuming the foundations for WTG units will remain in place, there will be few, if any interactions. In the instances of Unplanned Events, it is conceivable that some scenarios (spills/releases, fire/explosions) could affect groundwater quality, but such events would likely be restricted to the Argentia Peninsula. Note as well, groundwater utilization in the region is low and limited to a few private wells, none of which are proximate to the Project Area.

An array of precautionary and mitigation measures has been prescribed to protect surface water quality. These measures will also serve to ensure against potential indirect effects on groundwater.

In all cases, the Frequency of interactions is low. In all phases, the geographic extent is restricted to the LAA. It is conceivable (but highly unlikely) that an unplanned event (major spill or fire/explosion) could

affect a relatively large area; however, given that such events would likely occur at or near the Hydrogen and Ammonia plants located on the Argentia Peninsula brownfield site, and on a level plateau only metres above sea level, as well as Project emergency response planning and protocols, the possibility of any effect on groundwater is considered to be negligible. Given the timeframe for groundwater movement, the duration of any interaction has been rated as long lasting. Reversibility of potential effects is rated to have high potential through all Project phases. Finally, the ecological context of all potential effects on groundwater will be limited to the Project Area, which consists of brownfield and vegetation covered (but highly utilized) Backlands areas. As a result, the Magnitude of environmental effects on groundwater is rated as negligible.

Freshwater Environment (Fish and Fish Habitat)

The freshwater environment, particularly fish and fish habitat, can be affected by alterations to stream flow and habitat features, creation of barriers to fish movement, removal of riparian vegetation (affecting water quality via reduced shade or increased nutrient/energy inputs), introduction of sediments and contaminants, and potentially direct injuries or mortalities from in-water work.

Most of the interactions will occur during Project Construction when activities such as preparation of laydown areas, excavation for foundations, road construction, including water crossings, installation of collector systems, transmission lines and substations, can alter fish habitat quality as a result of run off and changes to water flow patterns, either by creating physical or velocity barriers to fish movement or restrictions to inflows/outflows along water courses, which may in turn affect fish health and survival. Minor quantities of fish habitat may be lost because of construction of the 13 small water crossings (11 streams, 2 waterbodies) associated with the wind farm. These locations also have with the potential to result in an obstruction to fish passage if not properly designed and installed.

During operations and maintenance of wind farms, run off from access roads may affect fish habitat quality, fish production, health, and survival. Since the water supply for operation of the hydrogen/ammonia plant will be from an existing protected public water supply area there will be no new aquatic habitat interactions introduced by the Project.

The effects of decommissioning and rehabilitation activities on fish and fish habitat are anticipated to be similar to Construction; however, it is expected there will be no in-water work associated with this Project phase.

Marine Environment (Fish and Fish Habitat)

Marine fish and fish habitat can be affected by nearshore construction and operations activities. Project site preparation and civil works during construction will occur on land and will not interact directly with the marine environment.

Operation of the hydrogen/ammonia plant and associated infrastructure, and surface runoff from facilities, will result in the release of treated freshwater effluent into the marine environment near the plant site. Wastewater (e.g., stormwater runoff, reject process water, sanitary discharge) will be directed to a sewage treatment system that will operate incompliance with applicable regulatory approvals and discharge criteria.

Note, the POA has plans for dockside expansion of its facilities. This proposed undertaking has been registered with the Impact Assessment Agency of Canada as well as the Government of Newfoundland and Labrador. Both governments have released the project with conditions. See Cumulative Effects for a discussion of the combined effects of the Project and dockside expansion. The existing and planned POA facilities will result in the Project requiring limited, if any additional dock infrastructure.

Section 3.1.2.12, Marine Navigation, addresses historic marine traffic to and from the POA. In summary, a total of 1,736 vessels were recorded by the POA between 2013 and 2022. Figure 4.2.2-1 provides a projection model for marine traffic based on the POA vessel activities from 2013 to 2022. The projection model indicates that by 2050 the yearly vessel traffic will be elevated to approximately 376 vessels, which is double the number of vessels in 2022 (n=189). The model agrees with the performance metric forecast of an estimated 371 vessels per year by the years 2048 to 2052, as provided in The Cooper Cove Marine Terminal Expansion Project Description (Dillon, 2023). However, the marine traffic increases associated with the Argentia Renewables Project may not be linear as more vessels are expected during the Construction Phase as compared to the projection model. The Energy and Emissions Study for the Project (Appendix H) estimated passage of 62 vessels coming to the Port of Argentia during the Construction Phase, while an increase of only 12 vessels yearly is expected during operations.

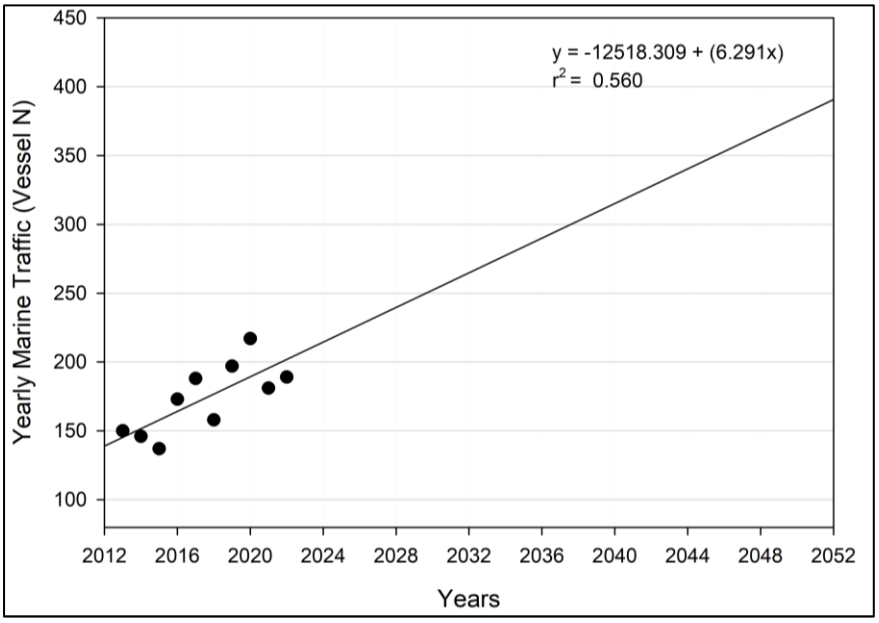


Figure 4.2.2-1 Projection Model for Yearly Marine Vessel Traffic in Argentia Harbour based on the period of 2013-2022.

Transportation of resources and equipment in the marine environment may affect habitat quality and interact with commercial/recreational fishing activities. Marine shellfish aquaculture operations could be affected by any accidental introduction or spread of AIS.

The minimal connection between the Project and the marine environment, combined with adherence to applicable regulatory standards, will result in few potential environmental effects during Construction, Operation and Decommissioning. Unplanned Events could result in deposition into the marine environment resulting in short term effects on fish and fish habitat.

Fisheries and Aquaculture

Potential effects of the Project on fishing/aquaculture grounds during Construction are related to an increase in POA vessel traffic during construction. These activities can limit access to fishing grounds and potentially introduce or spread AIS via transiting vessels. An increase in vessel activity has the potential to increase the risk of collisions or damage to fishing gear. The introduction of AIS through Project vessel activity could also disrupt local aquaculture operations. Several AIS species (e.g., golden star tunicate, oyster thief, vase tunicate, and violet tunicate) are known to cause issues with marine-based shellfish aquaculture operations. There is, however, very limited commercial and recreational fishing occurring near the POA and existing aquaculture operations are well removed from the LAA.

During operations and maintenance, marine infrastructure and vessel activity may result in temporary loss of access to fishing grounds. Changes in water quality during operation can also lead to changes in fishing / aquaculture grounds and productivity. Increases in noise and vibration from increased vessel traffic may cause auditory masking. As above, limited fishing activity occurs near the Port of Argentia; no aquaculture operations in Placentia Bay are close to or planned for the RAA, and the low frequency of vessel traffic (once monthly), will limit interactions and potential effects during Operations.

Potential effects of the Project on fishing/aquaculture grounds during Decommissioning are similar to the Construction Phase and are related to an increase in vessel traffic. It is anticipated that after the life of the Project, the POA marine infrastructure will remain in place for future use.

Species at Risk

Catadromous American eel and anadromous Atlantic salmon (South NL population) have been designated by The Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or under SARA and/or NL ESA, and both occur in the RAA. American eel were observed in the Project Area in 2023 in the stream connecting Argentia Pond to Salmon Cove, and the species likely occupies Argentia Pond. There are two pre-existing culverts that cross this stream, one of which may be upgraded for use by the Project to access the Argentia Backlands. The Project activities will not interact with or affect Argentia Pond. Anadromous Atlantic salmon occur in four scheduled salmon rivers in the RAA, but not in the LAA or PA, and therefore will not interact with or be affected by Project activities.

Most of the potential interactions with American eel will occur during Project Construction owing to activities such as preparation of laydown areas, excavation for foundations, road construction, water crossings, installation of collector systems, transmission lines and substations. These activities can alter American eel habitat quality because of run off and water flow patterns that create physical or velocity barriers to movement. These interactions could in turn affect eel health and survival. Eel habitat could also be lost because of the installation of culverts. During operations and maintenance of wind farms, eel habitat may be affected by run off from access roads, which may in turn affect habitat quality, production, health and survival. Water supply for operation of the hydrogen/ammonia plant will be from public water supply and will not affect eels and eel habitat. The effects of decommissioning and rehabilitation activities on eel habitat are anticipated to be similar to Construction, however, it is expected there will be no in-water work associated with this Project phase. There are 13 water crossings (11 streams, 2 waterbodies) associated with the wind farm. With proper design and adherence to standard construction and maintenance measures, the potential level of interaction with eels and eel habitat is predicted to be minimal.

Atlantic cod (Laurentian North Pop.) and American plaice (NL population) have a high probability of occurrence in the marine areas of the RAA and LAA. Other SARA listed species that have potential to occur in Placentia Bay including white shark, northern wolffish, spotted wolffish, Atlantic wolffish and banded killifish. Leatherback turtles and blue whales, two SARA listed species, are occasionally sighted in Placentia Bay. The potential for any of these species to occur in the RAA or LAA is extremely low. The Project will have limited aspects carried out in the marine environment, over a limited area; therefore, the potential level of interaction with marine species at risk is predicted to be minimal.

Habitats of Conservation Concern

The whole of Placentia Bay is designated as an Ecologically and Biologically Significant Area (EBSA) and this would include the RAA and LAA. Two Significant Benthic Areas (SiBAs) in the south of the bay have been identified, however, these are not close to the RAA. Sensitive areas near the RAA and LAA include capelin spawning beaches, eelgrass beds, salt marshes, wetlands, and scallop beds. There are no Marine Protected Areas (MPAs) or critical habitats, as defined under SARA and the NL ESA, identified near the RAA or LAA. Habitats of conservation concern will not interact with or be affected by the Project.

Marine Biosecurity

Invasive species are a concern, both with respect to new introductions, as well as the possible spread of such species already present within Placentia Bay and other locations in Canada. There are extensive requirements in place in Canada (Fisheries Act - Aquatic Invasive Species Regulations), as well as international protocols, to prevent introductions of invasive species through mechanisms such as ballast water or hull fouling.

To reduce or eliminate the risk of invasive aquatic species and pathogens being introduced into Canadian waters because of shipping, all ships are required to exchange ballast water in accordance with the *Ballast Water Control and Management Regulations* (Transport Canada 2006) and to follow international protocols (International Maritime Organization Code for Approval of Ballast Water Management System). The regulations require that ships transiting to Canadian ports exchange ballast water at sea in deep water away from coastal zones. This measure limits the potential for foreign harmful aquatic organisms or pathogens to be released in Canadian waters where they may colonize. The exchanged ballast water is then to be treated by a Ballast Water Treatment System (BWST) onboard the vessel during the remainder of the voyage. No interaction of ballast waters with the Project area (e.g., introduction of invasive species) is anticipated.

Fouling is the unwanted growth of biological material such as barnacles and algae on the surface of a hull submersed in water. Hull fouling can increase the risk of invasive aquatic species and pathogens being introduced into Canadian waters. Vessels transiting to Argentia from international ports will be required to meet the IMO International Convention on the Control of Harmful Anti-fouling Systems on Ships. This convention requires that vessels possess International Anti-fouling System Certification and that an anti-fouling system be in place on all vessels.

During Construction, the major supply route for equipment will be via marine traffic and originating at ports beyond Newfoundland and Labrador. Laden vessels will have a minimum of ballast water onboard. During Operations, product (ammonia) will be shipped monthly to European ports via charter vessels. When transiting to the POA, it may be assumed that these vessels will carry ballast water and require exchange as per the IMO protocol. During Decommissioning it may be assumed that some equipment and Project structures will be shipped for sale or disposal using chartered vessels. It may be assumed that these vessels will be carrying ballast water during inbound voyages. It is unlikely that an unplanned event would act as a possible mechanism for invasive species introduction. During all shipping activities related to the Project, it is unlikely that vessels will transit to other Placentia Bay or Newfoundland ports.

4.2.2.5 Mitigation Measures

Applicable avoidance and mitigation measures are listed in Table 4.2.2-3. Project-specific plans (e.g., the Environmental Protection Plan) will also include mitigation measures that are applicable to this VC.

Table 4.2.2-3 Mitigation and Enhancement Measures: Aquatic Environment.

Aquatic Environment			
Project Phase	**Key Indicator**	**Interaction**	**Mitigation / Enhancement**
Construction	Surface Water Resources	• Potential changes in water quality related to work in or near water, clearing/grubbing vegetation, excavating/grading, installation of stream crossing structures, fording, and introduction of silt from erosion and sedimentation. • Potential changes in water quantity due to clearing of areas for turbines. • Introduction of hydrocarbons (fuel, lubricants), solvents, and salts from construction equipment.	• Adhere to Environmental Protection Plan (EPP). • Adhere to Water Management and Monitoring Plan. • Adhere to DFO guidance documents, standard mitigation measures, and best management practices. • Monitor water quality via grab samples and real-time monitoring network.
	Ground Water Resources	• Possible temporary lowering of the water table during installation of turbine foundations.	• Adhere to Environmental Protection Plan (EPP).
	Freshwater Environment	• Potential change in fish habitat quantity from stream crossing structures or creation of barriers to migration. • Potential change in fish habitat quality from runoff during road construction, installation of crossing structures, laydown areas, or fording. • Potential change in fish health and survival.	• Adhere to Environmental Protection Plan (EPP). • Adhere to DFO guidance documents, standard mitigation measures, and best management practices. • In-water work will be planned to respect DFO timing windows to protect fish in Newfoundland and Labrador. • If fording is required, follow DFO's temporary ford code of practice. • Ensure proper installation of road crossing structures. • Monitor fish populations for change in community structure, abundance/biomass, and growth.
	Marine Environment	• Temporary impacts to marine habitat during installation of the discharge pipeline. • Transportation of resources and equipment may affect habitat quality.	• Adhere to Environmental Protection Plan (EPP). • Adhere to DFO guidance documents, standard mitigation measures, and best management practices. • Ensure vessels comply with Transport Canada's guidelines and regulations related to safety, environment, and fisheries.
	Fisheries and Aquaculture	• Increase in transportation of resources and equipment may affect commercial and recreational fisheries.	• Ensure vessels comply with Transport Canada's guidelines and regulations related to safety, environment, and fisheries.

Aquatic Environment			
Project Phase	**Key Indicator**	**Interaction**	**Mitigation / Enhancement**
		• Introduction of aquatic invasive species may affect shellfish aquaculture.	• Ensure compliance with DFO's Fisheries Act / Aquatic Invasive Species Regulations, Transport Canada's Ballast Water Control and Management Regulations, and IMO International Convention on the Control of Harmful Anti-fouling Systems on Ships.
	Species at Risk	• Potential change in American eel habitat quality from runoff during construction of roads. • Potential change in American eel health and survival.	• Adhere to Environmental Protection Plan (EPP). • Adhere to DFO guidance documents, standard mitigation measures, and best management practices. • In-water work will be planned to respect DFO timing windows to protect fish in Newfoundland and Labrador. • If fording is required, follow DFO's temporary ford code of practice. • Ensure proper installation of road crossing structures. • Monitor American eel populations for change in abundance and biomass.
	Habitats of Conservation Concern	• Potential change in Habitats of Conservation Concern during Project Construction • Transportation of materials and equipment may affect habitats of conservation concern.	• Ensure vessels comply with Transport Canada's guidelines and regulations related to safety, environment, and fisheries.
	Marine Biosecurity	• Introduction of aquatic invasive species from ballast water and hull fouling.	• Ensure compliance with DFO's Fisheries Act / Aquatic Invasive Species Regulations, Transport Canada's Ballast Water Control and Management Regulations, and IMO International Convention on the Control of Harmful Anti-fouling Systems on Ships.
Operation and Maintenance	Surface Water Resources	• Use of access roads by Project vehicles could result in suspended sediments entering adjacent waterbodies.	• Adhere to Environmental Protection Plan (EPP). • Adhere to DFO guidance documents, standard mitigation measures, and best management practices. • Ensure road, shoulder, and stream crossing structures are well maintained. • Monitor water quality.

Aquatic Environment			
Project Phase	**Key Indicator**	**Interaction**	**Mitigation / Enhancement**
			• Manage water consumption to ensure such use would not have a material negative impact on municipal water supply.
	Ground Water Resources	• None.	• None.
	Freshwater Environment	• Potential change in fish habitat quality from runoff during use of roads. • Potential change in fish health and survival.	• Site and access roads will be maintained in good condition. • Monitor fish habitat quality. • Monitor fish populations for change in community structure, abundance/biomass, and growth.
	Marine Environment	• Transit of shipping vessels may affect habitat quality and cause auditory masking. • Potential water quality effects from effluent discharge.	• Ensure vessels comply with Transport Canada's guidelines and regulations related to safety, environment, and fisheries. • Ensure effluent and wastewater comply with applicable regulatory approvals and discharge criteria. • Develop a noise and vibration monitoring plan in consultation with FFA and local environmental non-governmental organizations.
	Fisheries and Aquaculture	• Vessel activity may result in temporary loss of access to fishing grounds. • Introduction of aquatic invasive species may affect shellfish aquaculture.	• Ensure vessels comply with Transport Canada's guidelines and regulations related to safety, environment, and fisheries. • Ensure compliance with DFO's Fisheries Act / Aquatic Invasive Species Regulations, Transport Canada's Ballast Water Control and Management Regulations, and IMO International Convention on the Control of Harmful Anti-fouling Systems on Ships.
	Species at Risk	• Potential change in American eel habitat quality from runoff during use of roads. • Potential change in American eel health and survival.	• Site and access roads will be maintained in good condition. • Monitor American eel populations for change in abundance and biomass.
	Habitats of Conservation Concern	• Potential change in Habitats of Conservation Concern during Project Operations • Transportation of materials and equipment may affect habitats of conservation concern.	• Ensure vessels comply with Transport Canada's guidelines and regulations related to safety, environment, and fisheries.

Aquatic Environment			
Project Phase	**Key Indicator**	**Interaction**	**Mitigation / Enhancement**
	Marine Biosecurity	• Introduction of aquatic invasive species from ballast water and hull fouling.	• Ensure compliance with DFO's Fisheries Act / Aquatic Invasive Species Regulations, Transport Canada's Ballast Water Control and Management Regulations, and IMO International Convention on the Control of Harmful Anti-fouling Systems on Ships.
Decommissioning and Rehabilitation	Surface Water Resources	• Transportation along access roads during decommissioning, rehabilitation, and closure could result in suspended sediments entering adjacent waterbodies.	• Adhere to Environmental Protection Plan (EPP). • Adhere to DFO guidance documents. • Ensure roads, shoulders, and stream crossing structures are well maintained. • Monitor water quality.
	Ground Water Resources	• None.	• None.
	Freshwater Environment	• Potential change in fish habitat quality from runoff during use of roads. • Potential change in fish health and survival.	• Adhere to Environmental Protection Plan (EPP). • Adhere to DFO guidance documents, standard mitigation measures, and best management practices. • Limit any in-stream work.
	Marine Environment	• Transit of shipping vessels may affect habitat quality.	• Ensure vessels comply with Transport Canada's guidelines and regulations related to safety, environment, and fisheries.
	Fisheries and Aquaculture	• Transportation of materials and equipment may affect commercial and recreational fisheries. • Introduction of aquatic invasive species may affect shellfish aquaculture.	• Ensure vessels comply with Transport Canada's guidelines and regulations related to safety, environment, and fisheries. • Ensure compliance with DFO's Fisheries Act / Aquatic Invasive Species Regulations, Transport Canada's Ballast Water Control and Management Regulations, and IMO International Convention on the Control of Harmful Anti-fouling Systems on Ships.
	Species at Risk	• Potential change in American eel habitat quality from runoff during use of roads. • Potential change in American eel health and survival.	• Site and access roads will be maintained in good condition. • Monitor American eel populations for change in abundance and biomass.
	Habitats of Conservation Concern	• Transportation of materials and equipment may affect habitats of conservation concern.	• Ensure vessels comply with Transport Canada's guidelines and regulations related to

Aquatic Environment			
Project Phase	**Key Indicator**	**Interaction**	**Mitigation / Enhancement**
			safety, environment, and fisheries.
	Marine Biosecurity	• Introduction of aquatic invasive species from ballast water and hull fouling	• Ensure compliance with DFO's Fisheries Act / Aquatic Invasive Species Regulations, Transport Canada's Ballast Water Control and Management Regulations, and IMO International Convention on the Control of Harmful Anti-fouling Systems on Ships.
Unplanned Events	Surface Water Resources	• Spills/releases, fire, and/or explosions could affect surface water quality.	• Ensure containment and rapid cleanup of spills/releases. • Monitor water quality via real-time monitoring network
	Ground Water Resources	• Spills/releases, fire, and/or explosions could affect groundwater quality.	• Ensure containment and rapid cleanup of spills/releases.
	Freshwater Environment	• Spills/releases, fire, and/or explosions could affect fish habitat and fish health and survival.	• Ensure containment and rapid cleanup of spills/releases.
	Marine Environment	• Spills/releases, fire, and/or explosions, and accidents on vessels could result in oil spills and introduction of harmful substances into the marine environment.	• Ensure containment and rapid cleanup of spills/releases. • Maintain inventory of oil spill response equipment.
	Fisheries and Aquaculture	• Spills/releases, fire, and/or explosions, and accidents on vessels could result in oil spills and introduction of harmful substances affecting commercial and recreational fisheries.	• Ensure containment and rapid cleanup of spills/releases. • Maintain inventory of oil spill response equipment. • Consider closure of fisheries if there is potential of contamination.
	Species at Risk	• Spills/releases, fire, and/or explosions could affect American eel habitat and eel health and survival.	• Ensure containment and rapid cleanup of spills/releases.
	Habitats of Conservation Concern	• Spills/releases, fire, and/or explosions, and accidents on vessels could result in oil spills and introduction of harmful substances that could affect habitats of conservation concern.	• Ensure containment and rapid cleanup of spills/releases. • Maintain inventory of oil spill response equipment.
	Marine Biosecurity	• None.	• None.

4.2.2.6 Conclusion

Table 4.2.2-4 below provides a summary of predicted adverse residual effects on the Aquatic Environment VC.

Table 4.2.2-5 presents a summary of the effects prediction of the Project on the Aquatic Environment. These predictions consider the nature and extent of the identified interactions, as well as assuming the implementation of mitigation and monitoring measures as described and committed to in Table 4.2.2-3. There are no predicted negative significant residual environmental effects of the Project (all phases) with respect to the Aquatic Environment.

Table 4.2.2-4 Potential Adverse Residual Environmental Effects of the Project: Aquatic Environment.

Aquatic Environment							
Project Phase	**Key Indicator**	**Magnitude**	**Frequency**	**Extent**	**Duration**	**Reversibility**	**Context***
Construction	Surface Water Resources	2	2	2	3	1	3,5
	Ground Water Resources	1	1	2	3	1	3,5
	Freshwater Environment (Fish and Fish Habitat)	2	2	2	4	3	3,5
	Marine Environment (Fish and Fish Habitat)	1	1	2	2	3	3,5
	Fisheries and Aquaculture	1	1	3	2	1	3,5
	Species at Risk	2	2	2	4	3	3,5
	Habitats of Conservation Concern	1	2	4	3	1	3,5
	Marine Biosecurity	2	1	5	5	3	3
Operation and Maintenance	Surface Water Resources	2	2	2	5	1	3,5
	Ground Water Resources	1	1	2	5	1	3,5
	Freshwater Environment (Fish and Fish Habitat)	2	1	2	2	1	3,5
	Marine Environment (Fish and Fish Habitat)	1	1	2	1	1	3,5
	Fisheries and Aquaculture	1	2	2	1	1	3,5
	Species at Risk	1	1	2	2	1	3,5
	Habitats of Conservation Concern	1	2	4	3	1	3,5
	Marine Biosecurity	2	1	5	5	3	3
Decommissioning	Surface Water Resources	2	2	2	3	1	3,5
	Ground Water Resources	1	1	2	4	1	3,5
	Freshwater Environment (Fish and Fish Habitat)	2	2	2	4	3	3,5
	Marine Environment (Fish and Fish Habitat)	1	1	2	2	3	3,5
	Fisheries and Aquaculture	1	1	3	2	1	3,5
	Species at Risk	2	2	2	4	3	3,5
	Habitats of Conservation Concern	1	2	4	3	1	3,5
	Marine Biosecurity	2	1	5	5	3	3

Aquatic Environment							
Unplanned Events	Surface Water Resources	1	1	2	3	1	3,5
	Ground Water Resources	1	1	2	4	1	3,5
	Freshwater Environment (Fish and Fish Habitat)	2	1	4	1	1	3,5
	Marine Environment (Fish and Fish Habitat)	1	1	3	1	1	3,5
	Fisheries and Aquaculture	1	1	3	1	1	3,5
	Species at Risk	2	2	2	4	3	3,5
	Habitats of Conservation Concern	1	2	4	3	1	3,5
	Marine Biosecurity	2	1	5	3	1	3
*Context may be assigned more than one value.							

Table 4.2.2-5 Significance of Potential Residual Environmental Effects of the Project: Aquatic Environment.

Project Phase	Key Indicator	Significance of Predicted Residual Environmental Effects		Likelihood*	
		Level of Significance	Level of Confidence	Probability	Scientific Certainty
Construction	Surface Water Resources	NS	3		
	Ground Water Resources	NS	3		
	Freshwater Environment	NS	3		
	Marine Environment	NS	3		
	Fisheries and Aquaculture	NS	3		
	Species at Risk	NS	3		
	Habitats of Conservation Concern	NS	3		
	Marine Biosecurity	NS	3		
Operation and Maintenance	Surface Water Resources	NS	3		
	Ground Water Resources	NS	3		
	Freshwater Environment	NS	3		
	Marine Environment	NS	3		
	Fisheries and Aquaculture	NS	3		
	Species at Risk	NS	3		
	Habitats of Conservation Concern	NS	3		
	Marine Biosecurity	NS	3		
Decommissioning	Surface Water Resources	NS	3		
	Ground Water Resources	NS	3		
	Freshwater Environment	NS	3		
	Marine Environment	NS	3		
	Fisheries and Aquaculture	NS	3		
	Species at Risk	NS	3		
	Habitats of Conservation Concern	NS	3		
	Marine Biosecurity	NS	3		
Unplanned Events	Surface Water Resources	NS	3		
	Ground Water Resources	NS	3		
	Freshwater Environment	NS	3		

	Marine Environment	NS	3		
	Fisheries and Aquaculture	NS	3		
	Species at Risk	NS	3		
	Habitats of Conservation Concern	NS	3		
	Marine Biosecurity	NS	3		

*Only applicable to significant effects.
Significance
Level of Significance: S = significant; NS =not significant; P= positive
Level of Confidence: 1= low; 2= medium; 3= high
Likelihood (Only applicable for significant effect (rated as S)
Probability of Occurrence; 1= low; 2= medium; 3=high
Scientific Certainty: 1=low; 2=medium; 3=high.

4.2.3 Terrestrial Environment

The Terrestrial Environment was selected as a VC because of the myriad of terrestrial habitats and associated flora and fauna that will interact with Project infrastructure and activities throughout all phases of the Project.

Comprehensive site-specific information was collected through robust field surveys and literature reviews and was utilized to establish a solid foundation for assessing interactions and potential effects. The Ecological Land Classification (ELC) for the Project provided a foundation for field planning, establishing habitat suitability for Key Indicators (KIs), and assessing the potential interactions between the KIs and the Project.

Six Key Indicators were identified for the Terrestrial Environment: Flora (Rare Plants and Lichen), Wetlands, Fauna (Mammals), Avifauna, Species at Risk, and Habitats of Conservation Concern. Each reflects an important feature of the Terrestrial Environment that can be affected by the Project. Terrestrial habitat features (i.e., Flora, Wetlands) can be altered by the Project and in turn affect species utilization.

The spatial boundaries for the assessment of potential Terrestrial Environment effects include the Project Area (PA), LAA, and RAA as defined in Section 2.1. The temporal boundaries for this assessment include three major Project phases: Construction (29 months), Operation (nominally 30 years), and Decommissioning (one year). Temporal boundaries therefore extend from 2025 to 2058.

Table 4.2.3-1 lists the Key Indicators that apply to the Terrestrial Environment VC, summarizes the geographic scope for each KI, and lists the applicable measurable parameters.

A Species at Risk Impacts, Mitigations, and Monitoring Plan (draft) has been submitted as part of this Registration and includes an effects assessment for specific SAR (Appendix R). For this assessment, SAR will be considered as a collective/general KI. Note that Habitats of Conservation Concern have been assessed as part of the Land and Resource Use VC (see Section 4.2.4).

Table 4.2.3-1 Scope & Measurable Parameters of Key Indicators: Terrestrial Environment.

Key Indicator	Scope	Measurable Parameters
Flora (Rare Plants and Lichens)	Project Area	Presence/absence within the PA, locations and number of individuals, amount of suitable habitat in the PA (for lichens), change in habitat quality and/or quantity.
Wetlands	Project Area	Amount of wetland area in the PA, locations of wetlands, delineated boundaries from the ELC.
Fauna (Mammals)	Project Area	Presence/absence of each species from surveys, amount of suitable habitat in the PA.
Avifauna	Project Area, LAA	Relative abundance of each species by season, change to habitat quantity and/or quality. (Note: LAA was also used for marine/coastal birds).
Species at Risk (SAR)	Project Area	Species presence/absence, habitat suitability within the PA, locations of SAR observations.
Habitats of Conservation Concern	LAA	See Land and Resource Use VC (Section 4.2.4).

4.2.3.1 Assessment Criteria

An overview of the Terrestrial Environment effects assessment criteria is presented in Section 4.1.7. Criteria included magnitude, frequency, geographic extent, duration, reversibility, and context.

Significant negative residual environmental effects are those considered to be of sufficient magnitude, duration, frequency, and geographic extent to cause a change in the KI that will alter its status or integrity beyond an acceptable level. These residual effects will potentially exist despite the proposed mitigation measures.

4.2.3.2 Existing Knowledge

Section 3.1.3 provided a summary of existing knowledge of the Terrestrial Environment, while Appendices D1-D7 (Terrestrial Component Studies) provided more detailed descriptions based on dedicated field surveys and literature reviews.

There was sufficient knowledge of the KIs from field and desktop surveys to make confident effects predictions. However, the Project will require a continuation of some field survey programs going forward to improve the understanding of potential interactions and effects, to determine the adequacy of mitigation measures, and to identify opportunities for continuous improvement in environmental stewardship.

4.2.3.3 Definition of Significance

For the Terrestrial Environment VC, a Significant Effect was defined as:

- Having a high magnitude; or
- a moderate magnitude and characterized by either:
    - an extended duration affecting a geographic area that extends beyond the Project Area; or
    - a low level of confidence in the prediction.

For any Species at Risk, a Significant Effect was defined as:

- Having a moderate magnitude; or
- a low magnitude and characterized by either:
    - an extended duration affecting a geographic area that extends beyond the Project Area; or
    - a low level of confidence in the prediction.

Where a significant effect has been predicted, the evaluation then includes a determination of the likelihood associated with the predicted effect. “Likelihood” includes both the probability of occurrence as well as the scientific certainty of the predicted effect.

4.2.3.4 Potential Project-Environment Interactions

Potential interactions with identified KIs for the Terrestrial Environment VC are summarized in Table 4.2.3-2. The following discussion considers the nature and extent of potential interactions.

Table 4.2.3-2 Potential Project- Environment Interactions Matrix.

Key Indicators: Terrestrial Environment					
Project Component and Activity Description	Flora	Wetlands	Fauna	Avifauna	Species at Risk
Construction Phase					
Site Preparation	X	X	X	X	X
Roads	X	X	X	X	X
Staging and Laydown	X	X	X	X	X
Material Transport			X		X
Wind Turbine Foundations	X	X	X	X	X
Electrical Infrastructure	X	X	X	X	X
Wind Turbine Installation	X		X	X	X
Electrolyser Plant	X				
Ammonia Plant	X				
Operation and Maintenance Phase					
Wind Turbine Generation	X		X	X	X
Wind Turbine Maintenance			X	X	X
Electrical Infrastructure	X		X	X	X
Venting, flaring				X	X
Road maintenance	X	X	X	X	X
Plant operations					
Ammonia Handling, shipping			X	X	X
Decommissioning and Rehabilitation Phase					
Electrical Infrastructure	X	X	X	X	X
Wind Turbine Removal	X	X	X	X	X
Building Removal	X				X
Plant Removal	X				X
Terrain Reclamation	X	X	X	X	X
Unplanned Events					
Spills, releases*	X	X	X	X	X
Flaring, venting			X	X	X
Fire, explosion	X	X	X	X	X
Traffic accident			X	X	X
Wind Turbine collapse	X	X	X	X	X
Water supply failure					
Wildlife emergency			X	X	X
Human hazard, injury					
NOTES X: Potential interactions that might cause an effect. Blank =Interactions between the Project and the VEC are not expected.					

Flora

This Project will require the alteration and/or fragmentation of the terrestrial landscape, and as such, the frequency of interactions with Flora (Rare Plants and Lichens) is relatively high, especially during the

Construction Phase. During all phases, the geographic extent of interaction is restricted to the Project Area. The total Project Area comprises 5,113 ha, of which the majority (Barrens, Coastline, Mature Coniferous Forest, Meadow, Mixedwood Forest, Regenerating Coniferous Forest, Scrub) comprises productive terrestrial habitat, as summarized in Table 4.2.3-3. Most of the interactions with the Flora KI will be associated with energy generation infrastructure in the Backlands (e.g., new roadwork, other linear features, wind turbine foundations, laydown areas), but there are some rare plants known from the brownfield Argentia Peninsula as well.

Table 4.2.3-3 Ecological Land Classification.

Ecotype	Area (ha)	Percentage of Project Area (%)
Barren	96	1.88
Coastline	75	1.47
Anthropogenic	500	9.78
Mature Coniferous Forest	1,683	32.92
Meadow	255	4.99
Mixedwood Forest	35	0.68
Regenerating Coniferous Forest	1,031	20.16
Scrub	804	15.72
Open Water	266	5.20
Wetland	368	7.20
Total	**5,113 ha**	100%

Blue Felt Lichen in Newfoundland grow predominately on native yellow birch in coastal areas but occasionally on white spruce where spillover effects allow (COSEWIC, 2010). An estimated 30% of the known thalli exist on non-native red maple (COSEWIC, 2010). In the Project Area, the lichen was found to be present in yellow birch mixedwood forests in the Northeast portion of the Argentia Backlands surrounding Big Shalloway Pond. Small mixedwood forests in the Project Area were observed to include white birch, yellow birch, and balsam fir. Sampling of this forest type has resulted in the observation of numerous thalli of blue felt lichen. The yellow birch forests present in the Big Shalloway Pond area occupy the same areas of sloped terrain where humid air travels from the ocean through the valley. It is highly probable, based on observations to date, that all the yellow birch (“mixedwood forests”), as shown on the rare lichen habitat suitability maps, contain blue felt lichen thalli. Observations of blue felt lichen were obtained in closed coniferous dominated mixedwoods but were most abundantly present in large, open yellow birch and white spruce canopy dominated areas where low-growing regenerating balsam fir is present in the shrub layer. These areas have been highly grazed by moose. Alterations to surrounding forested areas during construction may produce changes in atmospheric conditions surrounding these thalli and cause desiccation and mortalities. Consequently, protective measures should apply not only to trees associated with thallus growth but include provision for buffers around the habitat type possessing the thalli as a means for the mixedwood patches to persist.

Boreal Felt Lichen grows in coniferous stands dominated by Balsam Fir adjacent to wetlands. Habitat suitability studies indicate a high likelihood of the species presence. Small areas of habitat may be lost through the removal of mature balsam fir forest stands during Project construction.

Rare lichens such as boreal and blue felt lichen require humid conditions with low air pollution. Epiphytic lichens, including all those found in the Project Area, demonstrate a high sensitivity and intolerance to air pollutants, such that they are widely used as an indicator species for air pollution (Pescott *et al*., 2015; Nimis *et al*., 2002). They are especially sensitive to nitrogen oxides and sulfur dioxide (Elsinger *et al*., 2007; ECCC, 2022). Further, once impacted by air pollution, lichens demonstrate a weak capacity for population restoration (Weldon & Grandin, 2021).

In a mature forest habitat, large balsam fir or yellow birch (i.e., dominant phorophytes for both species) are naturally spaced apart. Development of roads or other infrastructure located close to such mature trees can alter the habitat quality of the rare lichens they host. Exposure to the elements by tree cutting and the development of roads or other infrastructure will alter the atmospheric conditions within rare lichen habitat, and desiccation or mortality of rare lichens may occur (Cameron *et al*., 2013).

This effect could be amplified during operation phase by the microclimate effects of air movement from wind turbine operation. Vertical mixing, turbulence, and wakes created by wind turbine blades can result in changes to local temperature, moisture, and CO_2 levels (Kaffine, D.T., 2019). Research has shown a reduced biodiversity of plant species close to wind farms and the displacement of rare plants by invasive species (Urziceanu *et al*., 2021; Urziceanu, 2024).

Due to the nature of interactions between the Project and Flora (e.g., through the clearing of vegetation, removal of soil/overburden, alteration of microclimates or moisture regime, etc.), the duration of environmental effects during the Construction, Operations and Decommissioning phases will be long-term. Reversibility is generally ranked as partial since, during Decommissioning, some areas will likely be subject to rehabilitation/revegetation efforts, but some of the necessary conditions for the rare lichens (and possibly plants) will be altered for many decades.

It is conceivable (but highly unlikely) that an Unplanned Event (major spill or fire/explosion) could affect a relatively large area of the Argentia Peninsula (the most serious of such events are associated with the hydrogen and ammonia plants). Such events could have interactions with the known rare plants from this brownfield site. However, given the likelihood, the risk to Flora from Unplanned Events is low to negligible.

Mitigation measures can reduce the level of interactions as well as the potential environmental effects on Flora. Project design will include reference to the ELC mapping to locate and avoid sensitive areas, including challenging terrain and productive habitats (especially for SAR). The Construction EPP will

include measures to limit the extent of vegetation clearing and reduce the likelihood of Unplanned Events. Overall, the magnitude of the effects of the Project on Flora is predicted to be Low to Moderate.

Wetlands

Wetlands exist throughout the Argentia Backlands, primarily in the form of bogs and fens, and on the Argentia Peninsula in the form of anthropogenically-formed marshes in drainage areas. Collectively, Wetlands comprise 368 ha in the Project Area.

During Construction, route planning will attempt to avoid Wetlands and limit interaction. However, some activities and structures will be required near Wetlands. When construction within the 15 m legislated buffer can not be avoided, the Project will not proceed without required permits. The Water Resources Management Division of the Department of Environment and Climate Change maintains a **Policy for Development in Wetlands** that establishes criteria for issuing a permit for development activities in and affecting wetlands in accordance with Section 48 of the **Water Resources Act** (Water Resources Act, 2002). The stated objective of this Policy is to limit developments in wetlands to those which do not adversely affect water quantity, water quality, hydrological characteristics, functions, or habitats. Outlined within the Policy are the types of developments having indirect or direct effects to wetlands that are not permitted, and development activities that may be approved only with written permission by the Minister of Environment and Climate Change. When developments affecting wetland are permitted under the Act, any required mitigative or restoration measures are specified in the terms and conditions of the environmental approval.

The frequency of interactions was rated as level 2 (infrequent) for all Project phases. Similarly, during all phases, the geographic extent is restricted to the Argentia Backlands portion of the Project Area (i.e., the natural wetlands). The anticipated interactions between the Project and Wetlands during all Project phases will be relatively limited in duration.

Given the nature of potential interactions with Wetlands throughout all phases of the Project, many restoration efforts can be implemented during Decommissioning phase. However, the lasting effects of disturbance will be long-term, as wetland function can take decades to re-develop after disturbance (Trombulak and Frissell, 2000). There is the potential for hydrological function to be restored after the access road and turbine pads are decommissioned and surface and groundwater flow are re-established. While these changes will occur relatively rapidly, restoration of biochemical function, habitat functions, and functional diversity to pre-effect conditions could take several decades or longer (Trombulak and Frissell, 2000). Consequently, reversibility is generally ranked as partial. The context of all these interactions will fall within the Argentia Backlands portion of the Project Area, which is characterized as a utilized area that retains natural features. The implementation of standard mitigation measures throughout all Project phases will reduce both the likelihood and potential consequences of any potential negative environmental effect on Wetlands.

It is conceivable (but highly unlikely) that an Unplanned Event (major spill or fire/explosion) could affect some areas of natural Wetland; however, given that the most serious of such events are associated with the hydrogen and ammonia plants located on the Argentia Peninsula brownfield site, the magnitude of any effect on natural Wetlands from Unplanned Events is considered to be low to negligible. Overall, and through all Project phases, the magnitude of potential negative environmental effects on Wetlands is rated as Low.

Fauna (Mammals)

This KI excludes avifauna as well as SAR, it comprises mammals only. The brownfield nature of the Argentia Peninsula reduces (but does not eliminate) the potential for Project–Fauna interactions. The Argentia Backlands contain a high proportion of habitat suitable for mammal fauna typical of the region (e.g., moose, red squirrel, mink, snowshoe hare, meadow vole). The construction and maintenance of roads and turbine pads throughout the Backlands will create disturbance and habitat fragmentation (Helldin et al., 2012; Scholl & Nopp-Mayr, 2021; Colman et al., 2013).

During all Project phases, there will be some interactions with mammals that, at a minimum will elicit avoidance behaviours for many species. The long-term effects of wind turbine developments on mammal species are not well-studied (Helldin et al., 2012; Scholl & Nopp-Mayr, 2021), but there is sparse literature available. A recent study on the impacts of wind turbines on moose has concluded that wind turbines do not have a significant impact on their activity and habitat use (Berndt et al., 2021). Another study on the impacts of wind turbines on semi-domesticated reindeer found that there was no conclusive effect on their behaviour; some moved away from the turbine, whereas others moved closer (Flydal et al., 2004). Colman et al. corroborate this research, as they theorize that vegetation preferences are more important for semi-domesticated reindeer than the presence of wind turbines, and that access roads are the main cause of avoidance behaviours rather than wind turbines themselves (2013). While impacts on large mammals may be negligible, smaller mammals may be disturbed. The noise and vibration from wind turbine operations have been found to affect the anti-predator behaviour of the European ground squirrel (Rabin et al., 2006). Conversely, it was found that wind turbines do not affect the movements of the European hamster, although behavioural effects remain unknown (Lopucki & Perzanowski, 2018). While responses to wind turbines will differ between species, one study indicates that there may be a correlation between herbivorous mammals and wind turbine avoidance (Lopucki et al., 2017). This study found that where hare and deer avoided wind turbines, foxes behaved neutrally (Lopucki et al., 2017). Aside from the habitat fragmentation and avoidance behaviour associated with the Construction Phase, wind turbine interactions with mammals may be relatively minimal. While it is difficult to extrapolate across species (and geographic regions), these studies above provide some indications that there will likely be some avoidance effects.

Frequency of interaction is likely to be correlated with the level of activity throughout the Project Area and will be more likely during Construction and Decommissioning and reduced during Operation and

Maintenance or as a consequence of Unplanned Events. It is conceivable that an Unplanned Event (major spill or fire/explosion) could affect Fauna in a meaningful way; but, given that such events are associated with the hydrogen and ammonia plants located on the Argentia Peninsula brownfield site, the magnitude of any effect on Fauna from Unplanned Events is considered to be low to negligible. Overall, and through all Project phases, the magnitude of potential negative environmental effects on Fauna is rated as Low.

During all Project phases, the geographic extent of interactions will be restricted to the Project Area, with a greater proportion of interactions likely to occur in the Argentia Backlands. The anticipated interactions between the Project and Fauna during all Project phases will be limited in duration.

The context of all these interactions will fall within the Project Area, including both the Argentia Peninsula brownfield and the Argentia Backlands. The implementation of standard mitigation measures throughout all Project phases will reduce both the likelihood and potential consequences of any potential negative environmental effect on Fauna. Overall, and through all Project phases, the magnitude of potential negative environmental effects on Fauna is rated as Low.

Avifauna

Designated avian Species at Risk are excluded from this section and addressed under the SAR KI. An assortment of both resident and migratory species has been confirmed as present in the Project Area. Suitable foraging and nesting habitat have been identified throughout the Argentia Backlands. As well, to a lesser extent on the Argentia Peninsula, the Meadow habitat provides some limited passerine habitat, and the Coastal habitat is occupied by a variety of seabirds. The interactions between these myriads of bird species, occupying all ecological niches, and the Project are likely at all phases, and throughout the Project Area.

Avifauna habitat will be directly lost during construction through vegetation being cleared at each of the turbine pads, for access roads, and other associated infrastructure. The clearing and infilling will be wide enough to allow the transport of large equipment during construction. While the turbine pads and roads will remain clear throughout the lifespan of the Project and will be constructed with gravel/crushed stone fill, they will be reduced in size and the surrounding land recovered during the Operation and Maintenance Phase. Based on preliminary design, the quantity of habitat that will be altered for turbine pad/laydown area and road construction is outlined in Table 4.2.3-4. This calculation excluded collector lines, the Project Gen-Tie, and the Interconnect Line, as such the ELC habitat data excluded the Project Interconnect Line right-of-way.

Table 4.2.3-4 Habitat Altered in Argentia Backlands and Argentia Peninsula by Preliminary Project Layout (roads and turbine pads)

ELC Ecotype	Habitat Area in Argentia Backlands and Argentia Peninsula (ha)	Habitat Altered by Preliminary Project Layout (ha)	Percent Altered per Ecotype (%)
Coastline	14.34	0.2	1.39
Rocky Barren	40.03	2.42	6.05
Wetland	244.64	4.32	1.77
Meadow	173.76	7.6	4.37
Regenerating Coniferous Forest	425.27	7.92	1.86
Coniferous Scrub	415.48	16.37	3.94
Mature coniferous	1332.36	39.89	2.99
Mixedwood Forest	368.5	6.66	1.81
Open Water	245.76	0	0.00
Anthropogenic	276.91	14.34	5.18

This amounts to an estimated 99.72 ha altered ecotype or less than 3% in the Project Area (preliminary roads and turbine alterations only). At the time of this calculation, Project infrastructure is estimated to alter 4.32 ha of wetland, however, the Project maintains the goal of not effecting any wetlands. This is justified currently by the use of a preliminary Project layout and ELC mapping (Appendix D3) for this modelling. The Project layout will still undergo micro-siting adjustments prior to construction to avoid and minimize effects on wetlands in the Project Area.

The construction of wind turbines also leads to indirect habitat loss through habitat fragmentation and sensory disturbance, which negatively impacts avian species (Brawn *et al*., 2001; Fonturbel *et al*., 2021). In areas where vegetation is cleared for Project infrastructure, habitat fragmentation and new transitional areas will be created, leading to a type of habitat alteration described as edge effects. These changes may include changes in species composition, increases in predation, changes in vegetation structure, and microclimates. Species that rely on intact, contiguous tracts of forest may be more affected than the generalist species that often benefit from edges. Even resident forest-dwelling birds that may not necessarily fly high enough to be struck by turbine blades may be impacted by the effects of habitat disturbance (Fonturbel *et al*., 2021). For example, habitat fragmentation and deforestation are known to be the primary threat to the Red Crossbill percna subspecies, an endangered subspecies found in the Project Area (COSEWIC, 2016).

Excessive additive light in SAR habitat can alter the daily activity schedule of individuals. Singing (for birds), foraging, breeding, and migration may all be temporally or spatially modified by the presence of light; singing may start earlier in the morning, foraging for insects may continue later into the evening, and migration routes may be altered to favour areas of enhanced lighting, which also often coincides with heightened risk (of collisions with light sources). Given the Project Area landscape context (i.e.,

brownfield adjacent to an industrial port) it is anticipated that the site preparation and construction activities will result in minimal additive sensory disturbance for these SAR.

The effects on habitat quality from sensory disturbance will continue throughout the Operation and Maintenance Phase of the Project; noise will remain amplified over baseline conditions because of the rotating turbines, road traffic for maintenance and regular operation activities (and the associated noise of those activities). Lighting will be present in the Project Area to meet Transport Canada lighting requirements, for the safety of site personnel, for the maintenance of the facilities and equipment, and travel along the access roads. The effects on birds from lighting associated with wind projects are poorly understood (Marques *et al*. 2014). Turbines with lights can attract birds, increasing the risk of collision, especially in conditions of poor visibility where visual cues are lacking, and birds depend on magnetic compass navigation (Poot *et al*. 2008). This possibility also applies to the flaring stack at the production and storage facility. Bird collisions with lit structures are likely to be more pronounced at sea than on land, and particularly during nighttime storms and associated with heavy migration traffic (Hüppop *et al*., 2006). While the Project is on land, its adjacency to the coast may result in interaction with avifauna.

During the Operation and Maintenance Phase, collisions often occur when birds are preoccupied with hunting, landing, or fighting (Willard, 1978). Turbine strikes are a threat to both migratory and resident bird species; however, collision risk seems to be species-specific, even among birds of the same groupings (Krijgsveld *et al*., 2009; Dohm *et al*., 2019). Research has shown that wind turbines kill less birds than other anthropogenic structures, perhaps due to the avoidance behaviour of some avian species (Zimmerling *et al*., 2013; Santos *et al*., 2022; Campedelli *et al*., 2013; Marques *et al*., 2019). While these behaviours lead to reduced mortality rates, they also present a risk of habitat displacement. For example, studies have shown that wind turbines displace resident raptors from their usual habitat (Campedelli *et al*., 2013; Dohm *et al*., 2019).

Raptors are considered the most highly affected avian group through interactions with wind turbines. The site choice for turbines favours locations with elevated and sustained winds. These same locations may often be used by raptors seeking updrafts to soar along corridors and conserve energy. The typical landscapes for wind turbine farms also can serve as hunting, foraging, and in some cases nesting sites for birds of prey. The hunting habits of many of these raptors involve scanning the landscape for prey items at a height that is beyond the view of prey species, but close enough to the ground to site prey. This preferred elevation is often at the height of the wind turbine rotors (May *et al*., 2020). There is evidence that certain raptors return to wind farm sites in the years succeeding project development; however, this is a species-specific reaction (Dohm *et al*., 2019). In Dohm et al.'s study, the Northern Harrier (which is found in the Project Area), did not return to their habitat (2019).

Nocturnal neotropical and temperate migrant birds (e.g., Passerines) can, under some conditions interact with wind projects. In most cases these birds fly at altitudes well above turbines; however, during severe

weather events, birds can occupy relatively lower altitudes. Under such conditions, there is a potential for collisions with turbines.

Birds generally can also be affected by passive collisions with transmission lines (Bevanger, 1994) and associated towers. The majority of Project electricity distribution lines will be overhead and the Project Interconnect Line running from the Project to interconnect with the NLH grid will generally run parallel to existing linear facilities. As a result, the potential for collisions by avifauna is low.

Several Decommissioning and Rehabilitation Phase activities have the potential to interact with avifauna including removal of salvageable equipment and materials, demolition and removal of buildings and foundations, and earthworks including re-contouring, and overburden and topsoil replacement. During this phase, interactions will be similar, but somewhat less intensive as the Site Preparation and Construction Phase. Noise and lights will potentially interact with local avifauna, and fatalities could occur through collisions with light vehicles or machinery. While the removal of equipment will occur relatively quickly, revegetating the Project Area with healthy, sustainable vegetation that supports existing, native ecosystems will take longer.

The frequency of interaction is likely to be irregular and correlate with the level of avifauna activity throughout the Project Area, and therefore will be more likely affected initially during habitat alteration and sensory disturbance during the Construction Phase and seasonally during Operation and Maintenance or because of Unplanned Events. During all Project phases, the geographic extent of interactions will generally be restricted to the Project Area, with a greater proportion of interactions likely to occur in the Argentia Backlands given the much greater habitat suitability for a much larger biodiversity of bird species. In addition, the Project Area, given the amount of field surveys conducted year-round, does not appear to be an important migration route or staging area for migratory birds. The anticipated interactions between the Project and Avifauna during all Project phases will be limited in duration.

Given the nature of potential interactions with Avifauna throughout all phases of the Project, many of the interactions, will be reversible. Habitat changes resulting from Project construction and operations are anticipated to be long term, but reversible. An Unplanned Event can include vehicle collisions with associated mortalities; hence reversibility is ranked as unlikely for this Project phase.

The context of all these interactions will fall within the Project Area, including both the Argentia Peninsula brownfield as well as the Argentia Backlands. The implementation of standard mitigation measures throughout all Project phases will reduce both the likelihood and potential consequences of any potential negative environmental effect on Avifauna. Overall, and through all Project phases, the magnitude of potential negative environmental effects on Avifauna is rated as Low.

Species at Risk

The scope of this Key Indicator encompasses Species at Risk (SAR) as well as Species of Conservation Concern as designated by Provincial and Federal legislation. The identified SAR present in the Project Area and considered in this section include a total of 11 species: two bat species, four bird species, two plant species, two lichens, and one insect species. A draft Species at Risk Impacts, Mitigations, and Monitoring Plan (draft) has been submitted as part of this registration and includes an effects assessment for specific SAR (Appendix R). For this assessment, SAR will be considered as a collective/general KI.

While most of the suitable habitat for SAR is found in the Backlands, the Argentia Peninsula has known occurrences of plant SAR as well as some bird species. Special effort has been dedicated to the identification of SAR presence and suitable habitat throughout the Project Area so that potential interactions can be avoided; however, given the behaviours and distributions of the various SAR species, multiple irregular interactions are likely. Interactions will be possible during Construction and Decommissioning through the fragmentation or loss of habitat, noise disturbance and the presence of humans and heavy machinery. The phase of greatest risk for interaction is Operations and Maintenance, in particular for the bat SAR and some of the avian SAR. During all Project phases, the geographic extent of interactions will generally be restricted to the Project Area, with a greater proportion of interactions likely to occur in the Argentia Backlands. The anticipated interactions between the Project and SAR during all Project phases will be limited in duration.

SHORT-EARED OWL

Short-eared Owl prefers open grassland habitats for hunting, and they construct their nests in shallow scrapes on the ground. They fly relatively close to the ground and are most active during dawn, dusk and at night. Low shrub and barren habitats may be used by Short-eared Owl within the Project area during the nesting season. Minimal habitat loss will occur due to site preparation; however, the effects will be small as there is limited grasslands habitat in the LAA and RAA and those that do exist are contained within wetlands, a habitat that will see minimal disturbance. Short-eared Owl likely has an elevated potential for collisions with vehicles due to their tendency to fly low when hunting in open areas (including clearings and along roadsides). In addition, as a ground-nester, there is potential for the destruction of Short-eared Owl nests should site clearing be conducted during the breeding season.

As discussed in the avifauna KI, collisions often occur when birds are preoccupied with hunting, landing, or fighting (Willard 1978). However, a range of biological and external factors will affect the potential risks to a specific SAR. Among the most important considerations are a species' vision and its flying abilities. This can help explain why some birds of prey with highly binocular vision (eyes in front of the head) often are susceptible to collisions (Bevanger 1994, Tucker 2001). While their straight-ahead view is excellent, large blind zones to the sides increase vulnerability (Tucker 2001). This characteristic also applies to the Short-eared Owl. The crepuscular nature of the Short-eared Owl may also increase susceptibility due to the poor light associated with dawn and dusk (Bevanger 1994).

PASSERINE

The effects of the Project on passerine SAR overlap directly with those discussed in the avifauna KI. Below is an expanded discussion on the species-specific habitat usage and how they may be affected by the Project. Effects discussed earlier are more general, especially during the Operation and Maintenance Phase; however, they are to be considered to all apply to the following species when completing this assessment.

Red Crossbill prefers to forage on the seeds of conifer forests (pine trees and black spruce) and are reliant on these habitats for roosting and nesting. They are most active during the day, exhibiting irruptive behaviour in search of abundant food resources. Habitat loss and habitat fragmentation from tree clearing may occur for Red Crossbill due to site preparation and construction in the Argentia Backlands; however the effect will be reduced due to the nomadic lifestyle of the Red Crossbill and their ability to adapt. Since the species nests throughout the year, nest monitoring and avoidance will be required during vegetation clearing in the Project Area (see section 4.2). Red Crossbill has a high likelihood of interacting with the Project during site preparation and construction because they nest throughout the year in habitat types that will be disturbed during site clearing. They are the most SAR to be affected by habitat fragmentation; however, given the continuous forests outside of the Project Area and their nomadic lifestyle, the project impacts are assessed to be low. This SAR is unlikely to interact with vehicles outside of their migration periods in the spring and fall, preferring localized foraging near their nest and rearing habitat in clearings adjacent to mature forests.

Gray-cheeked Thrush prefers to ground forage and nest in dense low thickets characteristic of Newfoundland coastal habitat that occurs throughout the LAA and RAA. Clearing along pre-existing forest edges and coastal habitat will affect their nesting and foraging during site preparation, however, there is abundant alternate habitat available within the LAA and RAA. Gray-cheeked Thrush may interact with the Project Construction Phase during corridor widening and site clearing. Nesting and foraging for this species occur in dense thickets typical of the habitat type present in the Project Area. Site clearing during the nesting season presents the risk of destruction of nests/eggs/nestlings. However, the dense composition of trees and thickets created by edge effects may increase the habitat availability for this species. This SAR is unlikely to interact with vehicles outside of their migration periods in the spring and fall, preferring localized foraging near their nest and rearing habitat in clearings adjacent to mature forests.

Rusty Blackbird prefers to forage in shallow waters of wetlands surrounded by coniferous-dominant forests, and their nests are usually established in shrubs or small trees near/over water. A small amount of habitat loss may occur for Rusty Blackbird due to site preparation and construction (possibly due to habitat alteration by disturbance), but the potential effect will be reduced due to the quantity of suitable available habitat that exists in the LAA and RAA. Rusty Blackbird is likely to interact with the Project during site preparation and construction since it is known from field surveys to be present in the area.

Any site clearing in or near wetland habitat during nesting season has the potential to destroy nests/eggs/nestlings. However, minimal to negligible habitat alteration is to occur in wetlands. Rusty Blackbird seldom leaves the wetland habitats in which it breeds, so interaction with vehicles is unlikely

Olive-sided Flycatcher prefer to forage in open areas including mature forests near wet areas, including rivers and bogs, semi-open mature forests, barrens, and clearcuts. A small quantity of habitat loss may occur in the removal of mature forest stands, however the open habitat created might be beneficial to this species. Olive-sided Flycatcher is likely to interact with the Project given their habitat preference for edge habitat such as existing and new clearings. Their territory range during nesting is 10-20 ha in predominantly coniferous trees. Therefore, site clearing activities during nesting periods may result in interactions. This SAR is unlikely to interact with vehicles outside of their migration periods in the spring and fall, preferring localized foraging near their nest and rearing habitat in clearings adjacent to mature forests.

Evening Grosbeak prefers to forage on invertebrates in the summer months and fruit and conifer seeds in the winter. Their preferred habitat for mating and foraging is in mature mixedwood forests that are predominantly coniferous. A small quantity of habitat loss may occur for Rusty Blackbird due to site preparation and construction (possibly due to habitat alteration by disturbance), but the potential effect will be minimal due to the amount of available habitat that exists in the LAA and RAA and their nomadic lifestyle. Evening Grosbeak were not identified as present in the conducted surveys. However, their nomadic lifestyle allows for the possibility of occasional occurrences, including nesting. In such cases site clearing activities may affect such individuals. This SAR is unlikely to interact with vehicles outside of their migration periods in the spring and fall, preferring localized foraging near their nest and rearing habitat in clearings adjacent to mature forests.

BATS

Northern myotis and little brown myotis prefer forested areas or open water for foraging, and establish maternity roosts occur in trees, snags, or human structures. The preliminary Project infrastructure layout will affect marginal habitat for Little Brown Myotis, hence the effect of loss of habitat for this SAR from site preparation and clearing will be minimal.

The range of the migratory silver-haired bat likely does not extend to the Project area (aside from the rare outlier vagrant individual). The species occupies a similar niche to the Little Brown Myotis, foraging over waterbodies and roosting in forested habitat. The potential for the Project Area, LAA, or RAA to contain habitat for this species is minimal.

Hoary Bat has a higher wing loading and aspect ratio than the other three bat species, restricting it to less cluttered areas for foraging. Little is known about this species' foraging behaviour and diet in eastern Canada, but other studies have shown that their migratory diet resembles that while on summer grounds

(Reimer *et. al*. 2010). Some evidence suggests that this species may seek out larger waterbodies (Reimer *et al*. 2010) and it seems unlikely that the Project Area (or the LAA or RAA) would provide quality foraging habitat. More local information would be beneficial for this species, and the Post-Construction Monitoring Plan (PCMP) may contribute to this gap. Bat incidental mortality is unlikely to occur during the site preparation and Construction Phase. There are no known hibernacula in the RAA. There is, however, the potential for natural maternity roost habitats in snags, large roost trees, and/or cliff sides within the Project area. Further monitoring surveys for presence of natural maternity roosts (in addition to outbuildings and abandoned bunkers) will be completed prior to site clearing and/or blasting.

Bat incidental mortality is unlikely to occur during the site preparation and Construction Phase. There are no known hibernacula in the RAA. There is, however, the potential for natural maternity roost habitats in snags, large roost trees, and/or cliff sides within the Project area. Further monitoring surveys for presence of natural maternity roosts (in addition to outbuildings and abandoned bunkers) will be completed prior to site clearing and/or blasting.

Lights and flaring stacks can alter habitat, often by attracting insects which may be foraged by insectivorous bats. If densities of insects increase in the LAA due to additional lighting, they could act as a sink for bats. Wind turbine operations may result in sensory disturbance for bats beyond the footprint of the turbines (the Project Area) and result in changes to localized bat behaviour (e.g., within the LAA). Research has shown that anthropogenic noise affects bat foraging effort and success; bats have been found to spend less time foraging in noisy areas (Luo *et al*. 2015, Siemers and Schaub 2011, Schaub *et al*. 2008). Another study (Barré *et al*. 2018) indicated that, in addition to a decrease in activity for several bat species near turbines, sensory disturbance for bats can also extend as far as 1 km from wind turbines.

The effects of wind energy projects can vary substantially across the ranges of bat species (Environment and Climate Change Canada 2018). Bat mortalities are most commonly caused by collisions with rotors. Bats account for the majority of vertebrate fatalities at wind turbines, making wind energy production the leading cause of multiple mortality events in bats (Voigt *et. al*. 2024). However, it is also acknowledged that regions characterized by high wind speeds, like Newfoundland and the Argentia area, exhibit a reduced potential for turbine collisions due to relative lower habitat use by bats.

Aside from impact fatalities, Myotis bats also demonstrate avoidance behaviours near wind turbines, which in turn leads to habitat loss (Gaultier *et al*. 2023). Given the steep declines of bat populations in eastern Canada due to White-Nose Syndrome (WNS), any effects on individual bats of the SARA-listed species have the potential to be significant. Mortality of any remaining individuals, particularly breeding adults, can negatively affect the survival of local populations, slow the rate of recovery, and possibly delay the development of resistance to the fungus that causes WNS (Environment and Climate Change Canada, 2018).

Bats can be vulnerable to vehicle collisions (Fensome and Mathews 2016). Low-flying species are more prone to collisions than high-flying species, and juveniles are more vulnerable than adults (Fensome and Mathews 2016). Given that most light vehicle traffic associated with routine inspections and maintenance of the Project infrastructure will be during the day, and traffic volumes will be low (single vehicles), the potential for bat SAR interactions with light vehicles is low.

INSECTS

Yellow-banded bumblebee is generalist and can be observed in many different natural habitats and anthropogenic areas (COSEWIC, 2015). This bee can be observed in any area with abundant flowering plants. As such, existing transmission line right-of-way, open meadows, and unoccupied land on the Argentia Peninsula have the potential to support this species. Therefore, site preparation of turbine sites, transmission lines, and plant facilities all interact with potential suitable habitat. Yellow-banded Bumblebee mortalities are possible when clearing of land occurs during the colony's active season (May – August). During the fall and winter months, site preparation activities pose the risk of disturbing overwintering queens in shallow loose soil burrows or rotting logs.

While wind turbine operation does cause insect mortality, there is limited knowledge on this topic (Voigt, 2021). One recent study indicated that wind turbines do not appear to affect honeybee colonies (Fourrier *et al*., 2023). However, where the insect SAR identified in the Project Area is a bumble bee rather than a honeybee, extrapolating these conclusions provides limited inference to this species.

The relationship between bat fatalities and insect foraging has led to literature which may be used to support the evidence of insect interactions with wind turbines. There is a positive correlation between bat mortalities at wind turbines and the migration windows of high-flying migratory insects (Rydell *et al*., 2010). This may indicate that high-flying migratory insect species are susceptible to turbine strikes (Rydell *et al*., 2010). Another study found that insects of the order Lepidoptera (e.g., moths, butterflies) were dominant in the stomachs of bats killed by turbines, indicating that these insects may interact with turbine blades themselves (Foo *et al*., 2017).

While the potential is there for collision with turbine blades, the COSEWIC Assessment and Status Report on the yellow-banded bumble bee, assessed the threat of renewable energy as negligible. While they also state that the development may also result in a beneficial increase in flowers (COSEWIC, 2015).

PLANTS AND LICHENS

Lichen SAR including blue felt lichen, boreal felt lichen, and graceful felt lichen were considered and addressed in the Flora KI. In summary, lichen mortality is possible, either directly because of site clearing in yellow birch and balsam fir stands of high suitability or indirectly when nearby forest stands are eliminated causing alteration in local atmospheric conditions.

Water pygmyweed is located on the Argentia Peninsula along its northwestern coast. Should this area be used during the Construction Phase as a laydown area for Project components, there could be interactions with water pygmyweed. Mitigations will be sought through consultation with NL WD.

SUMMARY

The Local Assessment Area contains sufficient habitat to support any of the identified SAR, hence decommissioning and rehabilitation can be expected to result in negligible negative effects and, for many aspects of the work, will benefit the SAR using the area. Given the nature of potential interactions with SAR throughout all phases of the Project, many, but probably not all, will be reversible to some extent. An Unplanned Event can include vehicle collisions with associated mortalities; hence reversibility is ranked as unlikely for this Project phase.

The context of all these interactions will fall within the Project Area, including both the Argentia Peninsula brownfield as well as the Argentia Backlands. The implementation of standard and custom-designed mitigation measures throughout all Project phases will reduce both the likelihood and consequences of any potential negative environmental effect on SAR. Overall, and through all Project phases, the magnitude of potential negative environmental effects on SAR, while rated as Low, will nonetheless rely on the successful implementation of mitigation measures and the associated monitoring for feedback on environmental effects as well as the use of adaptive environmental management throughout all phases of the Project. A draft Species at Risk Impacts Mitigation and Monitoring Plan has been included with this Registration document (Appendix R) which outlines all the proposed mitigations for SAR.

4.2.3.5 Mitigation Measures

Applicable avoidance and mitigation measures are listed in Table 4.2.3-5. Project-specific plans (e.g., SAR IMMP, PCMP) will also include mitigation measures that are applicable to this VC.

Table 4.2.3-5 Mitigation and Enhancement Measures: Terrestrial Environment.

Terrestrial Environment			
Project Phase	**KI**	**Interaction**	**Mitigation/Enhancement**
Construction	Fauna Avifauna Flora SAR	• Loss and fragmentation of wildlife habitat due to vegetation clearing. • Change in ecological community diversity as a result of loss of forest.	• Remove as little vegetation as possible. • Clearing, grubbing, and topsoil overburden removal will be clearly identified in the field using flagging and survey stakes. • Vegetation removal will be limited to within the construction footprint area.
Construction Decommissioning and Rehabilitation	Fauna Avifauna Flora SAR	• Loss and fragmentation of wildlife habitat due to vegetation clearing.	• Rehabilitation will be initiated within all temporary construction and decommissioning areas as appropriate to

			the type of habitat that was removed, i.e., replant forested areas using native stock.
Construction	Fauna Avifauna SAR	• Possible mortality of nesting birds. • Loss and/or degradation of nesting habitat. • Disturbance and/or displacement of nesting birds.	• Site clearing and grubbing will be avoided during breeding bird season. • If vegetation must be removed during the bird nesting season of April 1 to August 31, mitigations will be applied in accordance with the **Migratory Birds Convention Act**. • Pre-clearing surveys for active migratory bird nests will be carried out for work done during the breeding season, and buffer / set-back distances from active nests will be established.
Construction	Fauna Avifauna SAR	• Possible mortality of nesting birds. • Loss and/or degradation of nesting habitat. • Disturbance and/or displacement of nesting birds.	• A qualified Avian Biologist will be present during clearing activities to supervise vegetation removal and carry out nest surveys.
Construction	Fauna Avifauna SAR	• Possible mortality of nesting birds. • Loss and/or degradation of nesting habitat. • Disturbance and/or displacement of nesting birds.	• A buffer zone shall be established around the active bird nest or confirmed bird nesting activity if one is discovered. The radius of the buffer will vary depending on the species, level of disturbance, and landscape context. The buffer will be developed in consultation with Wildlife Division. The nest is expected to be protected by the minimum buffer area of 10 m surrounding the nest from minor work such as vegetation clearing, building access roads, general heavy machinery use, and vehicle operation.
Construction	Fauna Avifauna SAR Flora	• Loss and fragmentation of wildlife habitat due to sub-surface excavation activities. • Possible mortality and/or harm to terrestrial wildlife. • Disturbance to wildlife due to construction noise and vibration.	• Limit the affected area of blasting to minimize disturbance to wildlife while carrying out blasting operations in accordance with relevant Federal and Provincial guidelines and standards.
Construction	Fauna Avifauna SAR	• Loss and fragmentation of wildlife habitat due to sub-surface excavation activities.	• Prior to blasting, a qualified Biologist is to undertake an area search of the intended blasting area to determine whether wildlife is present on the day of blasting. If wildlife is encountered in the blasting zone, deterrence measures are to be employed, up to implementation of a delay in blasting until the wildlife has vacated the area.

		• Possible mortality and/or harm to terrestrial wildlife. • Disturbance to wildlife due to construction noise and vibration.	
Construction	Fauna Avifauna SAR	• Loss and fragmentation of wildlife habitat due to sub-surface excavation activities. • Possible mortality and/or harm to terrestrial wildlife. • Disturbance to wildlife due to construction noise and vibration.	• Time delay blasting cycles or blast mats will be used to control debris generated from blasting. • Blasting will only occur in areas that have been cleared of vegetation.
Construction	Fauna Avifauna SAR	• Loss and fragmentation of wildlife habitat due to sub-surface excavation activities. • Possible mortality and/or harm to terrestrial wildlife. • Disturbance to wildlife due to construction noise and vibration.	• All blasting activities will be overseen by an Environmental Monitor as per the Construction EPP. The designated monitor will check the site prior to and during blasting activities to ensure compliance with the Blasting Plan.
Operations	Fauna Avifauna	• Possible bat and bird mortality as a result of collision with wind turbines. • Disturbance to wildlife caused by noise and light from Project infrastructure, and possible avoidance of the area.	• Wind turbine and meteorological tower lighting levels will be at the minimum allowed by Transport Canada for aeronautical safety, and white or red strobe lights may be used with the minimum intensity and flashes per minute allowable.
Operations	Fauna Avifauna SAR	• Disturbance to wildlife caused by noise and light from Project infrastructure, and possible avoidance of the area.	• Ground-level external lights on buildings and wind turbine bases will be pointed downward and shall use motion or heat sensors when possible and permitted by relevant codes and the authority with jurisdiction.
Construction, Operations and Maintenance, and Decommissioning and Rehabilitation	Fauna Avifauna SAR	• Disturbance to wildlife caused by noise and light from Project infrastructure, and	• Project lighting will be limited to that which is necessary for safe and efficient Project activity.

		possible avoidance of the area.	
Operations	Avifauna SAR	• Possible bat and bird mortality as a result of collision with wind turbines.	• Curtail turbines during Year One at wind speeds below 6 m/s, from dusk to dawn, when ambient air temperatures are above 6 degrees Celsius, between July 1 and September 30.
Operations	Avifauna SAR	• Possible bat and bird mortality as a result of collision with wind turbines.	• A post-construction mortality monitoring program (PCMP) will be established, and carcass searches will be conducted at all turbines between April and October for at least the first year, with thermal camera and/or acoustic monitoring occurring at least in the first, second, fifth, and seventh years of operations. Surveys will be designed to account for searcher efficiency and scavenger rates. The mortality monitoring program will be developed in consultation with the NL WD. • An adaptive management framework will be used to introduce new mitigation measures if high fatality rates are observed as per the Operations EPP.
Construction, Operations and Maintenance, and Decommissioning and Rehabilitation	Fauna Avifauna SAR	• Possible wildlife interactions with personnel, equipment, and vehicles	• A Wildlife Response Protocol will be developed and implemented. • Project personnel must record and report all wildlife sightings and human-wildlife interactions and conflicts to the Environmental Coordinator. • SAR sightings and human-wildlife interactions will be reported to FFA
Construction, Operations and Maintenance, and Decommissioning and Rehabilitation	SAR	• Possible destruction and/or fragmentation of avian SAR habitat. • Change in mortality risk – harm, harassment, and/or killing of SAR.	• Staff will receive formal training on how to recognize SAR that may be present in the Project Area and the proper procedure to follow if SAR are encountered as per the EPP.
Construction	SAR	• Possible destruction and/or fragmentation of avian SAR habitat. • Change in mortality risk – harm, harassment, and/or killing of SAR.	• Construction work must stop immediately within 10 m of a SAR observation until a qualified biologist can confirm the species has vacated the construction disturbance footprint. If the species is not present within the vicinity of the previous observation after a 24-hour period, work can resume.
Construction, Operations and Maintenance, and Decommissioning and Rehabilitation	Fauna Avifauna SAR	• Mortality to wildlife as a result of vehicles using access roads.	• Establish Project speed limits that are protective of wildlife. • Post signage and monitor for adherence to the limits set. • Inform staff to be vigilant for wildlife while driving on site.
Construction	Fauna Avifauna SAR	• Possible mortality, harm, and/or harassment to wildlife due to	• As per the Construction EPP, Environmental Monitors will be present during construction activities such as clearing vegetation, dewatering, and

		construction activities. • Disturbance to wildlife.	blasting to ensure adherence to environmental regulations.

4.2.3.6 Conclusion

Table 4.2.3-6 provides a summary of predicted adverse residual effects on the Terrestrial Environment VC.

Table 4.2.3-6 Potential Adverse Residual Environmental Effects of the Project: Terrestrial Environment.

Terrestrial Environment							
Project Phase	Key Indicator	Magnitude	Frequency	Extent	Duration	Reversibility	Context*
Construction	Flora	3	4	1	5	3	1,3
	Wetlands	2	2	2	3	3	3
	Fauna	2	3	3	1	1	1,3
	Avifauna	2	3	3	4	3	1,3
	Species at Risk	2	3	2	3	3	1,3
Operation and Maintenance	Flora	2	3	1	5	3	1,3
	Wetlands	2	2	2	3	3	3
	Fauna	2	2	3	1	1	1,3
	Avifauna	2	2	2	2	3	1,3
	Species at Risk	2	2	2	1	3	1,3
Decommissioning	Flora	3	4	1	5	3	1,3
	Wetlands	2	2	2	3	3	3
	Fauna	2	3	3	1	1	1,3
	Avifauna	2	3	3	4	3	1,3
	Species at Risk	2	3	2	3	3	1,3
Unplanned Events	Flora	2	2	1	4	3	1,3
	Wetlands	2	2	2	3	3	3
	Fauna	2	2	3	1	5	1,3
	Avifauna	2	2	2	1	5	1,3
	Species at Risk	2	1	2	1	3	1,3
NOTES *Context may be assigned more than one value.							

Table 4.2.3-7 presents a summary of the effects prediction of the Project on the Terrestrial Environment. These predictions consider the nature and extent of the identified interactions, as well as assuming the implementation of mitigation and monitoring measures as described and committed to (see Table 4.2.3-5). Special attention will focus on the contents of Appendix R (Species at Risk Impacts Monitoring and Mitigation Plan) and the Post-Construction Monitoring Plan (Appendix S). There are no predicted

negative significant residual environmental effects of the Project (all phases) with respect to the Terrestrial Environment.

Table 4.2.3-7 Significance of Potential Residual Environmental Effects of the Project: Terrestrial Environment

Project Phase	Key Indicator	Significance of Predicted Residual Environmental Effects		Likelihood*	
		Level of Significance	Level of Confidence	Probability	Scientific Certainty
Construction	Flora	NS	3		
	Wetlands	NS	3		
	Fauna	NS	3		
	Avifauna	NS	3		
	Species at Risk	NS	3		
Operation and Maintenance	Flora	NS	3		
	Wetlands	NS	3		
	Fauna	NS	3		
	Avifauna	NS	3		
	Species at Risk	NS	3		
Decommissioning	Flora	NS	3		
	Wetlands	NS	3		
	Fauna	NS	3		
	Avifauna	NS	3		
	Species at Risk	NS	3		
Unplanned Events	Flora	NS	3		
	Wetlands	NS	3		
	Fauna	NS	3		
	Avifauna	NS	3		
	Species at Risk	NS	3		

NOTES
*Only applicable to significant effects.
Significance
Level of Significance: S = significant; NS =not significant; P= positive
Level of Confidence: 1= low; 2= medium; 3= high
Likelihood (Only applicable for significant effect (rated as S)
Probability of Occurrence; 1= low; 2= medium; 3=high
Scientific Certainty: 1=low; 2=medium; 3=high.

4.2.4 Land and Resource Use

Land and Resource Use is selected as a VC because of the potential interactions between the Project and the use of lands and resources in and nearby the Project Area, and their socio-economic value to the region. There are five KIs through which the Land and Resource Use VC and the Project interact: private and municipal designated land use, commercial and industrial resource use, recreational and subsistence land and resource use, protected sensitive areas (Habitats of Conservation Concern), and Indigenous land use.

The spatial boundaries for the assessment of potential Land and Resource Use effects include the Project Area, LAA and RAA as defined in Section 2.1. Table 4.2.4-1 lists KIs applicable to the Land and Resource Use VC, as well as geographic scope and applicable measurable parameters for each KI.

Table 4.2.4-1 Scope & Measurable Parameters of Key Indicators: Land and Resource Use.

Key Indicator	Scope	Measurable Parameters
Zoning	Project Area	• Qualitative description of property development plans and zoning requirements • Qualitative description of activities affecting PPWSA • Extent of current land use sites (including tenured lands) overlapped by the Project • Change / restriction or disruption of land use (ha) • Proximity to land use sites (km)
Commercial and Industrial Resource Use	Project Area, LAA and RAA	• Extent of current resource use sites including tenured land (i.e., POA, mining/quarrying, agriculture, radar towers) • Change or disruption affecting resource use (ha) • Proximity to resource use sites (km)
Recreational and Subsistence Resource Use	Project Area and LAA	• Qualitative use of area (e.g., hunting/trapping/ angling, domestic wood harvesting, berry picking, swimming) • Change / restriction or disruption of land use (ha) • Proximity to recreation use sites (km)
Protected, Special and Sensitive Areas	Project Area, LAA and RAA	• Qualitative use of area (e.g., Parks and reserves, proposed protected areas, sensitive wildlife areas) • Proximity to Protected, Special and Sensitive Areas (km)
Indigenous Land Use	Project Area, LAA and RAA	• Proximity to contemporary indigenous land use areas (km)

4.2.4.1 Assessment Criteria

Assessment criteria presented in Table 4.1.7-2 were used to evaluate the effects of the Project on the Land and Resource Use VC.

4.2.4.2 Existing Knowledge

The existing knowledge of the five key indicators of Land and Resource Use are described in Section3.1.4.

4.2.4.3 Definition of Significance

For the Land and Resource Use VC, a significant adverse residual effect is defined as:

- Having a high magnitude; or
- A medium magnitude and characterized by either:
    - An extended duration affecting a geographic area that extends beyond the Project Area; or
    - A low level of confidence in the prediction.

Where a significant effect has been predicted, this evaluation then includes a determination of the likelihood associated with the predicted effect. “Likelihood” includes both the probability of occurrence as well as the scientific certainty of the predicted effect.

4.2.4.4 Potential Project-Environment Interactions

Potential interactions with identified KIs of the Land and Resource Use VC are summarized below in Table 4.2.4-2.

Given the absence of contemporary Indigenous land use within the RAA, there are no potential interactions anticipated with respect to the proposed Project during any phase. Indigenous land use is therefore not discussed further in this chapter.

Table 4.2.4-2 Potential Project Environment Interactions Matrix: Land and Resource Use.

Key Indicators: Land and Resource Use					
Project Component and Activity Description	**Zoning**	**Commercial and Industrial Resource Use**	**Recreational and Subsistence Resource Use**	**Protected, Special, and Sensitive Areas**	**Indigenous Land Use**
Construction Phase					
Site Preparation		X	X		
Roads	X	X			
Staging and Laydown	X	X		X	
Material Transport		X			
Wind Turbine Foundations	X	X			
Electrical Infrastructure	X	X	X	X	
Wind Turbine Installation		X		X	
Electrolyser Plant	X	X			
Ammonia Plant	X	X			
Ammonia Storage/Transfer		X			
Flares		X			
Admin Buildings	X	X			
Operation and Maintenance Phase					
Wind Turbine Operation				X	
Wind Turbine Maintenance					
Electrical Infrastructure			X		
Venting and Flaring					
Road Maintenance		X			
Plant Operations		X			
Ammonia Handling		X			
Decommissioning Phase					
Electrical Infrastructure		X	X		
Wind Turbine Removal		X		X	
Building Removal		X			
Plant Removal		X			

Key Indicators: Land and Resource Use					
Project Component and Activity Description	**Zoning**	**Commercial and Industrial Resource Use**	**Recreational and Subsistence Resource Use**	**Protected, Special, and Sensitive Areas**	**Indigenous Land Use**
Terrain Reclamation		X	X		
Unplanned Events					
Spills and releases		X			
Flaring and venting					
Fire, explosion		X			
Traffic accident		X			
Wind Turbine collapse		X		X	
Water supply failure		X			
Wildlife emergency					
Human hazard or injury					
NOTES X: Potential interactions that might cause an effect. Blanks indicate that interactions between the Project and the VC are not expected.					

Zoning

Potential issues and concerns that may arise with zoning because of Project activities would result from the proposed footprint of the Argentia Green Fuels Facility, the Argentia Wind Facility and associated linear infrastructure on the Argentia Backlands. Should Project features and activities be incompatible with designated land uses, and/or impede or restrict future land development, then such an interaction could result in potential zoning changes or potential negative effects.

In general, the Project will be able to comply with all existing zoning requirements and restrictions during all Project phases. The facilities on the Argentia Peninsula are to be sited within an existing industrially zoned area. The Argentia Backlands required for the construction of the wind turbines and electrical

infrastructure will need to be zoned and appropriately permitted within the Municipal Planning Area of Placentia. In discussion with the Town of Placentia, the following modifications are to be considered:

- Substation location must be classified as industrial, or rules for rural zoning must be amended to allow substations.
- Wind turbine locations must be classified as industrial, or rules for rural zoning must be amended.
- Discussion regarding whether the Argentia Green Fuels Facility is considered compatible with a regular industrial zone or a hazardous industrial zone.

In addition, the Project Interconnect Line will be substantially located on Crown Lands until joining the Long Harbour Terminal Station. The Long Harbour substation is zoned as special industrial. Permission will be required for construction of the Project Interconnect Line on Crown Land along the proposed routing. To the extent practical, the route will parallel existing rights-of-way.

Two Protected Public Water Supply Areas (PPWSAs) are located within the Project Area and include Clarkes Pond/Larkins Pond and Wyses Pond/Curve Pond. Construction adjacent to a PPWSA will comply with the Town of Placentia Municipal Plan, whereby no major development is permitted in these watersheds. The construction of roads as well as Collector Lines, the Project Gen-Tie, and the Project Interconnect Line within the PPWSA will require the approval of the NL DECC.

There are two segments of Protected Road zoning that run parallel with the proposed Project Interconnect Line. The first zone begins at the Southeast Placentia Road and extends east along Route 100 approximately 4.2 km and buffers 100 m on either side of the highway. The second section abuts the first continuing east along NL-100 extending to the Trans Canada Highway (TCH) and buffers 100 m on either side of the highway. The Project Interconnect Line is proposed to pass through these buffered areas and will require approval under Section 61 of the **Urban and Rural Planning Act** (2000).

Zoning adjustments will be solidified to proceed with construction permitting. Therefore, the Project will not interact with zoning concerns in the Operation and Maintenance, Decommissioning and Rehabilitation phases of the Project, nor during Unplanned Events.

Commercial and Industrial Resource Use

Potential concerns could arise with Commercial and Industrial Resource Use and Project features because of interactions with mineral land tenure accessibility, disturbance of adjacent properties and users, as well as commercial and industrial activities within the POA Property (e.g., quarrying). As discussed in Section 3.1.4.2, other activities including forestry, agriculture, aquaculture, and petroleum exploration will not interact with the Project.

Access to mineral land tenures located in the Argentia Backlands may be restricted throughout all Project phases. As of April 26, 2024, there are 8 subsurface licences which overlap with the Preliminary Layout of the Argentia Wind Facility, with a total of approximately 775 ha. Further, there are two quarries currently located on the POA Property. One is permitted to Tier 1 Capital Corporation Edward Collins Contracting Limited located on Broad Cove Head, Argentia, and encompasses 3.17 ha. The second is permitted to Pennecon Heavy Civil Ltd. located on Silver Mine Rd, Argentia, and encompasses 3.87 ha. Access will continue to be available to operational quarries and project infrastructure will not overlap with their permitted land areas, however, limited restrictions could apply to access routing.

The operation by Canadian Coast Guard (CCG) of the Vessel Traffic Centre includes use of a radar system, the effectiveness of which could be affected by the presence of physical structures within its viewing arc. Argentia Renewables is currently working with CCG to find a mutually beneficial solution to mitigate false returns due to wind turbine clutter and any loss of detection downrange due to shadowing. In order to reduce potential effects on radar activities in the general area of Placentia and the POA, the Project will continue to work with the CCG to minimize potential effects from wind turbines on radar activities. This will include the micro-siting of wind turbines (e.g., selecting a turbine location behind a coast guard radar rather than in front of it, modifying final wind turbine layout to further reduce effects) and may also include other measures such as funding software upgrades to utilize existing radar capabilities, based on direct consultation with the CCG.

The operations of the POA will not be reduced or restricted during any Project phases; rather, shipping during all phases will marginally increase marine traffic and port activity. Road transport of turbine components from the POA to the Argentia Backlands has the potential to produce temporary traffic delays. A Traffic Management Plan has been developed to address means to reduce interactions and ensure the smooth flow of road traffic (Appendix E). Potential for negative effects for the POA resource use would be the direct and indirect interactions caused by an Unplanned Event, as discussed in Section 4.3. Such Unplanned Events are addressed in detail in the Emergency Response Plan (Appendix M), and the Risk Assessment Workshop Report (Appendix V).

Any temporary disturbance to nearby properties will be limited to the Construction, and Decommissioning and Rehabilitation phases because of increased activity. During the Operation and Maintenance phase, levels of disturbance will be minimal. Given the industrial zoning of the POA, and the nature of ongoing (and anticipated) POA activities, there is minimal potential for Project activities to disrupt other commercial and industrial resource use.

Recreational and Subsistence Resource Use

Given the existing status of the POA Property as private lands, minimal Project interactions are expected with Recreational and Subsistence Resource Use. Anticipated interactions associated with the Construction phase will include temporary reduced access to hunting, fishing, swimming, and berry picking areas within the Argentia Backlands.

Some interactions could, however, result from the Construction, Operation and Maintenance of the Project Interconnect Line where the corridor crosses Crown Lands. This may affect recreational uses and domestic wood harvesting along the route as trees will be cleared and maintained throughout the life of the Project. The domestic wood harvesting zones D01-H-5D and D01-H-7D run along Route NL-101 and Route NL-100 respectively, and both are within the vicinity of the proposed Project Interconnect Line for the Project.

There may be restrictions within the Argentia Backlands for selected recreational activities during all Project phases, however other activities such as hiking will be facilitated. The Project will alter the visual landscape of the Argentia Backlands following the erection of the wind turbines, and this could alter the pattern of local tourism resource use.

Tourism facilities adjacent to the POA have the potential to be affected by the Project, especially during the Construction, and Decommissioning and Rehabilitation phases. Tourism facilities that overlap with the Project Area are outlined in Section 3.1.4.3 and include the Argentia Provincial Visitor Centre and the Sunset RV Park. These facilities will see increased activities during their operating seasons. While all phases of the Project will alter the viewscapes of the area, it is anticipated to generate interest in the region. Additional tourism facilities and related economic interactions with the Project are addressed by the Socio-economic VC (Sections 3.1.5 and 4.2.6) and in the Socio-economic Baseline Study (Appendix G).

Protected, Special and Sensitive Areas

There are few locations of Protected, Special, and Sensitive Areas either within or adjacent to the Project Area. One exception pertains to the provincially designated sensitive wildlife area associated with the recent observations of a provincially protected rare plant species (water pygmyweed) at two sites on the Argentia Peninsula (see Appendix D6). The potential for interaction is at its highest during the Construction, and Decommissioning and Rehabilitation phases due to increased activity on the turbine laydown area (the former runway) thus increasing the possibility of species disturbance. Operation and Maintenance interactions include air temperature/wind differences created by wind turbine operation that could alter the microclimate adjacent to the rare plant. In addition, located 25 kilometres from the Argentia Ferry, Fitzgerald’s Pond Provincial Park within the RAA protects a population of rare boreal felt lichen, however, overlap with the proposed park expansion is limited to potential for interaction with the Project Interconnect Line.

The Project will interact with the landscape when viewed from the historic site in the RAA, Castle Hill., however, this interaction will not compromise the integrity of the site itself. In reference to the Historic Resources Overview Assessment (Appendix F), there are minimal interactions with any other heritage sites by the Project. Otherwise, there are no designated or proposed protected areas that will interact with the Project.

4.2.4.5 Mitigation Measures

Standard mitigation and enhancement measures applicable to the Land and Resource Use VC are provided by Project phase in Table 4.2.4-3. Project-specific plans (e.g., the Waste Management Plan) will also include mitigation measures that are applicable to this VC.

Table 4.2.4-3 Mitigation and Enhancement Measures: Land and Resource Use.

Land and Resource Use			
Project Phase	**Key Indicator**	**Interaction**	**Mitigation**
Construction	Zoning	• Project activities may be incompatible with designated land uses. • Project activities may impede or restrict future land development.	• The Project will apply for the appropriate rezoning under the Municipal Plan. • The Project will apply for the appropriate permits within the Municipal Planning Area of Placentia. • The Project is to occur on privately owned lands with the Project Interconnect Line to follow existing linear corridors for minimal restriction to future land development.
	Commercial and Industrial Resource Use	• Land tenure and quarry accessibility. • Temporary disturbance to nearby properties (e.g., noise, dust). • Periodic increased traffic delays at the port.	• Vehicles and equipment are to be maintained in good working order. • Dust suppression will be used. • Schedule transport of oversize loads outside of peak traffic hours. • The Project will consult and work with the Mineral Lands division of the Newfoundland and Labrador Department of Industry, Energy and Technology (NLDIET) to ensure that project site safety is maintained while mitigating any issues from the mineral licences and their holders. • In order to reduce potential impacts to Canadian Coast Guard radar activities in the general area of Placentia and the Port of Argentia, the Project will continue to work with the Canadian Coast Guard to minimize potential impacts that wind turbines may pose to radar activities.
	Recreational and Subsistence Resource Use	• Project clearing may result in the alteration of recreational and/or subsistence land use along Project Interconnect Line due to changes in resource accessibility and availability. • Activities may reduce access to or quality of recreational land use.	• Plan to route electrical infrastructure and access roads along existing rights-of-way wherever possible to reduce infrastructure footprint. • Vehicles and equipment are to be maintained in good working order. • Dust suppression will be used. • Facilitate hiking trail development in the Argentia Backlands through identification of viewing areas and coordination of trail route selection.

Land and Resource Use			
Project Phase	**Key Indicator**	**Interaction**	**Mitigation**
		• The project will visually interact with local tourism.	
	Protected, Special and Sensitive Areas	• Project activities adjacent to sensitive wildlife areas at turbine laydown areas.	• Appropriate buffers will be set according to species-specific management plans and implemented to prevent disturbance to the sensitive wildlife area.
Operation and Maintenance	Commercial and Industrial Resource Use	• Land tenure and quarry accessibility.	• Agreements will be made with existing quarries.
	Recreational and Subsistence Resource Use	• Project infrastructure may result in the alteration of recreational and/or subsistence land use along Project Interconnect Line due to changes in resource accessibility and availability. • The project will visually interact with local tourism.	• Plan to route electrical infrastructure and access roads along existing rights-of-way wherever possible to reduce infrastructure footprint. • The project will collaborate with local tourism stakeholders.
	Protected, Special and Sensitive Areas	• Wind turbine operation adjacent to sensitive wildlife areas may negatively affect endangered plants.	• Appropriate buffers will be maintained in accordance with species-specific management plans to prevent disturbance to the sensitive wildlife area.
Decommissioning	Commercial and Industrial Resource Use	• Temporary disturbance to nearby properties (e.g., noise, dust). • Periodic increased traffic delays at the port.	• Vehicles and equipment are to be maintained in good working order. • Dust suppression will be used. • Timing of transport of materials will occur outside of peak traffic hours.
	Recreational and Subsistence Resource Use	• Project clearing for infrastructure removal may result in the alteration of recreational and/or subsistence land use along Project Interconnect Line due to changes in resource accessibility and availability.	• Plan to route electrical infrastructure and access roads along existing rights-of-way wherever possible to reduce infrastructure footprint. • Vehicles and equipment are to be maintained in good working order. • Dust suppression will be used.

Land and Resource Use			
Project Phase	**Key Indicator**	**Interaction**	**Mitigation**
		• Activities may reduce access to or quality of recreational land use. • The project will visually interact with local tourism.	
	Protected, Special and Sensitive Areas	• Wind turbine operation adjacent to sensitive wildlife areas may negatively affect endangered plants.	• Appropriate buffers will be maintained in accordance with species-specific management plans to prevent disturbance to the sensitive wildlife area.
Unplanned Events	Commercial and Industrial Resource Use	• Unplanned Events may interact with the operations of properties on the Argentia Peninsula.	• A sensor will be installed on the connection point of the ammonia transfer and pipeline feed to detect pressure losses and ammonia leaks. Instrumentation will be equipped with automated shut-off value closure to initiate emergency stops. • Atmospheric tanks double walled with no bund will be used for ammonia storage. Tanks will be designed as complete containment systems that can hold liquids and vapours. • Hydrogen storage and pipelines will be located away from sources of heat and ignition. • Ensure vehicles, heavy equipment, and machinery are inspected and free of fluid leaks. • Site maintenance, vehicle maintenance, and fuelling will be done in specified areas more than 30 m away from wetlands and waterbodies. • Use secondary containment to store any potential contaminants (e.g., oil, fuels, and chemicals) in designated areas. • All spills are to be reported and cleaned up as soon as possible, with contaminated soils removed from site for disposal at an approved/licensed location. • Personnel on-site will be trained to use firefighting equipment. • Fire detection and protection systems will be installed in high-risk areas such as fuel and hazardous material storage.
	Recreational and Subsistence Resource Use	• Unplanned Events (fire or spills) along the Project Interconnect Line may alter recreational and/or subsistence land use along Project Interconnect Line due to changes in resource accessibility and availability. • Unplanned Events may reduce access to or quality of recreational land use. • Unplanned Events may interact with local tourism by restricting access to areas including the Marine Atlantic Terminal and the Argentia Sunset RV Park.	
	Protected, Special and Sensitive Areas	• Unplanned Events located near sensitive wildlife areas may disrupt or destroy sensitive habitat critical to the species.	

Land and Resource Use			
Project Phase	**Key Indicator**	**Interaction**	**Mitigation**
		• Unplanned Events may result in altered landscape for which the nearest historic site overlooks.	• Turbines and hydrogen ammonia facility will be routinely inspected, and regular maintenance will take place to ensure proper operation.

4.2.4.6 Conclusion

Table 4.2.4-4 provides a summary of predicted adverse residual effects on the Land and Resource Use VC. The magnitude of effects is ranked as either negligible (1), low (2), or moderate (3).

Given the significance criteria defined above in Section 4.2.4.3, no Project phase was determined to result in significant residual effects to any KI of the Land and Resource Use VC, as summarized in Table 4.2.4-5. While two negative residual effects with KI's in the Construction Phase were determined to be moderate, neither were determined significant because of the high level of confidence in the outcomes of the desktop review.

Table 4.2.4-4 Potential Adverse Residual Environmental Effects of the Project: Land and Resource Use.

Land and Resource Use							
Project Phase	**Key Indicator**	**Magnitude**	**Frequency**	**Extent**	**Duration**	**Reversibility**	**Context***
Construction	Zoning	1	1	1	5	3	1,3
	Commercial and Industrial Resource Use	1	5	3	3	3	1,3
	Recreational and Subsistence Resource Use	3	3	3	3	3	1,3
	Protected, Special and Sensitive Areas	3	4	1	1	1	5
Operation and Maintenance	Zoning	N/A	N/A	N/A	N/A	N/A	N/A
	Commercial and Industrial Resource Use	1	5	1	3	3	1,3
	Recreational and Subsistence Resource Use	1	5	1	3	3	3
	Protected, Special and Sensitive Areas	1	4	1	1	1	5
Decommissioning	Zoning	N/A	N/A	N/A	N/A	N/A	N/A
	Commercial and Industrial Resource Use	1	5	1	3	3	1
	Recreational and Subsistence Resource Use	1	3	1	3	3	3
	Protected, Special and Sensitive Areas	1	4	1	1	1	5
Unplanned Events	Zoning	N/A	N/A	N/A	N/A	N/A	N/A
	Commercial and Industrial Resource Use	2	1	2	2	3	1,3

Land and Resource Use							
Project Phase	**Key Indicator**	**Magnitude**	**Frequency**	**Extent**	**Duration**	**Reversibility**	**Context***
	Recreational and Subsistence Resource Use	2	1	2	2	3	1,3
	Protected, Special and Sensitive Areas	1	1	2	2	3	1,3
*Context may be assigned more than one value.							

Table 4.2.4-5 Significance of Potential Residual Environmental Effects of the Project: Land and Resource Use.

Project Phase	**Key Indicator**	**Significance of Predicted Residual Environmental Effects**		**Likelihood***	
		Level of Significance	**Level of Confidence**	**Probability**	**Scientific Certainty**
Construction	Zoning	NS	3		
	Commercial and Industrial Resource Use	NS	3		
	Recreational and Subsistence Resource Use	NS	3		
	Protected, Special and Sensitive Areas	NS	3		
Operation and Maintenance	Zoning	N/A	N/A		
	Commercial and Industrial Resource Use	NS	3		
	Recreational and Subsistence Resource Use	NS	3		
	Protected, Special and Sensitive Areas	NS	3		
Decommissioning	Zoning	N/A	N/A		
	Commercial and Industrial Resource Use	NS	3		
	Recreational and Subsistence Resource Use	NS	3		
	Protected, Special and Sensitive Areas	NS	3		
Unplanned Events	Zoning	N/A	N/A		
	Commercial and Industrial Resource Use	NS	3		
	Recreational and Subsistence Resource Use	NS	3		
	Protected, Special and Sensitive Areas	NS	3		

*Only applicable to significant effects.
Significance
Level of Significance: S = significant; NS =not significant; P= positive
Level of Confidence: 1= low; 2= medium; 3= high
Likelihood (Only applicable for significant effect (rated as S)
Probability of Occurrence; 1= low; 2= medium; 3=high
Scientific Certainty: 1=low; 2=medium; 3=high.

4.2.5 Heritage and Cultural Resources

Heritage and Cultural Resources are included as a VC because they are valued by Indigenous Peoples and the public at large for the general and scientific information they can provide about past peoples, their societies, cultures and lifeways, and the connections and interactions they may have had with other groups. The study area utilized for this assessment is presented in Section 3.2 (Baseline Studies).

KIs presented in Table 4.2.5-1 for this VC include Historic and Archaeological Resources, which typically comprise materials such as stone tools, ceramics, glass, and metal objects, as well as structural remains (e.g., wooden or stone) that are 50 years old or older and show evidence of manufacture, alteration or use by humans. Also included can be burial, cultural, spiritual, and other types of heritage sites or artifacts that date to the Precontact and Historic Periods.

Another potential KI for this VC is architectural resources, which typically include buildings or structures of significance that have been recorded and registered with the Heritage NL (Newfoundland and Labrador Department of Tourism, Culture and Recreation,1990) or the Town of Placentia as a Municipal Heritage Site.

Heritage and Cultural Resources also include fossils (i.e., Palaeontological Resources), which in the Province of NL are protected under the **Historic Resources Act** (1985) and are registered and inventoried by the Provincial Archaeology Office (PAO) of the Department of Tourism, Culture, Arts and Recreation. There are no known or registered fossils in the Project Area (and the potential for them to be present is low due to the geological composition of the region), therefore Palaeontological Resources are not assessed further in this chapter.

This effects assessment is limited to the one registered archaeological site and one registered architectural resource situated within the Project Area, but also includes any heritage structures or features meeting the necessary criteria for registration with the PAO, Heritage NL, or the Town of Placentia as a Municipal Heritage Site, as well as any high potential locations worthy of field investigation during any required Historic Resources Impact Assessment. Potential for residual effect is restricted to the Project Area.

Table 4.2.5-1 Scope and Measurable Parameters of Key Indicators: Heritage and Cultural Resources.

Key Indicator	Scope	Measurable Parameters
Historic and Archaeological Resources	Project Area	The number of sites identified. The number/quantity of materials associated with a site.
Architectural Resources	Project Area	The number of sites identified. The number/quantity of materials associated with a site.

4.2.5.1 Assessment Criteria

A custom list of criteria will be used to evaluate the effects of the Project on the Heritage and Cultural Resources VC. Some of the generic criteria have been modified for applicability to this VC. Other criteria are not applicable to the Heritage and Cultural Resources effects assessment, as noted in Table 4.2.5-2 below.

Table 4.2.5-2 Assessment Criteria: Heritage and Cultural Resources.

Evaluation Criteria	Rating	Descriptor
Magnitude	1	Negligible – no perceptible effect on the integrity and/or quality of a Heritage and Cultural Resource
	2	Low - disturbance of a Cultural and Heritage Resource is predicted; however, the integrity and/or quality of the resource can be fully preserved.
	3	Medium – some disturbance or loss occurs to a portion of a Cultural and Heritage Resource and its associated information that is of interest and concern to the associated community.
	4	NA
	5	High – Complete disturbance or loss of a Cultural and Heritage Resource, with no retrieval of the resource and its associated information.
Frequency	Not applicable. An effect on Heritage and Cultural Resources occurs only once (i.e., disturbance results in the loss of context).	
Geographic Extent	Not applicable. Any extent is limited to specific Heritage and Cultural Resource site.	
Duration	Not applicable. Heritage and Cultural Resources are static and finite; therefore, residual effects are always permanent, with no return to pre-existing conditions.	
Reversibility	Not applicable. Any residual effect is not reversible.	
Historic or Cultural Context	1	Undisturbed - Area is relatively undisturbed or not adversely affected by human activity.
	2	NA
	3	NA
	4	NA
	5	Disturbed – Area has been substantially previously disturbed by human development or human development is still present.

4.2.5.2 Existing Knowledge

A Historic Resources Overview Assessment (HROA) prepared for the purposes of this effects assessment, and in accordance with PAO (PAO requirements, is summarized in Section 3.5). The full study, complete with maps of the Project Area that show the location of the one registered archaeological site and the one registered architectural resource, along with other potential sites and features, and several areas with historic and archaeological resources potential, appears in Appendix F.

4.2.5.3 Definition of Significance

A significant residual adverse effect on Heritage and Cultural Resources, in accordance with the **Historic Resources Act** (1985), is defined as a residual Project-related change to the environment that results in the unauthorized disturbance or destruction of a Heritage and Cultural Resource that is determined by

the provincial regulator (PAO) to be historically, archaeologically, or culturally significant and that cannot be mitigated.

4.2.5.4 Potential Project-Environment Interactions

Historic, Archaeological, or Architectural sites or materials could be lost or disturbed by the Project. The Project phase of most concern is Construction when the greatest extent of physical disturbance to the landscape will occur. Activities such as site preparation, construction of roads, and establishment of wind turbine foundations all involve potentially disruptive aspects. During the Operation and Maintenance Phase, there will be few potential interactions due to the nature of Project activities. Decommissioning and Rehabilitation will mirror Construction regarding physical disturbance, albeit with far less potential for site disturbance. Similarly, only some of the Unplanned Events are candidates for interaction with Heritage and Cultural Resources. Potential interactions with identified KIs of the VC are summarized in Table 4.2.5-3.

According to information provided by the PAO, there is only one registered archaeological site situated within the Argentia Backlands sector of the Project Area, and it is comprised of 13 separate, concrete structures, associated with the US Military defenses constructed in the area during WWII. Potential interactions with this site could occur from access road construction and/or upgrading, but more directly from installation and operation of a wind turbine based on preliminary wind turbine layout, if it is positioned too close to a site component (see Figure 3.1.5-2). All other potential WWII military facilities, the site of the former Silver Cliff Mine, and the locations near waterbodies that were rated as having high and/or medium historic / archaeological potential appear sufficiently distant from Project works, thus no interactions are anticipated. Regarding the one registered architectural resource situated within the Argentia Backlands, while the proposed Project Interconnection Line does extend close to the southern boundary of this High potential area, it too appears to be oriented is such a way that no direct interactions with this resource are expected (Figure 3.1.5-2).

One area identified in the HROA as having high potential for as-of-yet undiscovered historic and archaeological resources (PA-18) is very close to the Project Interconnect Line (Figure 3.1.5-2), however, in this area the Line is expected to be constructed within an existing right-of-way so potential for disturbance of PA-18 is low.

Table 4.2.5-3 Potential Project Environment Interactions Matrix: Heritage and Cultural Resources.

Key Indicators: Heritage and Cultural Resources		
Project Component and Activity Description	Historic and Archaeological Resources	Architectural Resources
Construction Phase		
Site Preparation	X	X
Roads	X	X
Staging and Laydown	X	X
Material Transport	X	X
Wind Turbine Foundations	X	X
Electrical Infrastructure	X	X
Wind Turbine Installation	X	X
Electrolyser Plant		
Ammonia Plant		
Ammonia Storage/Transfer		
Flares		
Admin Buildings		
Operation and Maintenance Phase		
Wind Turbine Operation	X	X
Wind Turbine Maintenance		
Electrical Infrastructure		
Venting and Flaring		
Road Maintenance	X	X
Plant Operations		
Ammonia Handling		
Decommissioning Phase		
Electrical Infrastructure	X	X
Wind Turbine Removal	X	X
Building Removal	X	X
Plant Removal		
Terrain Reclamation	X	X
Unplanned Events		
Spills and releases		
Flaring and venting		
Fire, explosion	X	X
Traffic accident	X	X
Wind Turbine collapse	X	X
Water supply failure		
Wildlife emergency		
Human hazard or injury		
NOTES X: Potential interactions that might cause an effect. Blanks indicate that interactions between the Project and the VC are not expected.		

4.2.5.5 Mitigation Measures

The applicable avoidance and mitigation measures are listed in Table 4.2.5-4 and discussed in detail in Appendix F. Based on the HROA, the best approach is to avoid disturbance to documented site. For potential sites of heritage and cultural importance, having a Contingency Plan in place for the discovery of a candidate site will mitigate disturbance.

Table 4.2.5-4 Mitigation and Enhancement Measures: Heritage and Cultural Resources.

Heritage and Cultural Resources			
Project Phase	**Key Indicator**	**Interaction**	**Mitigation / Enhancement**
All	Historic and Archaeological Resources	Physical disturbance of the material or site causing a loss of integrity and/or quality.	• Avoidance of the one registered archaeological site situated within the Project Area. • Avoidance of any other structures or features eligible for registration with the PAO. • Completion of an Historic Resources Impact Assessment (HRIA) prior to conducting any Project activities that may alter or disturb any existing structural remains or terrain identified in the HROA as having High potential for existing and/or as-of-yet undiscovered historic and archaeological resources.
	Architectural Resources		• Avoidance of the one registered architectural resource situated within the Project Area. • Avoidance of any other structures or features eligible for registration with Heritage NL or the Town of Placentia as a Municipal Heritage Site.

As recommended in the HROA, a detailed Contingency Plan would describe the measures and procedures to follow and the personnel to be contacted at the PAO if any suspected Historic and Archaeological Resources are encountered on the surface or are unearthed during any phase of the Project. The Contingency Plan would be provided to and discussed with all personnel working on the Project, particularly those involved in ground disturbing activities.

4.2.5.6 Conclusion

Table 4.2.5-5 identifies and characterizes the potential residual adverse effects. As noted, most of the criteria are not applicable. The magnitude of effects is ranked as either negligible (1) or low (2).

Table 4.2.5-5 Potential Adverse Residual Environmental Effects of the Project: Heritage and Cultural Resources.

Heritage and Cultural Resources							
Project Phase	Key Indicator	**Magnitude**	Frequency	Extent	Duration	Reversibility	Context
Construction	Historic and Archaeological Resources	2	N/A	N/A	N/A	N/A	1,5
	Architectural Resources	2	N/A	N/A	N/A	N/A	1,5
Operation and Maintenance	Historic and Archaeological Resources	1	N/A	N/A	N/A	N/A	5
	Architectural Resources	1	N/A	N/A	N/A	N/A	5
Decommissioning	Historic and Archaeological Resources	1	N/A	N/A	N/A	N/A	5
	Architectural Resources	1	N/A	N/A	N/A	N/A	5
Unplanned Events	Historic and Archaeological Resources	2	N/A	N/A	N/A	N/A	1,5
	Architectural Resources	2	N/A	N/A	N/A	N/A	1,5
*Context may be assigned more than one value.							

Given the significance criteria defined above in Section 4.2.5.3, no Project phase was determined to result in significant negative residual effects to any KI of the Heritage and Cultural Resources VC, as summarized in Table 4.2.5-6. This prediction is based on the implementation of the measures identified in the HROA and summarized as:

- Avoidance of the one registered archaeological site and the one registered architectural resource situated within the Project Area and any other structures or features potentially worthy of registration with the PAO, Heritage NL, or the Town of Placentia as a Municipal Heritage Site.
- Completion of an Historic Resources Impact Assessment (HRIA) prior to conducting any Project activities that may alter or disturb any existing structural remains or terrain identified in the HROA as having High potential for existing and/or as-of-yet undiscovered historic and archaeological resources.
- The development of a detailed Contingency Plan that outlines the measures and procedures to follow and the personnel to be contacted at the PAO if any suspected Historic and Archaeological Resources are encountered on the surface or are unearthed during any phase of the Project.

Table 4.2.5-6 Significance of Potential Residual Environmental Effects of the Project: Land and Resource Use.

Project Phase	**Key Indicator**	**Significance of Predicted Residual Environmental Effects**		**Likelihood***	
		Level of Significance	**Level of Confidence**	**Probability**	**Scientific Certainty**
Construction	Historic and Archaeological Resources	NS	3		
	Architectural Resources	NS	3		
Operation and Maintenance	Historic and Archaeological Resources	NS	3		
	Architectural Resources	NS	3		

Project Phase	Key Indicator	Significance of Predicted Residual Environmental Effects		Likelihood*	
		Level of Significance	Level of Confidence	Probability	Scientific Certainty
Decommissioning	Historic and Archaeological Resources	NS	3		
	Architectural Resources	NS	3		
Unplanned Events	Historic and Archaeological Resources	NS	3		
	Architectural Resources	NS	3		

*Only applicable to significant effects.
Significance
Level of Significance: S = significant; NS =not significant; P= positive
Level of Confidence: 1= low; 2= medium; 3= high
Likelihood (Only applicable for significant effect (rated as S)
Probability of Occurrence; 1= low; 2= medium; 3=high
Scientific Certainty: 1=low; 2=medium; 3=high.

4.2.6 Socio-Economic Environment

The NL DECC *Environmental Assessment Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects* identifies the need for proponents to provide information on various topics including communities, population demographic data, health services and social programs, family life, recreation and culture, education and training, fire and emergency services and housing and property values. For this Registration, these are captured in the Communities VC. Information on economy, employment and business capacity relative to procurement of goods and services is captured in the Economy, Employment and Business VC. Short-term tourist accommodations are also included in this VC. Study areas regarded for this assessment are presented in Section 3.2.

Communities are included as a VC because municipalities, local service districts, unincorporated communities, and rural residents may be affected by construction, operation / maintenance, and decommissioning of the Project as discussed in Section 4.2.6.4. KIs and Measurable Parameters of the Communities VC are identified in Table 4.2.6-1.

Various aspects of the Project that may affect human communities are discussed in other VC sections that address related topics such as air, light, noise, shadow flicker, ice-throw, viewscapes, groundwater and surface water. In addition, human activities may be affected indirectly by effects on fish, animals, birds, or plants and the habitats that support them. For brevity of the Registration, these related effects are not repeated here.

Economy, Employment and Business has been included as a VC because economic conditions may be affected by construction, operation / maintenance, and decommissioning of the Project. Economic activity, employment and business growth are the foundations of the livelihoods of residents and associated benefits arising from earned income. In addition, employer-sponsored benefits may provide security and enhance quality of life. Economic effects (e.g., labour, labour income and contributions to

GDP and government revenues) are of interest to the public, stakeholders, Indigenous Peoples, regulators and governments. KIs and Measurable Parameters of the Economy, Employment and Business VC are identified in Table 4.2.6-1.

The assessment of effects on the Economy, Employment and Business VC is linked to the assessment of the Communities VC due to potential changes in community wellbeing resulting from enhanced employment opportunities and income. Argentia Renewables is expected to make a strong contribution to the local, regional, and provincial economies resulting from taxation and royalties as well as employment and business activity throughout all Project phases. This assessment does not account for economic benefits resulting from the Project relating to either a) direct community benefits (e.g., environmental stewardship funding of the Cape St. Mary's Ecological Preserve for research, maintenance, and employment) or b) significant economic benefits that the municipality of Placentia will receive from the revenue that POA will receive as the landowner in the Project.

Table 4.2.6-1 Scope & Measurable Parameters of Key Indicators: Socio-Economic Environment

Valuable Component	Key Indicator	Scope	Measurable Parameters
Communities	Population Demographics	Socio-Economic RAA	• Population growth / trends • Age • Diversity
	Community Health and Wellbeing	Socio-Economic RAA	• Education • Income • Housing • Food security • Health and social services • Diversity, equity and inclusion
	Infrastructure and Services	Socio-Economic RAA	• Water and sewer • Waste management • Transportation • Utilities and communications • Prevention and emergency services • Recreation
Economy, Employment, and Business	Economy	Socio-Economic RAA	• GDP • Tax revenue
	Employment	Socio-Economic RAA	• Labour supply • Employment equity and diversity
	Business	Socio-Economic RAA	• Other economic sectors • Capacity and growth

4.2.6.1 Assessment Criteria

Assessment criteria presented in Table 4.1.7-2 were used to evaluate the effects of the Project on the socio-economic environment. The assessment evaluates the significance of potential effects using threshold criteria beyond which adverse residual effects are considered for significance, as described in Section 4.2.6.5.

4.2.6.2 Existing Knowledge

Section 3.1.6 (Socio-Economic Environment) summarizes existing knowledge while Appendix G (Socio-Economic Baseline) provides a more detailed description based on desktop research. Table 4.2.6-2 identifies KIs and summarizes issues and concerns, which will be discussed in following sections.

Economic activity and associated benefits arising from earned income and employer-sponsored programs may provide security and enhance quality of life, which may help to stabilize the population. These benefits may also result in improvements to the health and wellbeing of subsets of the population such as women and other groups that show historical economic disadvantages, especially in heavy industry. Short- and long-term changes to population may result in challenges for some types of infrastructure and services that are sensitive to population size.

Generally, Project activities result in economic stimuli that provide revenue or income to governments, businesses, and individuals. Major capital projects also result in spending that generates direct, indirect and induced economic activity, such as is currently experienced in Placentia due to the Cenovus construction project. Potential adverse effects of the Project, identified in Table 4.2.6-2, include an ageing labour force that may result in increased labour competition. Green hydrogen is a new sector for which some trades are not yet available. Some population segments may require support to ensure their successful participation in the Project. Increased year-round business in the service sector (e.g., accommodations, restaurants, convenience stores, supermarkets, service stations) is beneficial and the Project may result in increased demand for businesses (e.g., accommodations) that are used seasonally by tourists. Additionally, while Placentia and regional businesses are experienced with heavy industry, green hydrogen is a new sector representing both an opportunity and a challenge.

Table 4.2.6-2 Summary of Issues, Concerns, Opportunities: Socio-Economic Environment.

Key Indicators	Issues, Concerns and Opportunities
Population Demographics	Major projects may result in short- and long-term population change.
Community Health and Wellbeing	Major projects' effects on community health and wellbeing may be both beneficial (e.g., increased income) and adverse (e.g., increased cost of living).
	Short- and long-term population changes resulting from major projects may affect availability and affordability of housing.
	Short- and long-term population changes resulting from major projects may affect availability and capacity of health and social infrastructure and services.
Infrastructure and Services	Major projects that use water resources or result in short- or long-term population changes may affect local water and sewer infrastructure and services.
	Major projects that generate solid or hazardous waste or result in population changes may affect local water and sewer infrastructure and services.
	Construction workforces for major projects may result in increased vehicular activity. Movement of large project infrastructure components may affect local traffic.

Key Indicators	Issues, Concerns and Opportunities
	Major projects that increase demand on energy or communications, or result in short- or long-term population changes, may affect local utilities and communications infrastructure and services.
	Major projects may require support from emergency response services.
	Major projects may overlap with recreation facilities or activity areas.
Economy	Major projects contribute to GDP and tax revenue.
Employment	Major projects result in short- and long-term employment (direct, indirect, induced). The NL labour force is ageing with frequent competition for labour with required skill sets. The green hydrogen sector is new with limited local training and experience.
Employment	Certain population segments may be underrepresented in employment and business opportunities particularly in industrial sectors.
	The green hydrogen energy sector is new with limited training opportunities available.
Business	Procurement for major projects stimulates business activity (direct, indirect, induced) locally, regionally and provincially. The culture and tourism sector may experience beneficial and adverse effects depending on the component (e.g., marine ferry, recreation facilities and activity areas, short-term accommodations) and Project phase.
	Local, regional, and provincial businesses have experience with major projects. Local businesses also have experience and capacity in industrial development and in supporting products and services. However, the green hydrogen sector is new with limited local business experience.

4.2.6.3 Definition of Significance

A significant effect on the Communities VC is defined as an adverse residual Project-related effect to the socio-economic environment that results in either, or both, of the following:

- Long term deterioration of community health and well-being, which cannot be managed through planned Project mitigation measures, or public policies, plans and programs (current or adjusted); or
- Long term exceedance of available capacity, or a substantial decrease in quality of infrastructure or services, which cannot be managed through planned Project mitigation measures, or current or adjusted public policies, plans and programs.

A significant effect on the Economy, Employment and Business VC is defined as an adverse residual Project-related effect to the socio-economic environment that results in:

- A measurable change distinguishable from current conditions and trends, lasting beyond the life of the Project, and cannot be managed through planned Project mitigation measures or by application of current or adjusted public policies, plans or programs.

Where a significant effect has been predicted, this evaluation then includes a determination of the likelihood associated with the predicted effect. “Likelihood” includes both the probability of occurrence as well as the scientific certainty of the predicted effect.

4.2.6.4 Potential Project-Environment Interactions

Table 4.2.6-3 outlines potential interactions between the Project and KIs for the socio-economic environment VCs. Generally, all Project phases (construction, operations / maintenance, and decommissioning) are likely to interact with population demographics, community health and wellbeing, and infrastructure and services. Potential effects of these interactions are discussed below. From the perspective of the Communities VC, Project effects would be similar regardless of the components being constructed, operated or decommissioned, as these are caused by Project employment, spending, and the presence of a non-resident workforce or changes in permanent population. Similarly, industrial development is expected to affect nearby communities through all Project phases. Therefore, Project components have been removed from Table 4.2.6-3. Unplanned Events are unlikely to result in changes to Communities or to Economy, Employment and Business and are not discussed further in the socio-economic effects assessment. Argentia Renewables has developed a Project Emergency Response Plan (Appendix M) that addresses potential effects and appropriate response measures.

Table 4.2.6-3 Potential Project Environment Interactions Matrix: Socio-Economic Environment

Key Indicators: Socio-Economic Environment						
Project Activity	**Population Demographics**	**Community Health and Wellbeing**	**Infrastructure and Services**	**Economy**	**Employment**	**Business**
Construction Phase	X	X	X	X	X	X
Operation and Maintenance Phase	X	X	X	X	X	X
Decommissioning Phase	X	X	X	X	X	X
Unplanned Events						
NOTES X: Potential interactions that might cause an effect. Blanks indicate that interactions between the Project and the VC are not expected.						

Population Demographics

The Project may result in temporary or permanent increases in population, which vary by Project phase. Population increases are generally considered positive in communities such as Placentia that are experiencing population decline. The Project will have a positive effect in Placentia due to employment

opportunities and the possibility of retaining and / or gaining new permanent residents. This may result in a younger and more diverse population.

As the existing permanent population may not be able to supply sufficient labour and support for businesses during a construction project of this scale, non-resident workers may reside short term in the community to help satisfy the demand for workers (peak 660 positions) during the Construction Phase. Non-resident workers are not expected to relocate permanently to the community while working on a construction project. The Project may present an opportunity to employ population subsets normally underrepresented in heavy industry in NL.

Existing population may be retained during the Operations and Maintenance Phase, or new residents may be attracted to permanent employment (anticipated to be about 65 positions) with the Project or in supporting businesses during the 30-year operational period. Through consultation and engagement activities, Argentia Renewables has met with residents enquiring about employment opportunities. Non-residents may consider relocating for these opportunities.

More information on the Decommissioning and Rehabilitation phase will be available as Project planning progresses. Project Decommissioning and Rehabilitation may require the support of a non-resident labour force as with construction. Following Decommissioning and Rehabilitation activities, permanent population may decline due to fewer permanent employment and business opportunities.

Community Health and Wellbeing

Community health and wellbeing has been evaluated in terms of social determinants of health parameters, which may be enhanced by employment opportunities. Conversely, the Project may result in adverse effects on some segments of the population due to the tendency of industrial economic development to create or aggravate economic disparity and social disadvantages.

The Project will result in opportunities for employment that may require formal education and / or on-the-job training. These opportunities will enhance the ability of participants to engage in employment that provides higher income and better conditions for individuals and families. With a focus on gender equity, diversity and inclusion, Argentia Renewables can have a positive effect on women and others often overlooked in traditionally male-dominated industries and professions found in construction projects and natural resource developments.

For Project construction, it is anticipated that at least some construction workers will come from the Avalon and may live too far away for daily commuting. As Argentia Renewables is not planning to provide temporary accommodations for construction workers, it is likely dwellings will be rented by non-resident workers who have longer commute distances, which may result in constrained availability and increased costs of rental housing normally used by residents, particularly when rental prices and other costs are

already elevated due to inflation. Conversely, a reduction in vacancy rates will benefit owners of such properties through higher demand and increased rental rates.

While data were not available for Placentia, St. John's rental prices are increasing and the vacancy rate decreasing. In October 2023, median rental prices in St. John's showed a year-over-year increase of 7% while the vacancy rate declined from 2.9% to 1.5% (CMHC 2024). Rental affordability and availability are less likely to be problematic in rural areas of the province due to declining population. However, individuals and families with low or fixed incomes using market rental housing are most likely to be at risk of dwelling shortages or rent increases, which may contribute to other issues such as food insecurity. Individuals and families living in publicly subsidized housing, which is rent controlled and restricted to those meeting specific criteria, are less likely to be affected by rental shortages.

Workers in the construction industry may be subject to pressures related to the nature of working long shifts and extended rotations. Increased disposable income may also lead to unhealthy behaviour and unsafe working conditions related to increased use of alcohol / Cannabis and other substances (e.g., illicit drugs) arising from mental and physical strain of working long shifts and (for some) factors such as peer pressure or being away from home for long periods of time (ConstructConnect 2021, ConstructConnect 2023, Drug and Alcohol Testing Association of Canada 2021, New York University 2019, Public Health Ontario 2022).

The presence of a non-resident construction workforce could possibly contribute to shortages of health services. Limited urgent care services are available in Placentia with additional support available in Carbonear and St. John's. A declining population may have resulted in excess capacity in some health and social services, but the health care system in NL is experiencing a high number of job vacancies. In March 2023, NL Health Services listed 13 vacancies at Placentia including nine registered nurses, two licensed practical nurses and two personal care attendants (NL Health Services 2024). Argentia Renewables and its contractors will provide health and safety programs for workers to help ensure their safety and wellbeing, and to limit demand on local facilities.

The 30-year Operations and Maintenance phase will result in an estimated 51 full-time positions for the Argentia Green Fuels Facility and an estimated 14 full-time positions for the Argentia Wind Facility. Individuals accessing favourable long-term employment and income may benefit from improved social and health outcomes through better housing, higher education, more nutritious foods, and additional recreational activities.

Any shortages or price increases in rental housing should stabilize during Operations and Maintenance as the non-resident construction workforce will no longer be present in the community. It is anticipated that, due to the smaller number of employees, any non-resident or visiting workers would not adversely affect rental housing. With a declining population, Placentia may have excess housing available for rent

or purchase during Operations and Maintenance. Following construction, demand for health and social services is likely to stabilize.

More information on the Decommissioning and Rehabilitation phase will be available as Project planning progresses. Following this phase, the community is likely to return to pre-Project conditions with challenges due to loss of employment and income.

Infrastructure and Services

Temporary and permanent changes to population may affect the usage and capacity of infrastructure and services. The type and degree of changes depend on the number of individuals, Project phase and type of infrastructure or service.

The Project will require a temporary workforce anticipated to be drawn from the labour force of Placentia, Avalon, and potentially other areas of NL. Specialized technical workers may be recruited from other areas of Canada or internationally since Green Hydrogen is a new industry to the province.

During construction, the non-resident population may increase demands for water and sewer infrastructure owned and operated by the Town of Placentia. The POA site has existing water and sewer services that will be used for the Project. Where workers use temporary accommodation in other parts of Placentia, increased demand may occur but as the population has been declining, capacity may be available. Nonetheless, Placentia's infrastructure is ageing and requires a robust maintenance and replacement program. Argentia Renewables is working with the Town of Placentia and the POA regarding access to and use of existing infrastructure.

Large scale projects can generate a high volume of waste especially during construction and decommissioning. From a financial perspective, as well as for environmental reasons, it will be beneficial to sort waste appropriately prior to transport to Robin Hood Bay. This is addressed in detail in the Project Waste Management Plan (Appendix N).

The Project will require electricity and communications services. Electricity in the RAA is provided by NLH and Newfoundland Power. Argentia Renewables will develop a new transmission line to Long Harbour to access additional electricity from NLH only when needed. Therefore, the Project will not compromise Placentia's power supply. Argentia Renewables will also work with communications service providers and the POA to ensure adequate communications services are available at the site.

Project construction may affect traffic at the POA and in Placentia generally. During construction, traffic may increase because of the number of workers commuting to the Project site from and through Placentia. Currently, peak traffic periods would likely include the beginning and end of work shifts for the existing construction project. A Project Traffic Management Plan has been developed for the Project

(Appendix E). The Plan examines mitigation measures that apply to oversize/overweight traffic as well as other Project related traffic during all phases.

The ferry has a capacity of 1100 passengers and 470 cars or 120 lorries/trailers/trucks (CruiseMapper, 2024). Vehicle capacity depends on the type of vehicle transported, as large vehicles (e.g., transport trucks and recreational vehicles) use more space. Argentia Renewables will work with the POA and Marine Atlantic to plan Project activities to avoid effects on ferry-related road traffic during construction.

While most recreation amenities are outside the POA site, the Argentia Backlands Trails (and proposed trails) and Argentia Sunset RV Park are within the industrial park boundaries. Argentia Renewables is working with the POA to avoid potential conflicts with recreation infrastructure and usage, especially for trails and the RV park.

Increased demands for water, sewer, and waste management are anticipated to be relieved during operations and maintenance due to completion of construction activities and a smaller workforce. The need for additional capacity in utilities and communications will have been satisfied during construction through installation of new services as required for the Project. Effects on recreation infrastructure at the POA will be mitigated during Project design by changing the location of Project infrastructure (e.g., wind turbines).

During Operations and Maintenance, the Project will require a clean water supply. In cooperation with the Town of Placentia, Argentia Renewables is studying the existing water supplies to identify the best solution for the Project and the community.

Any construction-related traffic concerns will be relieved during Operations and Maintenance. With 65 permanent employees, the Project is not expected to generate enough change in population to result in a perceptible change in traffic patterns.

Placentia’s volunteer fire department has satisfactory ratings for residential fire suppression but may not have the capacity, skills or equipment necessary to respond to a potential Project-related incident. Argentia Renewables is working with the Town of Placentia to increase capacity to deal with potential emergencies and to enhance the area’s emergency response capability.

More information on the Decommissioning and Rehabilitation phase will be available as Project planning progresses and potential issues such as waste management will be incorporated into an approved Plan for this phase of the Project. Following Decommissioning and Rehabilitation, infrastructure utilization and associated services are likely to return to pre-Project levels.

Economy

All phases of the Project will provide revenue due to fees, taxation and royalties. The Government of NL has created a land title and economic development regime for the wind-hydrogen industry (Government of NL 2023).

Crown Land Fees will apply only to a portion of the Project Interconnect Line, as most of the Project is limited to privately held lands owned by the POA and within the Town of Placentia. The Project will access water from the PPWSA managed by the Town. The Project will also make a positive contribution to GDP.

The Construction Phase will include most of the spending for procurement in construction contracts and materials / components. The Project is expected to require a substantial capital investment of more than $1 billion CAD.

During Operations and Maintenance, the Project will result in spending to procure goods and services and to engage staff. These will all result in economic benefits locally, regionally, and provincially through direct, indirect, and induced economic activity and contribution to GDP and taxation revenues of governments.

More information on the Decommissioning and Rehabilitation phase will be available as Project planning progresses. The value of decommissioning and rehabilitation will depend on costing and other requirements at that time. Detailed data are not available but decommissioning of the Exxon Mobil Goldboro liquefied natural gas plant in Nova Scotia was estimated at $42 million in 2010 dollars (CBC 2016). Based on this information, decommissioning and rehabilitation of the Argentia Renewables Project is likely to be much smaller than construction. Following decommissioning and rehabilitation activities, the local economy may retract due to fewer employment and business opportunities.

Employment

Section 3.1.6 presents an overview of anticipated employment numbers and occupation categories. Project planning and studies are ongoing and more detailed information will be provided when available. As an equal opportunity employer, Argentia Renewables will focus on diversity, equity and inclusion in all phases of the Project. For more information on Argentia Renewables policies, see Appendix Q (Workforce and Employment Plan).

Placentia residents are skilled in industrial settings due to the presence of a large industrial park and a current major construction project. However, residents experience higher unemployment than Avalon or NL generally, meaning that individuals will likely be seeking work. Specialized training will be required for some technical aspects of the Project.

The Project is expected to create 660 construction jobs during peak construction. Construction trade jobs include heavy equipment operators, carpenters, masons, painters, boilermakers, electricians, millwrights, pipefitters, ironworkers, sheet metal workers, crane operators, drillers and blasters, industrial truck drivers, machinery operators, trades helpers and labourers, electrical trades and collector line and telecommunications workers, and contractors and supervisors. Placentia residents are skilled in industrial settings due to the presence of a large industrial park. Also, the current major construction project accesses tradespeople from within the community and beyond.

Permanent jobs associated with Operations and Maintenance include approximately 52 positions in plant operation and maintenance and approximately 13 positions in wind Operation and Maintenance. As Placentia has higher unemployment than Avalon or NL, residents will likely be seeking work with the Project.

More information on the Decommissioning and Rehabilitation phase will be available as Project planning progresses. Project decommissioning may require the support of a resident and non-resident labour force but smaller than labour requirements for construction.

Business

The POA Industrial Park provides opportunities for local and regional businesses and has a spin-off effect on the economy supporting other sectors. The POA is currently hosting a major capital project and local and regional companies have experience in supporting large scale construction projects and heavy industrial activities.

Many of the businesses at the POA, especially those involved in the Cenovus construction project, are compatible with the Argentia Renewables Project. However, the POA is the location of the Marine Atlantic Ferry Terminal, the RV Park and hiking trails (existing and proposed). In addition, the Town of Placentia and other sites in the region are cultural tourist destinations. Thus, the tourism sector is potentially sensitive to changes brought on by the Project.

Placentia has limited tourist accommodations. As discussed in Section 2.3.5.1, non-resident workers are expected to rent temporary accommodation in Placentia or nearby communities While this is good for businesses, it likely limits the availability of accommodations for tourists such as those entering or exiting eastern Newfoundland via the Marine Atlantic Ferry. As tourists may have difficulty finding accommodations, this may result in lower participation, attendance, and revenue for cultural and recreation-based tourism service providers. Additionally, given high competition for labour in NL, Project contractors (including local businesses) may be challenged to attract and retain workers in other sectors during construction.

Demand for accommodations is likely to decrease during operations and maintenance though the presence of the Project will result in ongoing need, presenting a business opportunity. Though fewer than in the Construction Phase, Project-related non-resident workers will also require other services (e.g., accommodations, food) that support local businesses outside the summer tourist season. In addition, population stabilization and sustained employment, because of the Project's operation phase, is likely to result in steady demand and / or opportunities for local business operations.

More information on the Decommissioning and Rehabilitation phase will be available as Project planning progresses. Project Decommissioning and Rehabilitation will include engagement of contractors to conduct various activities including dismantling and removal of waste materials for reuse or disposal. Completion of these activities will result in reduced business opportunities although businesses may have developed new capacity and opportunities due to the presence of the Project and spin-off opportunities.

4.2.6.5 Mitigation Measures

Argentia Renewables has considered the beneficial and adverse effects of the Project on Communities, Economy, Employment and Business and designed measures that will serve to avoid or reduce adverse effects and enhance beneficial ones. Key measures to mitigate and / or enhance potential Project effects on the Communities VC and the Economy, Employment and Business VC are listed in Table 4.2.6-4, by category and Project phase. Some mitigations identified for Community Health and Wellbeing (e.g., hiring locally as much as possible) and Services and Infrastructure (e.g., working closely with Marine Atlantic) will address issues and / or enhance conditions for Economy, Employment and Business, and are not repeated. Project-specific plans (e.g., the Workforce and Employment Plan) will also include mitigation measures that are applicable to this VC.

Management of Project effects include compliance with all Project EA conditions and municipal, provincial, and federal regulatory requirements and policies that address concerns and manage issues. These include NL statutes such as **Buildings Accessibility Act, Water Resources Act, Environmental Protection Act, Occupational Health and Safety Act, Highway Traffic Act** and **Transportation of Dangerous Goods Act**. Other policies and guidance (e.g., NL Traffic Control Manual) will also apply to the Project.

The ongoing program of consultation and communications with stakeholders, including the POA, the Town of Placentia, and the business community, will serve to monitor effectiveness, address issues, and identify opportunities to enhance benefits. The Project will work with POA, the Town of Placentia, and community stakeholders to develop a community benefit program that will reflect concerns and priorities of the local community.

Table 4.2.6-4 Mitigation and Enhancement Measures: Socio-Economic Environment.

Socio-Economic Environment			
Project Phase	**Key Indicator**	**Measurable Parameter**	**Mitigation / Enhancement**
All	Communities	Population Demographics	Hire locally / regionally as much as possible to the extent that labour force with appropriate training and skills is available.
All		Community Health and Wellbeing	Institute policies and programs to facilitate inclusion and success of women and other groups typically underrepresented in heavy industry.
All			Prepare a gender equity and diversity plan for the Project.
All			Ensure contractor compliance with workers health and safety regulations.
All			Institute worker health and safety programs to promote the health, safety and wellbeing of workers.
All			Cooperate with education institutions (e.g., College of the North Atlantic) on local training opportunities for the new industry sector.
Construction			Hire locally / regionally as much as possible to the extent that labour force with appropriate training and skills is available to reduce effects of rental housing that may become occupied by companies or individuals associated with the Project.
Construction			Institute worker health and safety programs to avoid or reduce use of local health and social services.
All			Enter into a Regional Community Benefits Program to ensure benefits to municipalities and Local Service Districts in the region have a lasting effect.
All		Infrastructure and Services	Enter into a shared services agreement with the Town of Placentia.
All			Work with the Town of Placentia to ensure equitable allocation of community water supplies that can satisfy local needs.
All			Implement a waste management and waste reduction plan for the Project with special emphasis on construction and decommissioning and rehabilitation.
Construction			Develop incentives to encourage worker carpooling and / or bussing options.
Construction			Work with Marine Atlantic to avoid traffic congestion during arrival and departure of the marine ferry.
All			Work with the Town of Placentia to increase training and capacity in emergency response infrastructure and services.
Construction			Design and install Project infrastructure to ensure safe distances are maintained between Project structures and the RV Park along with existing and proposed hiking trails.
All	Economy	GDP, tax revenue	Procure goods and services provincially as much as possible to the extent that they are available.
All	Employment	Labour Force	Hire locally / regionally as much as possible to the extent that labour force with appropriate training and skills is available.
All	Business	Capacity and Growth	Enter into a Regional Community Benefits Program to support the local economy and sectors that may be disadvantaged.
All			Procure goods and services locally / regionally as much as possible to the extent that they are available.
All			Prepare a gender equity and diversity plan to outline procurement policies.
Construction	Business	Other Sectors (i.e., Tourism)	Design and install Project infrastructure to avoid, or maximize safe distances to, the RV Park and existing / proposed hiking trails.

Socio-Economic Environment			
Project Phase	**Key Indicator**	**Measurable Parameter**	**Mitigation / Enhancement**
Construction			Include local cultural venues and events in sponsorship programs to help alleviate any effects due to lack of availability of tourist accommodations.

4.2.6.6 Conclusion

Table 4.2.6-5 provides a summary of predicted adverse residual effects on the Socio-Economic Environment VCs.

Table 4.2.6-5 Potential Adverse Residual Environmental Effects of the Project: Socio-Economic Environment.

Socio-Economic Environment								
Project Phase	**Valuable Component**	**Key Indicator**	**Magnitude**	**Frequency**	**Extent**	**Duration**	**Reversibility**	**Socio-Economic Context**
Construction	Communities	Population Demographics	N/A	N/A	N/A	N/A	N/A	N/A
		Community Health and Wellbeing	1	5	3	1	1	3
		Infrastructure and Services	3	5	3	1	1	5
	Economy, Employment, and Business	Economy	N/A	N/A	N/A	N/A	N/A	N/A
		Employment	N/A	N/A	N/A	N/A	N/A	N/A
		Business	3	5	3	1	1	3
Operation and Maintenance	Communities	Population Demographics	N/A	N/A	N/A	N/A	N/A	N/A
		Community Health and Wellbeing	N/A	N/A	N/A	N/A	N/A	N/A
		Infrastructure and Services	N/A	N/A	N/A	N/A	N/A	N/A
	Economy, Employment, and Business	Economy	N/A	N/A	N/A	N/A	N/A	N/A
		Employment	N/A	N/A	N/A	N/A	N/A	N/A
		Business	N/A	N/A	N/A	N/A	N/A	N/A
Decommissioning	Communities	Population Demographics	N/A	N/A	N/A	N/A	N/A	N/A
		Community Health and Wellbeing	1	5	3	1	1	3
		Infrastructure and Services	1	5	3	1	1	5
	Economy, Employment, and Business	Economy	N/A	N/A	N/A	N/A	N/A	N/A
		Employment	N/A	N/A	N/A	N/A	N/A	N/A
		Business	1	5	3	1	1	3
*Context may be assigned more than one value.								

Communities

Project construction and decommissioning and rehabilitation could potentially result in adverse residual effects on the Communities VC. Non-resident workers are likely to be present in the community during these phases. Where these workers rent housing, it could result in availability and affordability issues for a small portion of the permanent population. These effects are conservatively determined to be medium

in magnitude and continuous during these Project phases. The conclusion is based on uncertainty with respect to the number of locally hired workers compared to those from the RAA and other areas and the number of low-income people in market housing. Nonetheless, adverse residual effects on community health and wellbeing are expected to be short term, limited to the LAA and reversible. Effects on community health and wellbeing (particularly market rental housing) are characterized as medium value to the community as they have been identified as important by stakeholders.

Non-resident workers could also affect usage of services and infrastructure during Construction and Decommissioning and Rehabilitation. In consideration of planned mitigation and enhancement measures, these effects are predicted to be low in magnitude. It is anticipated that usage of water and sewer infrastructure, waste management services and roads will increase and be continuous during construction and decommissioning but not to the extent that it will compromise usage by residents. These residual effects will be short term, limited to the LAA and reversible following Construction and Decommissioning and Rehabilitation phases. Within the socio-economic context, they are characterized as low value given that Argentia Renewables is working with the Town of Placentia to address water supply needs and will comply with all relevant legislation related to water supplies, effluent discharge, solid waste and traffic.

Economy, Employment, and Business

Following implementation of mitigation and enhancement measures, Project residual effects on the Economy, Employment and Business VC are predicted to be generally positive. The only potentially adverse effects are with respect to business in the tourism sector.

While businesses offering services such as short-term accommodations or food to the tourism sector will experience increased usage and revenue during construction, other portions of the tourism sector (e.g., cultural venues and events) may experience fewer visitors and lower revenue due to limitations on availability of short-term accommodations. In addition, businesses in the service sector may be challenged to attract and retain workers when competing with an industrial project that can offer higher wages and year-round employment. The effects on the tourism sector of local business are conservatively considered to be of low to medium magnitude and within the LAA. Effects are expected to be continuous and short-term in duration (construction and decommissioning and rehabilitation) and reversible following completion of construction and / or decommissioning and rehabilitation. Within the socio-economic context, these effects are considered to be of medium value to the community as potential effects on tourism businesses have been identified by regulators as an issue to be considered for this Project.

Determination of Significance

Given the significance criteria defined above in Section 4.2.6.5, the residual effects of routine Project activities on the Communities VC are predicted to be “not significant”. Adverse residual effects on rental

housing and health and wellbeing are anticipated to be limited to construction and can be largely mitigated in decommissioning and rehabilitation through actions of the Proponent and through legislation and public programs to address relevant issues. Anticipated increased demand on services and infrastructure is likely to be within capacity due to population decline or will be managed through proven mitigations and / or application of government regulations, policies and programs designed to address these issues.

Similarly, the residual effects of routine Project activities on the Economy, Employment and Business VC are predicted to be “not significant”. Adverse residual effects are anticipated to be limited to some types of businesses / organizations in the tourism sector during construction and to a lesser extent in decommissioning and rehabilitation and can be mitigated through actions of Argentia Renewables (e.g., sponsorship initiatives) and government programs. Anticipated competition for higher wages in industry compared to the service sector is balanced as it is a combination of both positive and adverse effects throughout all phases of the Project.

Table 4.2.6-6 provides an overview of the significance of residual effects. Note that these assessments did not consider positive effects in the discussion of residual effects. The level of confidence for the Communities VC is medium due to lack of data regarding the number of workers that may access health care services or rent housing during construction and decommissioning and rehabilitation though these effects are generally understood based on similar projects. The level of confidence for the Economy, Employment, and Business VC is medium due to lack of specific data on businesses, their operation and workforce. Similar effects have been observed in other parts of the province during boom-and-bust economic cycles.

Table 4.2.6-6 Significance of Potential Residual Environmental Effects of the Project: Socio-Economic Environment.

Project Phase	**Valuable Component**	**Key Indicator**	**Significance of Predicted Residual Environmental Effects**		**Likelihood***	
			Level of Significance	Level of Confidence	Probability	Scientific Certainty
Construction	Communities	Population Demographics	N/A	N/A	N/A	N/A
		Community Health and Wellbeing	NS	2	N/A	N/A
		Infrastructure and Services	NS	2	N/A	N/A
	Economy, Employment, and Business	Economy	N/A	N/A	N/A	N/A
		Employment	N/A	N/A	N/A	N/A
		Business	NS	M	N/A	N/A
Operation and Maintenance	Communities	Population Demographics	N/A	N/A	N/A	N/A

Project Phase	Valuable Component	Key Indicator	Significance of Predicted Residual Environmental Effects		Likelihood*	
			Level of Significance	Level of Confidence	Probability	Scientific Certainty
		Community Health and Wellbeing	N/A	N/A	N/A	N/A
		Infrastructure and Services	N/A	N/A	N/A	N/A
	Economy, Employment, and Business	Economy	N/A	N/A	N/A	N/A
		Employment	N/A	N/A	N/A	N/A
		Business	N/A	N/A	N/A	N/A
Decommissioning	Communities	Population Demographics	N/A	N/A	N/A	N/A
		Community Health and Wellbeing	NS	2	N/A	N/A
		Infrastructure and Services	NS	2	N/A	N/A
	Economy, Employment, and Business	Economy	N/A	N/A	N/A	N/A
		Employment	N/A	N/A	N/A	N/A
		Business	NS	M	N/A	N/A

*Only applicable to significant effects.
Significance
Level of Significance: S = significant; NS =not significant; P= positive
Level of Confidence: 1= low; 2= medium; 3= high
Likelihood (Only applicable for significant effect (rated as S)
Probability of Occurrence; 1= low; 2= medium; 3=high
Scientific Certainty: 1=low; 2=medium; 3=high.

4.2.7 Human Health and Quality of Life

Human Health and Quality of Life has been included as a VC because health and quality of life of local residents and visitors may be affected by Construction, Operation and Maintenance, and Decommissioning and Rehabilitation of the Project. There are five aspects through which the Human Health and Quality of Life VC and the Project interact: air quality, light, sound quality (noise), vibration, shadow flicker, and ice throw.

Various aspects of the Project that may affect the Human Health and Quality of Life VC are discussed in the Atmospheric Environment VC section (Section 4.2.1) that address air, light, sound quality (noise) and vibration. Additionally, the Human Health and Quality of Life VC may be affected by Project interactions with weather radar, domestic wood harvesting, viewscapes, and traditional, cultural, recreational, and Indigenous activities. Weather radar was considered in Project planning and siting, while others are discussed in the Land and Resource Use VC section (Section 4.2.4). Effects on groundwater and surface water, as well as fish, animals, birds or plants and the habitats that support them (Section 4.2.2 and 4.2.3) may also affect Human Health and Quality of Life VC. For brevity of the Registration, these related effects are not repeated here.

Table 4.2.7-1 lists all the relevant KIs, showing where each is addressed in other sections of the Registration, but applicable to the Human Health and Quality of Life VC. Geographic scope for the assessment is consistent with study areas presented in Section 2.1. Applicable Measurable Parameters for each KI are also included. As is noted, this section will address Shadow Flicker and Ice Throw.

Table 4.2.7-1 Scope & Measurable Parameters of Key Indicators: Human Health and Quality of Life.

Key Indicator	Scope	Measurable Parameters
Air Quality	See above Section 4.2.1	
Greenhouse Gases		
Light		
Sound Quality		
Vibration		
Shadow Flicker	LAA/RAA	Shadow hours
Ice Throw	LAA	Ice throw distance
Recreational and Subsistence Resource Use	Including domestic wood harvesting, viewscapes, traditional, cultural, and recreational land use, see above Section 4.2.4	
Indigenous Land Use	See above Section 4.2.4	

4.2.7.1 Assessment Criteria

An overview of the assessment criteria utilized to characterize potential effects to human health and quality of life are in-line with the socio-economic effects assessment criteria presented in Table 4.1.7-2 in Section 4.1.7. Criteria include socio-economic context, reversibility, frequency, duration, geographic extent, and magnitude.

4.2.7.2 Existing Knowledge

Section 3.1.1 (Atmospheric Environment) summarizes existing knowledge of the ambient light conditions in the RAA while Section 2.3.4.1 and Appendix K (Shadow Flicker Analysis) details the concept of shadow flicker from wind turbines. Ice throw is contextualized in Appendix L (Ice Throw Analysis).

4.2.7.3 Definition of Significance

For the Human Health and Quality of Life VC, a Significant Effect is defined as:

- Having a high magnitude; or
- A medium magnitude and characterized by either:
    - An extended duration affecting a geographic area that extends beyond the Project Area; or
    - A low level of confidence in the prediction.

Where a significant effect has been predicted, this evaluation then includes a determination of the likelihood associated with the predicted effect. “Likelihood” includes both the probability of occurrence as well as the scientific certainty of the predicted effect.

4.2.7.4 Potential Project-Environment Interactions

Potential interactions with identified KIs of the Human Health and Quality of Life VC are summarized in Table 4.2.7-2.

Table 4.2.7-2 Potential Project Environment Interactions Matrix: Human Health and Quality of Life.

Human Health and Quality of Life		
Project Component and Activity Description	**Shadow Flicker**	**Ice Throw**
Construction Phase		
Site Preparation		
Roads		
Staging and Laydown		
Material Transport		
Wind Turbine Foundations		
Electrical Infrastructure		
Wind Turbine Installation		
Electrolyser Plant		
Ammonia Plant		
Ammonia Storage/Transfer		
Flares		
Admin Buildings		
Operation and Maintenance Phase		
Wind Turbine Operation	X	X
Wind Turbine Maintenance		
Electrical Infrastructure		
Venting and Flaring		
Road Maintenance		
Plant Operations		
Ammonia Handling		
Decommissioning and Rehabilitation Phase		
Electrical Infrastructure		
Wind Turbine Removal		
Building Removal		
Plant Removal		
Terrain Reclamation		
Unplanned Events		
Spills and releases		
Flaring and venting		

Human Health and Quality of Life		
Project Component and Activity Description	**Shadow Flicker**	**Ice Throw**
Fire and explosion		
Traffic accident		
Wind Turbine collapse		
Water supply failure		
Wildlife emergency		
Human hazard or injury		
NOTES X: Potential interactions that might cause an effect. Blanks indicate that interactions between the Project and the VEC are not expected.		

Shadow Flicker

Shadow flicker (SF) happens when the sun shines through the rotating blades of a wind turbine, casting a moving shadow. The “flicker” caused by the rotating blades can be perceived as a nuisance to onlookers, nearby homeowners, or businesses. Project construction, decommissioning and rehabilitation, and Unplanned Events will not generate Shadow Flicker and are not discussed further in this assessment; only wind turbine operation will cause the effect.

Shadow Flicker Analysis (Appendix K) was conducted to assess interactions and potential effects on receptors in the area of influence of the Argentia Wind Facility. The largest potential wind turbine model that is being considered for the Project (i.e., 7.2 MW turbine) was used in the modeling exercise as it corresponds to an anticipated greatest potential level of SF interaction with receptors. SF effects were modeled assuming worst case and real case. The worst-case analysis was based on the astronomic model, assuming that the sun shines every day (i.e., no clouds), turbines operate continuously at 90 degrees (°) towards the sun throughout the day, and SF occurs when the sun is more than 3° above the horizon. Existing forest obstacles were also excluded from the worst-case model. The real case analysis was calculated using forest obstacles, sunshine probabilities, and long-term directional wind frequencies collected in the Project Area.

Due to limitations (i.e., considerable data gaps) of the meteorological station in Argentia, sunshine probabilities from St. John’s were used in the real case model. Since the Project Area experiences considerably less sunlight than St. John’s, the real case model provides a conservative estimate of SF effects.

In the absence of federal and provincial regulations that specify criteria or limits of SF from wind turbines, a generally accepted guideline which originates from Europe was used (Staatliches Umweltamt Schleswig, 1999) (Länderausschuss für Immissionsschutz, 2020). The guideline stipulates that SF exposure should not exceed 30 hours per year and 30 minutes per day at a receptor using obstacle data such as forest stand heights. Of the 2,492 receptors modeled in the real case scenario, the 30-hour

threshold was exceeded at a single receptor during Project operation. Individual receptor results for the worst case and real case models are provided in Appendix K.

Based on results of the preliminary modeling exercise, SF modeling was re-initiated using the 6.8 MW turbine. When the 6.8 MW turbine is used in the real case model, the number of shadow hours is below the 30-hour threshold (i.e., 23:08 shadow hours per year) at the receptor where an exceedance was detected with the 7.2 MW turbine. Further mitigation is expected to reduce shadow flicker by reducing the tower height of a 6.8 MW turbine to 99 m. Following decommissioning and rehabilitation, shadow flicker will not occur, and conditions are anticipated to return to pre-Project conditions.

Ice Throw

At a wind power facility, ice can form on buildings, power lines, roads, walkways, stairs, towers, nacelles, hubs, blades, weather masts, and any other structure (Canadian Renewable Energy Association, 2020). Ice throw occurs when ice fragments detach from rotating wind turbine blades during operation, while ice fall occurs when ice fragments detach from the turbine when the blades are paused or idle. Both phenomena occur when temperatures rise rapidly from below freezing, or are rapidly changing near 0°C. The phenomenon may also occur when the wind turbine resumes operation following a pause during an icing event.

Project construction, decommissioning and rehabilitation, and Unplanned Events will not generate Ice Throw and are not discussed further in this assessment; only wind turbine operation will cause the effect. Ice Throw Analysis (Appendix L) was conducted to assess ice throw and ice fall hazard to people, animals, and property that lie within the maximum ice throw or ice fall zone.

Icing refers to any type of accumulation of ice or snow on a structure and occurs when water present in the air freezes after it encounters a surface. Icing events are either meteorological or instrumental. Meteorological icing happens due to suitable weather conditions. Instrumental icing is the period during which ice is present and visible on the instrument, and thus the ice can melt, sublimate, and shed (i.e., be thrown by a rotating blade). Instrumental ice can still be present on the site for days after meteorological icing. The Ice Throw Analysis indicated that meteorological icing is anticipated to occur 0.5-3% of the year (average of 1.8 to 11.0 days per year), while instrumental icing is anticipated to occur 1-9% of the year (average of 3.7 to 32.9 days per year).

The largest potential wind turbine model that is being considered for the Project (i.e., 7.2 MW turbine) was used to model ice throw zone and ice fall distance as it corresponds to the greatest potential level of hazard to receptors. A conservative estimate of the ice fall zone was developed using maximum daily wind gust speeds from the Project Area. It was determined that the maximum ice throw distance for the 7.2 MW turbine is 507 m. Should the 6.8 MW turbine be utilized, the maximum ice throw distance will be

reduced to approximately 422 m. Maximum ice fall distance by wind speed is outlined in Table 4.2.7-3. Ice fall distance was computed for the 7.2 MW turbine.

Table 4.2.7-3 Maximum Ice Fall Distance by Wind Speed: Argentia Wind Facility 7.2 MW Turbine.

Wind Speed (m/s)	Wind Speed (km/hr)	Maximum Ice Fall Distance (m)
0	0	0
5	18	84
10	36	168
15	54	252
20	72	336
25	90	420
30	108	504

Potential Project ice throw and ice fall interactions may arise at locations throughout the Project Area. A comprehensive list of receptors is provided in Appendix L. Following decommissioning, ice throw and ice fall will not occur, and conditions are anticipated to return to pre-Project conditions. This analysis does not account for ice throw mitigation that will be in place.

4.2.7.5 Mitigation Measures

Standard mitigation and enhancement measures applicable to the Human Health and Quality of Life VC are provided by phase in Table 4.2.7-4. Project-specific plans (e.g., the Traffic Management Plan) will also include mitigation measures that are applicable to this VC.

The installed wind energy capacity in cold climates currently makes up 22% of the global capacity (Roberge et.al., 2023). To meet challenges such as ice accretion on the rotor blades, multiple wind turbine suppliers and retrofitters have made various technologies for anti-icing and de-icing available since the 1990s. Active de-icing technologies such as electro-thermal heating and air-circulated heating are commonly implemented and can drastically improve the performance of wind turbines under icing conditions (Roberge et.al., 2023; Wind Energy IQ, n.d.). Passive anti-icing paints and coatings that prevent the formation of ice are newer and therefore less prevalent. More conventionally, ice throw protection devices such as grating, or roofs built above worker access pathways or ground-level infrastructure such as transformers are regarded as a best practice for hazard mitigation (Canadian Renewable Energy Association, 2020).

Based on modeling included in this registration, there is a potential for ice throw from wind turbine blades. While conservative ice throw calculations identify a maximum ice throw distance well below the Project minimum wind turbine setbacks from sensitive registers (e.g., occupied residences), all Project wind turbines are planned to be outfitted with winter weatherization operational package as well as de-icing or anti-icing technology.

The selection of an effective system will include consideration of:

a) a de-icing system (i.e., hot air heating of blades with heater and fan mounted in root of blades to prevent ice buildup), or

b) an anti-icing system (i.e., heating elements embedded in the blades to prevent ice buildup); and

c) an ice detection system, which has the ability to stop the turbine when ice build-up reaches a critical point.

Table 4.2.7-4 Mitigation and Enhancement Measures: Human Health and Quality of Life.

Human Health and Quality of Life			
Project Phase	**Key Indicator**	**Interaction**	**Mitigation**
Operation and Maintenance	Shadow Flicker	• Project activities may generate shadow flicker during the daytime, causing visual nuisance.	• Implement a curtailment schedule to minimize duration of shadow flicker effects. • Where feasible, install screening (e.g., trees, fences) to reduce shadow flicker effects. • All Project wind turbines will be set back at least the greater of 600 m or 3.0 times the blade tip height of the wind turbines.
Operation and Maintenance	Ice Throw	• Project activities may result in ice throw and ice fall hazard, posing a risk of injury to people and animals or property damage.	• Equip turbines with ice throw mitigation technology - heated blades, low friction coatings. • Equip turbines with ice protection devices to provide safe worker access. • Add public education and warning signage that explain hazards to prevent members of the public from entering maximum ice throw areas during periods of rotor icing. • Educate and train employees in potential risks in accordance with best practices and guidelines. • All Project wind turbines will be set back at least the greater of 600 m or 3.0 times the blade tip height of the wind turbines.

Incidence of shadow flicker is commonly mitigated by installing screening that acts to block the receptor line of sight. Aesthetically pleasing, and effective, options in rural areas include transplanting trees and installation of fencing.

To accommodate the concerns of nearby landowners, wind projects are commonly developed with minimum setbacks from sensitive receptors (e.g., occupied residences). These setbacks are either defined in terms of an absolute distance (e.g., 500m) or relative distance in terms of wind turbine maximum blade tip height (e.g., 1.1 times turbine height). In Ontario, the minimum setback from non-participating residences required by the Provincial government is 550 m. In other jurisdictions, turbines may be required to be 1.5 or 2.0 times the blade tip height. Overly small setbacks amplify the concerns of local landowners while overly large setbacks can, whether by deliberate design or simple

consequence, preclude wind development altogether (especially on private land with other environmental and constructability siting constraints). To address landowner concerns, all Project wind turbines will be set back at least the greater of 600m or 3.0 times the blade tip height of the wind turbines. Furthermore, the Project will microsite wind turbines to further minimize visibility to nearby landowners to the extent practicable and will consider reduced turbine height (e.g., from 119m to 99m) where other approaches are not feasible.

4.2.7.6 Conclusion

Table 4.2.7-5 provides a summary of predicted adverse residual effects on the Human Health and Quality of Life VC.

Table 4.2.7-5 Potential Adverse Residual Environmental Effects of the Project: Human Health and Quality of Life.

Human Health and Quality of Life							
Project Phase	**Key Indicator**	**Magnitude**	**Frequency**	**Extent**	**Duration**	**Reversibility**	**Context***
Operation and Maintenance	Shadow Flicker	1	2	3	1	1	1, 3
	Ice Throw	2	2	3	1	1	1,3
*Context may be assigned more than one value.							

Project operations could result in adverse effects to quality of life due to shadow flicker, however, of the potential 2,492 receptors modeled, the recommended 30-shadow hours per year threshold was exceeded at just a single receptor using the largest (7.2 MW) wind turbine model for Project operation. Additional height reductions would further reduce potential shadow flicker. The effect is highly reversible, of short duration (i.e., restricted to daylight hours), restricted to the LAA, and infrequent (less than 30 hours per year). Shadow flicker exposure is not regulated in NL and has not been identified as an issue related to the Project by stakeholders.

Project operations could result in adverse effects to human health and quality of life due to ice throw, however, this risk is mainly restricted to workers accessing the wind turbines for maintenance / operations purposes during periods of rotor icing who may be struck by a falling or thrown ice fragment. The mitigation measures available to reduce the probability of occurrence of ice throw and hence the potential for injury are adequate to reduce the consequences associated with the risk of ice throw.

Property damage is mostly limited to the wind turbine structure itself or associated aboveground electrical or other infrastructure, however, can be mitigated with protective caging or housing and is highly reversible (i.e., damage can be repaired). The frequency of icing conditions was predicted at a maximum

of 42.9 days per year (i.e., 11% annually), therefore ice throw events are expected to be infrequent over the Operations and Maintenance phase. An ice throw event has a very short duration. The modelled ice throw zones for each turbine are limited to the Project Area or the LAA, and given that the model of wind turbine under consideration will cut out at wind speeds greater than 25 m/s, the maximum distance indicated in the model that ice can fall is unlikely to occur. The effectiveness of ice protection systems integrated in the turbine design such as heated blades and low friction coverings, is known to be high (Roberge et.al., 2023) and therefore the magnitude of effect is greatly reduced.

Given the significance criteria defined above in Section 4.2.7.3, neither shadow flicker nor ice throw were determined to result in significant residual effects to human health and quality of life. Level of confidence in the outcomes of both modelling exercises are high. These conclusions are summarized below in Table 4.2.7-6.

Table 4.2.7-6 Significance of Potential Residual Environmental Effects of the Project: Human Health and Quality of Life.

Project Phase	Key Indicator	Significance of Predicted Residual Environmental Effects		Likelihood*	
		Level of Significance	Level of Confidence	Probability	Scientific Certainty
Operation and Maintenance	Shadow Flicker	NS	3		
	Ice Throw	NS	3		

*Only applicable to significant effects.
Significance
Level of Significance: S = significant; NS =not significant; P= positive
Level of Confidence: 1= low; 2= medium; 3= high
Likelihood (Only applicable for significant effect (rated as S)
Probability of Occurrence; 1= low; 2= medium; 3=high
Scientific Certainty: 1=low; 2=medium; 3=high.

4.3 Accidents and Malfunctions

The NL DECC *Environmental Assessment Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects* requires that potential accidents and malfunction be considered in the Registration of the Project. By definition, an accident is an unforeseen or unplanned event or circumstance, and a malfunction is a failure to operate or function in the correct manner. In this chapter, accidents and malfunctions are jointly referred to as incidents. Incidents have the potential to occur during all Project phases, and potentially have significant adverse effects.

Argentia Renewables is committed to protecting the safety of its personnel, contractors, the public, and the environment. Upholding this commitment requires extensive planning and preparation. The Project will follow established good engineering practices throughout its development, with a focus on proactively identifying and addressing risks and hazards at each stage of design, construction, and operation. An Emergency Response Plan (ERP) has been prepared to detail the prevention, preparedness and response procedures to be taken in avoiding or responding to an incident (Appendix M). Environmental

management measures and mitigation measures will be described in the Environmental Protection Plan, to be developed prior to project Construction Phase (An annotated table of contents for the EPP is presented in Section 9). These plans will be used to drive prevention measures, standards, and protocols that the Design, Operations and HSE teams will put in place before the Project Operations and Maintenance phase commences. All staff and personnel working on the Project will be trained and aware of the full suite of Project Environmental, and Occupational Health and Safety plans.

Through the development of the ERP and the completion of an Environmental Effects Assessment and Risk Assessment Workshop (trajectorE, 2024), Argentia Renewables has identified and evaluated incidents that could potentially affect the Project. The risk of an incident is assessed by identifying its likelihood of occurrence combined with the severity of potentially adverse consequences. A diverse group of subject matter experts with experience from similar projects and facility operations, identified such potential incidents – including both natural occurrences as well as events arising from the operation of a complex energy and chemical-generating facility.

The potential scenarios identified during the assessment are listed in Table 4.3.2-1. The likelihood of a major incident occurring that is associated with the Project is considered low; however, it is possible that additional scenarios other than those presented in the table could occur. Since risk management is an active process that requires regular evaluation, Argentia Renewables will regularly review and refine its approach to preventative and response protocols.

4.3.1 Emergency Preparedness

The Project will have a dedicated and trained Emergency Response Team (ERT). The Project ERP details the organizational structure, responsibilities, training, and specific procedures and actions to be taken in the event of an incident. The primary goals of the plan are to protect lives, reduce injuries, prevent property damage, and ensure the continuity of essential functions during and after an emergency. The ERP offers guidelines for a well-coordinated emergency management system for the production facility and the wind energy generating facility operations, ensuring effective responses to such situations. In instances requiring it, the system will harness the collective efforts of all departments, mutual aid groups, and municipal agencies to address emergency incidents safely, efficiently, and promptly. To this end, Mutual Aid Agreements will be established with local and provincial response organizations as the Project planning advances.

The Argentia Renewables facility will be designed to safely produce and store hydrogen and ammonia using applicable Canadian codes, as well as relevant international codes, such as: ASME B31.3 Process Piping; ASME B31.12 Hydrogen Piping and Pipelines; ASME STPPT- 006 Design Guidelines for Hydrogen Piping and Pipelines; and National Fire Protection Association (NFPA) 2 Hydrogen Technologies Code and NFPA 55 Compressed Gases and Cryogenic Fluids Code (covers both hydrogen and ammonia).

The design process will incorporate an array of “designed-in” mitigation measures that will serve to eliminate or reduce potential hazards. Features such as inclusion of a flaring facility and keeping hydrogen storage to a minimum exemplify this approach.

As an industrial site, the Project is vulnerable to accidents such as chemical spills, fires, or equipment malfunctions. In addition to a program of active planning to prevent incidents, a high level of emergency preparedness will be maintained throughout all Project phases. On-site emergency equipment, such as firefighting, confined space rescue, high angle rescue, medical aid kits, and spill response materials will enable a rapid and effective response that can contain and mitigate the severity of such incidents. The availability of this equipment is essential for safeguarding lives, protecting the environment, complying with regulations, and maintaining operational continuity.

The ERP has been developed based on early-stage engineering and as such many of the necessary design details are yet to be completed. In turn, further design work will enable improvements and refinements to emergency response procedures. As changes are identified, the plan will be updated and provided to all interested parties.

4.3.2 Incident Scenarios

The scenarios assessed are in accordance with the Project Registration guidance (NL DECC, 2023). Each scenario has been assessed based on a reasonable “worst-case scenario” during any phase of the Project. A summary of the assessment is outline in Table 4.3.2 -1, and further described in Section 4.2.

Table 4.3.2-1 Summary of Identified Incident Scenarios.

Incident Category	Description	Environmental Interactions
a. Accidental spills and/or releases of hydrogen, ammonia, chemicals, pesticides or any potentially hazardous substance on land or in air or water	The release of ammonia or hydrogen during Project Operations and Maintenance phase. Hydrogen and ammonia release scenarios may arise from catastrophic failure of the mixing drum, electrolyzer containment, storage tank containment, and reactor. Pipe ruptures of the mixing drum, ammonia transfer line, ammonia ship loading arm, recirculation line, reactor inlet pipe, and reactor discharge piping are also potential sources of hydrogen release. Hazardous spills can arise during all Project phases from the use of	An ammonia release to the atmosphere could lead to toxicity concerns for receptors, especially humans. An ammonia release would generate a vapour cloud that, prior to dispersing would compromise air quality over a portion of the Project area depending on the quantity released. Ammonia release into the marine environment could introduce a hazardous substance to aquatic receptors depending on the concentration of ammonia. Hydrogen release could result in flash fires, jet fires, fireballs, vapour

Incident Category	Description	Environmental Interactions
	fuel (storage, refuelling, operation of heavy machinery, and vehicle traffic) and handling/storage of assorted chemicals.	cloud explosions, and pressure vessel explosions. Although hydrogen fires do not produce smoke themselves, burning of nearby combustible materials can result in smoke. Hazardous spills could contaminate air, soil, and water. Inhalation, ingestion, and contact with contaminated air, water, and soil can impair the health and safety of receptors, including humans.
b. Traffic accident	Traffic accidents during all Project phases involving vehicles and heavy equipment, affecting humans and wildlife.	A traffic accident could result in injury or fatalities to people and wildlife, as well as property damage.
c. Fire and explosions (other than from Hydrogen)	Fires and explosions could occur during all Project phases as a result of equipment malfunction, mishandling of flammable materials/substances, or flaring/venting of gases.	Fires and explosions arising from ignition of combustible materials will threaten human safety (injury/fatality) as well as Project infrastructure and facilities. Animal injuries and fatalities could occur, along with damage to riparian and terrestrial habitat. A fire or explosion could result in an increase of greenhouse gas emissions, negatively affecting the atmospheric environment in the Project area and neighbouring communities.
d. Dislodging of wind tower or turbine blade	The collapse of a wind tower or dislodging of a turbine blade could occur during any phase of the Project. The likelihood of this happening during the Operation and Maintenance phase is lower than would be the case during the Construction Phase and Decommissioning and Rehabilitation phase due to the use of tower cranes, and heavy lifting equipment.	Incidents involving the dislodging of a turbine blade, or the collapse of a wind tower have the potential to compromise public safety, and cause damage to infrastructure and property.

Incident Category	Description	Environmental Interactions
e. Occupational hazards and human injuries	As with most industrial sites, a variety of tasks and activities expose workers to an array of hazards during all Project phases. A key issue will result from the produced chemical – ammonia.	Inhalation or direct contact can result in health effects ranging in severity from irritation to fatalities. The greater the concentration of ammonia, the more severe the symptoms. A liquid phase exposure on skin can cause both thermal and chemical burns. Other workplace hazards include a variety of Construction phase and Operations and Maintenance phase activities.
f. Failure of water supply	In the event of a loss of water availability for processes and operations, the Argentia Green Fuels Facility may be required to shut down. Unplanned releases of hazardous products (hydrogen or ammonia) are possible due to equipment failure/leakage or infrastructure damage.	Given the provision for emergency fire water supply, interactions would likely be indirect, likely resulting from response actions to the water loss event. Direct interactions with the biophysical environment are unlikely.
g. Flaring/venting of hydrogen, ammonia, other gases in the event of malfunction	During Project Operations and Maintenance phase, Flare units provide for safe release of flammable gases, e.g., off-gases from electrolysis, ammonia loop, refrigeration, and ammonia storage. The flare units will be designed to operate during power outages and boil-off system failures.	Gaseous ammonia may be released to the atmosphere in the event of malfunction of the Process Flare and the Tank Flare. Ammonia released into the atmosphere may interact with nearby receptors, including humans, posing a health risk.
h. Wildlife emergencies/incidents	During all Project phases, interactions between various forms of wildlife and workers or Project infrastructure can occur. During the Project Operations and Maintenance phase, moving or stationary wind turbine blades can interact with avian species. Human presence in the Project Area could increase human-wildlife interactions as some wildlife species become acclimated to their presence.	Collisions with wind turbines and other Project infrastructure (meteorological towers, overhead collector lines, transmission system) can result in injury and mortalities for birds and bats, including species at risk. The association of humans and food can lead to human-wildlife conflict. Wildlife attacks may result in injury or fatality of Project personnel.

4.3.3 Risk and Risk Management

For each category of incidents, an evaluation has been carried out to assess the likelihood of occurrence and consequence severity of each. A formal risk assessment has been conducted for the scenarios involving a release of hydrogen and ammonia, the planned output of the Project. The results of these considerations are presented below, along with a summary of mitigation measures that will be applied for the purposes of reducing the likelihood or severity of consequences from each category of incidents.

4.3.3.1 Accidental Spill or Release of Hydrogen, Ammonia or Hazardous Materials

Hydrogen and Ammonia

A specialist design firm - trajectorE was engaged by Argentia Renewables as part of the Project to conduct a series of Structured What-If Analysis (SWIFT) workshops. These sessions focused on Hydrogen and Ammonia Production, Ammonia Storage, Ammonia Ship Loading, and Hydrogen Storage at site. The assessment considered the Argentia Green Fuels Facility and Loading Facility. The SWIFT is a type of high-level Process Hazard Analysis (PHA) that uses a structured brainstorming technique to identify major potential hazards and then applies a risk matrix to characterize the likelihood and consequences of said hazards. The results are used to identify candidate mitigation measures for application for each hazard as an integral component of planning and design.

A total of 72 “What-If” scenarios were identified during the workshops. The list was then screened for relevance and the remaining scenarios entered into a worksheet and each assigned a consequence (impact) and likelihood rating, which generated risk ranking. Results of the report are presented in the trajectorE Risk Assessment Workshop Report (trajectorE, 2024) presented in Appendix V.

HYDROGEN - RISK

Hazardous substance releases could occur due to hydrogen storage tank leakage or ruptures, pipeline transfer leakage, and connection leakage at the electrolyzer.

Since hydrogen has a very wide flammability range and low ignition energy, it should be assumed that any hydrogen release is likely to result in hydrogen fire. Hydrogen fires can damage or ignite objects in the vicinity through heat transmitted by radiation and convection.

HYDROGEN - RISK REDUCTION

Emergency shut-down procedures for a hydrogen gas fire in the Argentia Green Fuels Facility will be established to ensure the safety of personnel, equipment, and the surrounding environment. Refer to the ERP.

Hydrogen storage and pipelines will be located away from sources of heat and ignition. Thermal imaging cameras and flame detectors will be used to verify that a hydrogen flame is present. Argentia Green Fuels Facility operation is designed to minimize the quantity of hydrogen in storage by synchronizing hydrogen production with ammonia conversion.

Argentia Renewables plans to install auto-isolating valves on both hydrogen tanks. These will substantially reduce the probability and consequence of a hydrogen spill or leakage event.

AMMONIA - RISK

Ammonia releases could occur due to storage tank leakage or ruptures, ammonia handling equipment, pipeline transfer leakage, pumps, and the ammonia loading arms.

The most common ammonia release occurs as a result of liquid that evaporates into the atmosphere. Although hazardous substance releases can occur during all phases of the Project, usually these situations arise during the Project Operations and Maintenance phase.

AMMONIA - RISK REDUCTION

A sensor will be installed on the connection point of the ammonia transfer and pipeline feed to detect pressure losses and ammonia leaks. Instrumentation will be equipped with automated shut-off valve closure to initiate emergency stops.

Ammonia storage will employ double walled tanks with no bund. Tanks will be designed as complete containment systems that can hold liquids and vapours. These design features will substantially reduce the probability and consequences of an ammonia spill or leakage event.

In the event of a release, all surrounding neighbours are to be notified in a timely fashion and advised of the extents of the hazard zone.

Emergency response procedures in the event of an unplanned hydrogen or ammonia leak are described in the ERP in Sections 9.2.6 and 9.2.7.

It is expected that through prudent and responsible engineering design development many of the risks identified will be mitigated during upcoming design phases of the Project. To ensure that all recommendations shown in the SWIFT Worksheet (Appendix V) are actioned and fully managed it is recommended that this list of risks be transferred to the overall project risk register and tracked and managed accordingly (trajectorE, 2024).

Hazardous Material

RISK

The facility is expected to contain various hazardous chemicals and reagents such as fuels, oils, and cleaners; however, given the access to various nearby suppliers, none of these are currently contemplated to be stored in substantial quantities and all will be managed according to applicable regulatory requirements and safety standards. The Project includes several features that will reduce the likelihood of occurrence or consequence severity of various types of spills.

Since the Project is to be constructed and operated within an industrial site (POA), the Project from inception will have infrastructure available, including a road network and electricity supply. The availability of these will reduce the extent of construction required to bring the facility into the Project Operations and Maintenance phase. It will also result in minimal requirements, for on site fuel and hazardous material storage. In the event of an incident, the ability to respond is enhanced through the ready accessibility of outside resources. Further, the nature of the terrain comprising the Project Area will reduce the potential consequences of unplanned releases. The Argentia Peninsula is a brownfield site, so that travel distances from a spill source to sensitive receptors (e.g., marine environment) for any form of spill will likely be enough to enable deployment of containment and recovery measures. The Argentia Backlands is an area of high topographic relief, characterized by small watershed areas. As a result, these natural features will serve to contain a spill and enable response actions to be geographically focused.

Both the likelihood of occurrence, as well as the consequence severity of a hazardous substance spill is judged to be low for this Project. Additionally, as described below, a well-developed ERP will be maintained by Argentia Renewables at all Project phases.

RISK REDUCTION

A series of preventative and mitigation measures will be in place to further reduce the potential for, and consequences of, a hazardous material spill.

Measures on-site to prevent a spill or release of chemicals include, but not limited to:

- Mandatory Health, Safety and Environment (HSE) orientation.
- Training in proper handling and best practices, and incident response.
- Ensure proper equipment and material are available on-site to respond to an incident.
- Ensure vehicles, heavy equipment, and machinery are inspected and free of fluid leaks.
- Site maintenance, vehicle maintenance, and fuelling will be done in specified areas more than 30 m away from wetlands and waterbodies.

- Use secondary containment to store any potential contaminants (i.e., oil, fuels, and chemicals) in designated areas.
- All spills are to be reported and cleaned up as soon as possible, with contaminated soils removed from site for disposal at an approved/licensed location.

The ERP details the procedure to manage a spill, this includes: assessing the situation, alerting others, isolating the area, ensuring use of proper Personal Protective Equipment (PPE), containment, if possible, using appropriate materials (e.g., absorbent pads, booms), evacuate (if necessary), activate Spill Response Team, spill cleanup, properly disposal of contaminated materials according to local, provincial, and federal regulations, report the spill to the relevant authorities, and decontaminate affected personnel, surfaces and equipment, as necessary.

4.3.3.2 Traffic Accident

Public roads, private Port of Argentia roads, and Project constructed access roads will be utilized during all phases of the Project; however, heavier traffic is anticipated during Construction and Decommissioning and Rehabilitation phases.

Risk

While the compact nature of the Project Area will serve to reduce vehicular travel during all Project phases, the likelihood of occurrence of a traffic accident is directly tied to the volume of traffic associated with the Project. A major factor affecting consequence severity is traffic speed. For roads within control of Argentia Renewables, a strictly enforced maximum speed will be posted and enforced. Overall, both the likelihood of occurrence, as well as the consequence severity of a traffic accident is judged to be low for this Project. As described below, a well-developed program of awareness and enforcement capability will be maintained by Argentia Renewables during all Project phases. Potential for vehicle incidents exist with activities such as:

- Passenger vehicle movement carrying people and freight throughout the Project site.
- Travel from Project site areas to the POA.
- Heavy equipment movement and transport on access roads throughout the Project site.
- Passenger vehicle movement and heavy equipment usage along the transmission line access.

The likelihood of a vehicle incident varies according to changing conditions. These conditions may include:

- Road conditions (including dust, loose roadbed or unstable road shoulders, ice/snow cover);
- Mechanical failure in vehicle systems; and/or
- Operator error in judgment.

Risk Reduction

Traffic related mitigation measures will ensure that Project activities take place with minimal disruption to the public, local businesses, and the environment. A Traffic Management Plan has been developed for the Project, see Appendix E.

Several traffic safety measures will be implemented to reduce vehicle related incidents:

- The Traffic Management Plan, driver education, and driver safety will be covered during site orientation to ensure all Project personnel are informed of their legal responsibilities and are focused on the safety of the public and the environmental.
- Regularly held toolbox meetings and informative safety briefing will be held to ensure drivers are equipped with the necessary knowledge and skills to navigate roadways safely.
- All Project personnel will be required to obey all posted speed limits and traffic rules.
- All vehicles are to be maintained in good working order.
- Traffic control signage and other measures will be used for the safe flow of traffic.
- Movement of oversized or overweight loads will be scheduled to avoid peak traffic periods.

Responding to a vehicle accident on a worksite requires a well-defined and organized procedure to ensure the safety of individuals, the environment, and property. The ERP details the roles and responsibilities of on-site emergency response crews, as well as coordination with relevant authorities and local emergency services.

4.3.3.3 Fire and Explosions

The main threat to the Project from fires and explosions would result from hydrogen or ammonia releases (see Section 4.3.3.1). Other fire/explosion risks are associated with several Project activities at all phases. There is also the potential for fires to originate from other sources within and adjacent to the Project Area that could spread to the Project Area and threaten site features.

Risk

The likelihood of a fire and/or explosion must be regarded as moderate, given the nature of activities associated with the Project Construction and Operations and Maintenance phases. With allowance for a high level of emergency preparedness, and the proximate availability of support resources, the consequences severity has been rated as low.

Risk Reduction

Project buildings and facilities will be designed and constructed in compliance will all National and provincial fire code requirements. Fire prevention and response mitigation measures include, but are not limited to:

- Training and orientation for Project personnel regarding fire hazards, prevention, and roles and responsibilities in the event of a fire.
- Installation of fire detection and protection systems in high-risk areas such as fuel and hazardous material storage.
- Proper disposal of flammable materials.
- Necessary fire response equipment on-site, such as fire extinguishers and personal protective equipment (PPE). A complete list of the fire response equipment is included in the ERP.
- Clearly identified “no smoking” areas.

The ERP details the process for maintaining a high level of preparedness to prevent and, as necessary, respond to a fire or explosion.

4.3.3.4 Dislodge of Wind Tower or Turbine Blade

The Project includes an array of wind turbines on Port of Argentia lands. The dislodgement of a wind turbine tower or blade could occur during any Project phase. This could happen because of a failure during the erection or disassembly of structures, as a consequence of structural failures such as cracks and corrosion, or from failure of foundations and anchors.

The likelihood of the collapse of a wind tower or dislodging of a turbine blade during the Project Operations and Maintenance Phase is low due to preventative measures considered in the design phase. The chance of wind turbine part dislodgement increases during the Construction and Decommissioning and Rehabilitation phases due to issues related to the use of tower cranes, and heavy lifting equipment.

The likelihood of occurrence for a failure scenario is considered low in light of both industry and proponent experience. The consequence severity of such an event (other than financial considerations) would be limited to the immediate proximity of the structure, and hence is judged as low.

Risk Reduction

Site-appropriate design and effective Quality Management (including diligent monitoring and early detection) are the best means to prevent catastrophic failures. Prior to actual Construction Phase, detailed planning and design activities are conducted, including the collection of required site-specific information. These surveys characterize a variety of site conditions. Major studies include geotechnical

surveys (detailed further below), installation and operation of meteorological towers to gather critical weather data and environmental surveys to establish baseline conditions. Wind turbine site selection, infrastructure routing, and wind turbine foundation design are dependant on the results of these surveys.

Geotechnical field assessments during the planning phase will identify unstable conditions such as high erosion potential, slope instability, and rock fall hazards. The best foundation design for wind turbines (gravity foundation or rock-anchored foundation) will also be determined from site characterization assessments.

Setback distances for wind turbines will also be established during the planning phase to reduce hazards associated with collapse or dislodgment of a wind turbine component. Wind turbines will be sited a safe distance away from nearby residences to ensure public safety.

Facility maintenance activities include regular scheduled monitoring of performance leading to updates to equipment and preventative maintenance and repairs. A maintenance schedule will be developed and followed, and data analyzed to find trends and improve performance. This includes monitoring energy output, availability, and reliability of the wind turbines. Continuous monitoring of wind speed and direction, air temperature, atmospheric pressure, electricity generation, and turbine performance will ensure optimal performance of the Argentia Wind Facility.

If a turbine or turbine blade suffers a catastrophic failure, it will be isolated and de-energized. The area will be cordoned off to prevent entry by untrained personnel, and all stakeholders and local authorities notified. Due to the size and weight of turbines and turbine blades, mobile cranes will be required to either repair or remove the damaged equipment.

4.3.3.5 Occupational Hazards and Human Injuries

Argentia Renewables will follow the Occupation Health and Safety Act to ensure a safe and healthy workplace. The ERP outlines procedures for hazard recognition and assessment. Hazards associated with chemicals such as ammonia or hydrogen material exposure are described in the ERP. As noted above, workers could be exposed to an array of hazards during all Project phases.

Risk

Argentia Renewables is dedicated to a Safety Culture that effectively reduces worker injuries to below industry averages. Newfoundland and Labrador overall has one of the lowest lost-time injury rates in Canada, and the trend is towards a continuing decline (WorkplaceNL, 2017), especially for the Construction and Manufacturing sectors. Nevertheless, both wind energy and hydrogen/ammonia production represent a new emerging industry for the province.

Argentia Renewables is committed to achieving both a low level of occurrence and consequence severity with respect to worker and workplace safety.

Risk Reduction

All Project personnel and visitors will be required to complete a health and safety orientation to access the site. This will mitigate risks related to occupational hazards and human injuries. Near misses will be tracked to ensure any occupational hazards that may arise are rectified. This will mitigate risks related to reoccurring occupational hazards and human injuries. Other mitigations include, but are not limited to:

- Site health and safety orientation for all Project personal and visitors.
- Training for safe work procedures.
- Requirement for proper PPE to be always worn.
- Ensuring regular maintenance of equipment and facilities.
- Posting of safety and hazard signage is appropriate locations.
- Use of toolbox talks to reinforce safety messages and review of safe work practices and hazards associated with work tasks.
- Use of educational material and signage at worksites as daily reminders for safe work practices. Focus on common workplace injuries such as slips, trips, and falls.

The ERP details the on-site procedure to administer first aid, as well as local emergency responders and medical clinics in the event the incident is serious and requires medical attention.

4.3.3.6 Failure of Industrial Water Supply

If there is a loss of water supply, the Argentia Green Fuels Facility will have to be shut down, isolated, and purged. The cause of the loss of water will have to be identified and the Argentia Green Fuels Facility will remain shut-down until the cause of the failure is identified and corrected. Fire water will still be available during this investigation. Emergency shut-down procedures in an ammonia processing plant are critical to ensuring the safety of personnel, protecting the environment, and preventing equipment damage. The loss of water in an ammonia plant can lead to potentially dangerous situations, including the formation of anhydrous ammonia, which is highly reactive and poses serious risks.

The Argentia Green Fuels Facility will require a temporary shut down should the industrial water supply fail. While unplanned releases of hazardous products (hydrogen and ammonia) into the environment are not anticipated during a shut-down, there is a possibility of equipment failure/leakage or infrastructure damage that could result in a release.

Risk

The Project is heavily reliant on a secure suitable water supply. Based on consultations and detailed resource assessments, the Protected Public Water Supply administered by the Town of Placentia meets and exceeds these requirements. Given the availability of a reserve water supply designed into the system, the likelihood of a total failure of the water supply is regarded as low. As noted, the consequences severity of such an event, while major for the Project, are less so for the surrounding biophysical environment.

Risk Reduction

Mitigations associated with a failure of industrial water supply and subsequent Argentia Green Fuels Facility shut-down include, but are not limited to:

- Design of the Argentia Green Fuels Facility shut-down mechanisms.
- Operator training of the Argentia Green Fuels Facility shut-down procedures.
- Routine maintenance of Argentia Green Fuels Facility infrastructure and equipment.
- Regular review of supply system capability and water resource availability.

Emergency response procedures in the event of an unplanned hydrogen or ammonia leak is the same a noted in Section 4.3.3.1.

4.3.3.7 Flaring/Venting of Hydrogen, Ammonia, other Gases

Flaring is the controlled burning of fuel or waste gas that takes place during production and processing. Fuel or waste gas is ignited at the top of a flare stack, causing the characteristic flame associated with flaring. Some odours may be associated with flaring. Venting is a controlled release of unburned gases into the atmosphere, such as natural gas or other hydrocarbon vapours, water vapour, oxygen, or other gases. Venting may occur during operational processes and during maintenance activities. Odours may be associated with venting.

Risk

Venting and flaring act as means to address other Unplanned Events and thereby avoid more severe consequences. The likelihood of an individual occurrence is therefore directly tied to the likelihood of a causative event. To be conservative, it is suggested that a moderate probability has been assigned to such an event. Conversely, the consequence severity is generally low.

Risk Reduction

The Project design includes flare units for the burn-off of flammable gas to prevent the release of hazardous off-gases from the electrolyzer process and ammonia synthesis production and storage. The

flare units will be designed to manage Unplanned Events such as power outages and boil-off system failures.

Mitigation measures associated with the flaring or venting of hydrogen, ammonia, or other gases include, but are not limited to:

- Flare units will be equipped with continuous emissions measurement devices.
- Flare units will be designed to handle large ammonia volumes from Unplanned Events.
- an ambient Air Quality Monitoring Station will be installed to evaluate and monitor air quality in Argentia.

The ERP details the procedure to respond to an uncontrolled event of flaring and/or venting. The Emergency Response Team will be immediately notified and activated to assess the situation and manage the response.

4.3.3.8 Wildlife Emergencies/Incidents

Since the Project Area includes sections of wildlife habitat, it is possible that different types of animals may be encountered during normal working activities. Interaction with animals such as caribou, moose, and black bears has the potential to harm people, property, and the subject animals. Human presence in the Project Area will increase human-wildlife interactions as wildlife become tolerant of disturbance.

Note, the issue of chronic interactions between wind turbine blades and avian species (including Species at Risk) is addressed separately and in detail for each of the identified Key Indicators of the Terrestrial Environment VC (see Section 4.2.3).

Risk

The likelihood of interactions between Project personnel and wildlife is relatively high, given the proximity of the Project Area to natural landscapes. Subject to implementation of preventative and cautionary measures, the consequence severity is considered to be low.

Risk Reduction

The primary mitigation associated with wildlife incidents is to ensure that Project personnel who have the potential to encounter wildlife are aware of the applicable policies and ways to prevent and respond.

Applicable measures include, but are not limited to:

- Providing a means for employees to request deterrents (such as bear spray or air horn) and address the hazards associated with the use of such deterrents.

- Feeding of wildlife will be prohibited on Argentia Renewables properties.
- The development of a Species at Risk Impacts Mitigation and Monitoring Plan (Appendix R) and ensuring personnel are familiar with and adhere to the plan. The plan describes mitigation and monitoring measures to be implemented to assess effects and minimize impacts.

When animals, such as black bear, moose, caribou, or fox, pose a threat or a problem in the Project area, the priority will be personnel safety. After measures have been taken to minimize risk of injury to people, consideration will be given to avoid or reduce effects on the animals. Live animal traps cannot be set within the Argentia Renewables area unless a permit is granted by the Department of Fisheries, Forestry and Agriculture (NL FFA). Responsive actions for the situation will be determined by the Environmental Coordinator through consultation with the Facility Manager or designate, and the NL FFA Wildlife Division. Project personnel must record and report all wildlife sightings and human-wildlife interactions and conflicts.

4.4 Effects of the Environment on the Project

This section describes the effects of the environment on the Project over the expected lifespan of the Project. This analysis aids in distinguishing the effects of environmental changes on the Project and those arising from natural processes. The following discussion considers the continued effects of ongoing interactions along with natural environmental processes. The potential effects of the environment on the project include the following:

- Weather and Climate Change
- Algal Bloom
- Geological Hazards
- Forest Fires

4.4.1 Weather and Climate Change

Harsh weather conditions, including extreme snowfall, freezing rain, storms, and hurricanes, present a risk of causing damage to Project infrastructure and equipment. A detailed baseline study on the existing atmospheric environment in addition to climate projections is discussed in Section 3.1.1. The effects of weather and climate change will be considered for all phases and for the lifetime of the Project.

4.4.1.1 Temperature

Daily average temperatures in the Project Area, as outlined in Section 3.1.1, ranges from -4.0 to 15.9 degrees Celsius (°C), with the lowest average temperatures occurring in February and the highest in August (Government of Canada, 2023). The wind turbine being considered for the Project has an operating temperature range between -20°C and +45°C (with provision for a -30°C minimum operating

temperature based on inclusion of a cold weather operating package). It is expected with climate change that temperature increases (4.4°C to 5.3°C) will occur in Argentia over the next century. Rising temperature trends indicate less precipitation in the form of snow and more in the form of rain. There will be fewer days with temperatures below freezing, particularly in the fall and spring.

Temperature alone is anticipated to have minimal effect on the Project Area; however, temperature could contribute to increased severity of storms, significant weather events, and seasonal fluctuations (e.g., rapid freeze and thaw conditions in winter). Hotter and drier conditions increase the risk of droughts and wildfires. Winter temperature fluctuations and increased winter rain could result in road washouts temporarily limiting access to areas of the Project. Globally as the atmospheric and subsequently ocean temperatures rise, increased storm events such as hurricanes may become more frequent and with sustained strength upon landfall. Storms are further discussed below in Section 4.4.1.3.

4.4.1.2 Precipitation

The Project Area is characterized by a humid coastal climate, however, with climate change, there are projected increases in precipitation event intensity along the south coast; Argentia may see substantial changes in precipitation intensity in the winter, spring, and fall. Projected changes in maximum 3-day, 5-day, and 10-day precipitation as well as the 90th percentile of precipitation events follow regional patterns similar to those described for mean precipitation intensity. Hazardous events typically occur over several days, during which time reservoirs, soil moisture capacity, and waterbodies reach capacity, eventually resulting in overflow and potential flooding. The greatest changes for consecutive precipitation days for the Avalon Peninsula occur in the winter and are concentrated along the south coast. Given the nature of the topography in the Argentia Backlands and the local siting of Wind Facility infrastructure, any potential overflow from local ponds will have minimal effect on the Project.

Extreme precipitation events, coupled with consequential surface water runoff, could lead to flooding, erosion, and road washouts. Should a road become impassable due to washouts or poor driving conditions, access to the Project site may be limited. This restriction could give rise to delays in the transportation of crucial Project components – receipt of materials and supplies, delivery of products to market, and the workforce to and from the site.

The low flow period within the Project Area generally occurs in August, as outlined in Section 3.1.2, while ponds re-charge from September to April. The Source Water Hydrology Analysis and the Placentia Regional Water Supply Study (Appendix C1) confirmed sufficient baseline water availability for the Project with considerations for seasonal variability and potential effects from public water withdrawal. The proposed Project water withdrawal is estimated to range from 11.5% to 12.4% of the available water, based on historical data and climate change projections.

While the area is not prone historically to drought-like conditions, the increase in extreme weather from climate change could cause drier than normal conditions. During these times, it is possible that water usage restrictions would apply to the Argentia Green Fuels Facility, and thus limit or temporarily cease operations until conditions improve. It is also possible that the period of drought would increase in length over time as well, as outlined in Section 3.1.1, from 2.9 days (existing) to 3.4 days (2041 to 2070 projections).

4.4.1.3 Snowfall, Freezing Rain, and Storms

As with precipitation, the Project Area commonly experiences winter weather including snowfall, freezing rain, and storms, all of which have been considered in the Project's design. However, climate change precipitation analyses predict that there will be fewer but heavier snowstorms and more frequent and heavier occurrences of rain throughout the cold season.

The accumulation of heavy snowfall can strain structures (Argentia Green Fuels Facility and Argentia Wind Facility components) and utility systems (collector and transmission system, electricity grid connection), potentially leading to structural issues or failures. In addition, loss of electrical power could compromise production. Snow accumulation may also decrease visibility and impair road conditions, preventing workers from accessing the site, thus delaying Project activities during all Project phases.

Freezing rain poses the threat of ice accretion on surfaces, increasing the risk of damage to exposed equipment and infrastructure. Adverse cold weather conditions, such as heavy snowfall, freezing rain, and ice pellets, constitutes the risk of ice accumulation on critical infrastructure, which becomes particularly precarious in the context of wind turbines. Inactive periods of wind turbines may lead to the buildup of ice on the turbine blades. Subsequently, during operation, the potential for ice throw emerges, where chunks of accumulated ice may be thrown from the rotating blades. Freezing rain may also impair road conditions, preventing workers from accessing the site, thus delaying Project activities during all Project phases.

Storms, characterized by strong winds and intense precipitation, can cause flooding, harm to structures, and compromise the integrity of equipment. The primary flood risk lies with the Argentia Green Fuels Facility. The facility faces exposure to coastal flooding and waves caused by storm surges, especially considering potential increasing intensity of storms. Coastal areas on the Island of Newfoundland, previously unaffected by storm surges, are now becoming vulnerable due to the increasing severity of storm conditions. This is further amplified by sea level rise as discussed below.

Storms may also delay the receipt of materials for Construction (i.e., turbine components, plant components), because of shipping delays. The presence of extreme winds necessitates a safeguard mechanism for wind turbines. Specifically, when the 10-minute average wind speeds surpass 25 m/s, a protective protocol engages the rotor to stop moving. The design of the wind turbine foundations (gravity

and rock-anchored) will take into the consideration of high winds. Storms may also decrease visibility and impair road conditions, preventing workers from accessing the site, thus delaying Project work during all phases. As mitigation for ice accumulation on wind turbine blades, all Project wind turbines will be outfitted with de-icing technology and icing protocols will be implemented throughout operations of the Project.

4.4.1.4 Sea Level and Ice

The rise in sea level, attributed to the melting of ice, carries the potential for adverse effects. Coastal sea level in Argentia is projected to rise, as outlined in Section 3.1.2, by 40 cm by 2049 and more than 100 cm by 2099 (Batterson & Liverman, 2010). Local effects of crustal rebound (i.e., rising of land mass as ice sheets melt) in Argentia are projected to be +2 mm annually, thereby offsetting to a very minor extent, the effect of rising sea level. Infrastructure faces increased vulnerability as rising sea levels encroach upon coastal areas. Shipping routes, vital for transportation, may be disrupted or altered due to changes in water depth and navigation challenges. Adjacent terrestrial land areas are susceptible to coastal erosion and submersion of low-lying areas. With less sea ice cover acting as a protective buffer, Project areas situated along shorelines become more exposed to the forces of waves and storm surges. Consequently, the heightened exposure increases the likelihood of erosion and flooding, bringing additional challenges to project stability. Waves and coastal flooding from storm surge pose a risk to the Argentia Green Fuels Facility; this is further amplified by sea level rise.

Reduced sea ice increases opportunities for shipping, tourism, resource exploration, and industrial activities, which may benefit the Project. Further, as the sea level conditions change and considering the Project will be located on the privately owned Port of Argentia, the Port is likely to conduct upgrades to mitigate the effects of climate change.

4.4.1.5 Wind

Maximum hourly wind speeds at the Long Harbour Climate Monitoring Station were recorded at 53 to 79 kilometres per hour (km/hr); highest wind speeds were historically detected between October and March. The prevailing wind direction is westerly in the fall and winter months and southwesterly in the spring and summer months.

The wind turbine being considered for this Project has a cut-in speed of 3 m/s (10.8 km/hr) and a cut-off speed of 25 m/s (90 km/hr). While these specifications are within the typical seasonal average for the region, prolonged operation in extreme winds might cause structural damage to the blades, turbine, and even the support structure. Prolonged periods of winds may also damage Project electrical infrastructure.

Wind conditions along the coast of Argentia will vary seasonally and during major weather events. High winds in excess of 90 km/hr are most likely to occur from September to May and could be a potential

cause of damage to infrastructure (i.e., buildings, fences). Wind thresholds are established to protect the turbine blades from and the turbines themselves. Therefore, increased sustained winds above 90 km/hr will lead to the increased occurrence of precautionary temporary shut down of turbines. As climate changes and storms increase in frequency and intensity, spanning a couple days or more, this may lead to reduced energy production and supply to the Argentia Green Fuels Facility.

4.4.2 Algal Bloom

The Project proposes to withdraw water from local ponds, as outlined in Section 3.1.2, which are within a designated PPWSA. It is recognized that these ponds may be susceptible to algal blooms, potentially affecting water quality. Algal blooms may degrade water quality which could necessitate the implementation of additional water treatment processes for operation of the Argentia Green Fuels Facility. Moreover, algal blooms could potentially clog intake systems or filtration equipment, potentially leading to operational interruptions.

Water quality at the ponds is currently regularly monitored by the Town of Placentia, given their designation as PPWSA. Consequently, deviations in water quality or the occurrence of algal blooms would be detected ahead of time and managed accordingly. Therefore, it is anticipated that algal blooms are not expected to have an environmental effect on the Project.

4.4.3 Geological Hazards

Geological desktop analysis and interpretation has been conducted on the Project Area. The purpose of the study was to review, interpret, and predict possible geological hazards and suggest reasonable mitigation measures to reduce the effects of any unpredicted hazardous events. Review of topographic, surficial and bedrock mapping, and publicly available geological research was used to complete this assessment. Further information regarding the surficial and bedrock geology of the Project Area is provided in Section 3.1.3.

4.4.3.1 Terrain Stability

No indication of any type of large-scale landslides, rockfalls or slope instability was observed on satellite imagery or reported in the available literature. While the town of Placentia experiences frequent energetic erosional events from storm surges, these conditions have little to no effects on the Project Area.

It is expected that some coastal rockfalls are possible from the freeze-thaw cycles of the area, however, as Placentia Sound is well protected from currents and wave action from Placentia Bay, high-energy storm-surge erosion in this coastal area is unlikely. The Project Area is mainly covered by vegetation and wetlands, which also assists in adding to the stability of the coastal edges and interior areas. Erosion along the banks of the Port is mostly managed and mitigated by the Argentia Port Authority.

4.4.3.2 Seismic Activity

Seismic hazard is quantified by determining the probability of experiencing damaging ground motions caused by earthquakes. The Geological Survey of Canada prepares seismic hazard maps and assesses regional seismic hazards based on statistical analysis of previous earthquakes and information about Canada's tectonic and geological structure. There was a total of 31 earthquakes documented within a 250 km radius of the Argentia Peninsula from 1985 to 2023: 22 earthquakes of magnitude 2.0 or greater, eight earthquakes of magnitude 3.0 or higher, and one earthquake of magnitude 4.2. There have been no reported seismic occurrences in the Project Area (NRCan, 2021), hence the seismic hazard probability for the area is regarded as very low.

The causes of earthquakes in Newfoundland and eastern Canada are not well understood. Unlike tectonic plate boundary regions where the rate and size of seismic activity is directly correlated with plate interaction, eastern Canada is part of the stable interior of the North American Plate. Seismic activity in areas like these seems to be related to the regional stress fields, with the earthquakes concentrated in regions of crustal weakness (Natural Resources Canada, 2021).

The Island of Newfoundland is in a stable continental region within the North American Plate, so the seismic hazard risk is low according to 2015 and 2020 seismic hazard maps of Canada, implying that the probability of significant damage to buildings, which occur with seismic magnitudes greater then 3, within the region is less than 1% in 50 years (Natural Resources Canada, 2021). The probability of a seismic event occurring in the Project Area that could result in Project damage or interruption is low given the minimal seismic activity risk and the implementation of the nationally recognized design standards. Project infrastructure will be designed and constructed to accommodate potential seismic events and as recommended by the National Building Code of Canada (National Research Council of Canada, 2015).

4.4.4 Forest Fires

The Project Area is within the Avalon Peninsula of Newfoundland, where the largest fire was the Spread Eagle Fire in 1999 (Department of Fisheries, Forestry & Agriculture, 2016). Other large-scale forest fires on the Avalon peninsula occurred near Bay de Verde and along the Southern Shore in the 1960's (Department of Fisheries, Forestry & Agriculture, 2016).

Forest fires have the potential to cause delays in schedule, loss of production, and damage to Project infrastructure. Electrical infrastructure such as substations, transmission lines, and collector lines are also vulnerable to damage, potentially resulting in electricity loss. Forest fires may also obstruct access roads and damage water crossings. Other potential negative effects of forest fires on the Project include reduced visibility due to smoke and health and safety concerns for personnel.

Climate change might exacerbate the risk of forest fires in the Project Area because of an increase in daily maximum temperatures across all seasons, as outlined in Section 3.1.1, and a 17% increase in mean dry spell length between 20th century climate conditions (2.9 days) and climate change projections in 2041 to 2070 (3.4 days). However, in this same timeframe the maximum number of consecutive dry days is expected to decrease by 27% from 14.4 days to 10.5 days. Overall, it is expected that Climate Change will have minimal effect on the probability of forest fires in or close to the Project Area.

Project infrastructure will be designed and operated to reduce risk of damage from wildfire (e.g., transmission rights-of-way will be maintained to ensure vegetation is maintained to decrease fuel load and maintain reliability, turbine pads will be maintained to avoid the accumulation of vegetation that represents fuel load in the event of wildfire).

4.5 Mitigations

Robust mitigations are essential to ensure that Argentia Renewables has adequately addressed the myriad social, technical, and environmental issues that may accompany the Project.

Argentia Renewables has adopted a “mitigation-in-design” approach to the Planning and Design phase, which considered environmental constraints for MET tower siting and installation, transmission corridor and access road routing, siting of the Argentia Green Fuels Facility, and placement of wind turbine infrastructure. In addition, Argentia Renewables has incorporated mitigations resulting from extensive and regular consultation with the provincial government, and other stakeholders such as residents of the Placentia area. By integrating these mitigations into all phases of the Project (i.e., Planning and Design, Construction, Operations and Maintenance, and Decommissioning and Rehabilitation) Argentia Renewables will minimize the environmental footprint of the Project, proactively address community members’ concerns, and create a sustainable and beneficial project for the region and the province.

The numerous mitigations varied in nature across the VCs, but broadly included mitigations to address:

- Environmental constraints like sensitive habitats (e.g., SAR, wetlands, migratory routes);
- Human health considerations like noise, ice throw, visual impact, emissions, and shadow flicker;
- Stakeholder concerns (e.g., local residents, regulatory agencies, Indigenous Peoples, and environmental groups);
- Wildlife collisions with Project infrastructure or activities (e.g., turbines, vehicle collisions, transmission lines);
- Conservation of natural vegetation communities to minimize habitat fragmentation and edge effects (e.g., reclamation of temporary impacts to natural habitats);
- Reduction of noise and/or vibration by utilizing the newest technology in turbine design and operational controls to minimize disturbance;
- Minimizing the effects of blasting on the natural environment;

- Housing issues in the Placentia area to ensure that the Project does not exacerbate the local shortages in affordable housing;
- Ensuring local hiring and training to maximize opportunities for residents; and
- Implementing safety and regulatory compliance procedures to avoid accidents during all phases of the Project.

Argentia Renewables is committed to an iterative process of avoidance and minimization of impacts to sensitive resources (i.e., VCs). Where there is uncertainty around the efficacy of a mitigation measure to ensure there is no material impact to a VC, this may include adaptive management throughout the life of the applicable Project phase, such as additional monitoring of appropriate KIs and the success of mitigations. In this way, Argentia Renewables can assess the ongoing effects of the Project on the sensitive resources in the environment and with respect to residents of the area. Additional mitigations will be developed over the course of Project development, construction, and operations based on further stakeholder input and as additional Project design specifications are advanced.

Appendix W provides a comprehensive summary listing of mitigation measures proposed throughout the life of the Project. The listing includes references to the successful application of mitigations in other jurisdictions and/or projects. Additionally, to characterize the level of effectiveness associated with each mitigation measure, ranking has been employed as:

1. Regulatory requirement/standard condition; proven effectiveness.
2. Industry standard practice; generally effective.
3. Innovative, customized to Project; effectiveness not proven.

For all rank three mitigation measures, an associated monitoring program will be initiated to provide feedback and, as appropriate, allow for adaptive management. Identification of roles and responsibilities for implementing specific mitigations will be included in each of the management plans developed for the Project, found in Appendices E, and M to T.

4.6 Plans and Environmental Management

Environmental management is necessary to reduce or avoid negative environmental effects, track environmental performance, and advance long-term environmental sustainability. Effective environmental management requires a shared commitment to the principles of sustainable development, pollution prevention, environmental protection and enhancement, and due diligence. Argentia Renewables is accountable for sound environmental stewardship through continuous measurement that demonstrates performance improvement.

The Argentia Renewables operational policies and procedures, including those related to the environment, seek to avoid or reduce negative environmental effects, track environmental performance, demonstrate compliance with applicable environmental laws and regulations, document Project adherence to environmental commitments, promote sustainable practices, and set out requirements for environmental incident reporting for employees. Argentia Renewables provides Project employees with education and training on environmental policies, procedures, and practices to enable them to work with respect for the environment and their community.

In addition to compliance with applicable environmental legislation, regulations and policies, Argentia Renewables applies industry best practices for sound environmental stewardship at individual and corporate levels.

Environmental performance is measured by comparing environmental management achievements against environmental policy and, more specifically, the associated environmental management objectives and targets.

4.6.1 Environmental Policy

Argentia Renewables is committed to reducing its negative effect on the environment, and to incorporating sustainability into its core business operations. This is achieved by employing commercially reasonable measures throughout its operations. It is the policy of Argentia Renewables to conduct its operations in a manner that is environmentally responsible and befitting of a good corporate neighbor and citizen.

To further this policy, Argentia Renewables will:

- Operate its facilities in compliance with all applicable environmental laws and regulations, in a way that is protective of the health and safety of its employees and the surrounding communities and environment.
- Strive to improve environmental quality, by minimizing waste and emissions, reducing, reusing and recycling, purchasing environmentally preferable products, reducing the use of natural resources and promoting pollution prevention efforts throughout the company.
- Review its facilities and programs on a regular basis and establish goals for continuous improvement in the environmental arena.
- Encourage the integration of environmental considerations into business planning and decisions, including design, procurement, production and facilities management.

- Promote a workplace in which all employees are properly trained to comply with applicable environmental laws, regulations, and procedures, to meet environmental program goals and to take personal responsibility for protecting the environment.

4.6.2 Environmental Management Framework

Argentia Renewables has established an Environmental Management Framework (EMF) to guide the implementation of its Environmental Management Policy. Argentia Renewables has relied on the internationally recognized standard ISO 14001 in developing its EMF. This EMF is intended to achieve the following benefits through its implementation:

- Avoided or reduced negative environmental effects;
- Pro-active rather than re-active environmental and community management planning and control;
- Facilitation of continuous improvement;
- Improved operational structure and efficiency with regard to environment management;
- Foster good relations with the community and stakeholders;
- Achieve a level of environmental performance that goes beyond compliance with applicable laws;
- Affective management of environmental risks; and
- Efficient use of resources.

The EMF and associated management plans are Life of Project endeavours. They apply from the onset of the Construction Phase, throughout the Operations and Maintenance phase, and eventually during the Decommissioning and Rehabilitation phase of the Project. The key elements of the framework are illustrated in Figure 4.6.2-1.



Figure 4.6.2-1 Continuous Improvement Process of the Environmental Management Framework.

The Argentia Renewables approach follows the sequence of “Policy – Planning – Implementation and Operation – Checking and Corrective Actions – Management Review Process” that must be in place to ensure that the Project is executed in an environmentally and socially acceptable manner, consistent with a continuous improvement cycle and employing adaptive management principles. This approach follows the Plan-Do-Check-Act (PDCA) model, which is an iterative, four-stage approach for achieving continual improvement. It involves identifying objectives and targets, systematically testing possible solutions, assessing the results, and implementing the ones that are shown to work.

4.6.2.1 Roles and Responsibilities

The Chief Executive Officer of Argentia Renewables is responsible for obtaining an annual written statement of assurance regarding the degree of implementation and effectiveness of the Health, Safety, and Environment (HSE) Management System.

The Operations Manager is responsible for the HSE performance, the implementation of the HSE Management System, the maintenance of the HSE Management System, and for providing an annual statement of assurance to the Chief Executive Officer.

The HSE Officer will have prime responsibility for health, safety, and environmental duties including: provision of advice to management in meeting their HSE Management System responsibilities; development and implementation of a program for awareness; training and competency validation for staff; and Plan maintenance and performance documentation.

Employees will comply with all HSE rules and regulations, and promptly report any Health, Safety, and Environmental incidents. Employees will follow all Operational Controls. Argentia Renewables will implement and maintain the HSE Management System by providing the necessary human, material, and financial resources.

4.6.2.2 Planning

Planning encompasses a series of actions leading to development of management plans for selected environmental aspects. As part of the preparatory work associated with the Project, Argentia Renewables will conduct a Hazard Identification exercise for its planned operational activities. As reflected in the Project Registration, the company has identified the suite of legal and other regulatory requirements associated with the proposed undertaking. For each environmental aspect, manageable objectives and targets are being developed to measure progress and success in implementation of specific management plans.

By initiating HSE practices early in the Project life cycle, Argentia Renewables has been able to avoid many potentially adverse effects through the “designed-in mitigation” approach. Measures identified through this approach include:

- Appropriate water quality standards and treatment methods;
- Allowance for climate changes such as marine water levels in aspects of siting the Green Fuels Facility;
- Using state-of-the-art equipment with well maintained exhaust emission controls to reduce GHG emissions during the relatively brief Construction Phase period;
- Development and application of a Diversity Plan for personnel hiring, training, and promotion; and
- Implementing energy efficiency measures into building construction.

4.6.2.3 Management Plans

Argentia Renewables is continuing to develop and refine a suite of Management Plans to address identified environmental issues and concerns. Each plan follows a similar format to ensure completeness and consistency. Table 4.6.2-1 provides a listing of Argentia Renewables’ standard components with a description of the required contents for each section. Individual plans may vary depending on the selected topic, but also to address external requirements (e.g., regulatory permit conditions, industry standards).

Table 4.6.2-1 Argentia Renewables Management Plan Format.

#	Title	Description
1	Cover Page - Document Identification	a. Document title b. Corporate identification (owner of the document) c. Project phase, activity d. Affected facility/location e. Effective date
2	Document Control	a. Approval page- name, title signature of persons responsible for I. Document development II. Document approval III. Document implementation b. Documentation record of updates and amendments c. Document Distribution list
3	Table of Contents	Provide listing of sections of the plan. Paginate by section (1-1, 2-1 etc.) to facilitate updates.
4	Introduction	a. Describe the rationale for generating the document. b. Identify relevant environmental aspects and anticipated interactions. c. Identify how the document is to be communicated to users, and results reported to relevant stakeholders.
5	Legal	a. Identification of applicable legislation and regulations, as well as permits and approvals. b. Identify reporting and compliance conditions associated with permits and approvals.
6	Scope	Describe the scope for the plan, including: a. The subject matter addressed by the document. b. Relationship to other plans. c. Potential overlap/redundancy and how this is addressed/resolved. d. The relationship of the plan to employees, contractors, and other entities.
7	Objectives	a. Describe the planned outcome of the plan, including long term Goals, as well as interim Objectives and achievable Targets. b. Performance targets will comply (and where possible exceed) regulatory limits.
8	Roles and Responsibilities	Identify personnel responsibilities and reporting relationships for: a. Monitoring; b. Measuring; c. Observing; d. Acting (incident response); e. Reporting; f. Evaluating; and g. Approval.
9	Monitoring and Reporting	Identify: a. The parameters to be measured; b. The methods and procedures to employ; c. The means of documentation; d. The frequency of measurement; e. The contents of reports; f. Regulatory requirements for measurement and reporting; and g. Plan review procedures and participation.

#	Title	Description
10	Training	a. Identify required training by task and role. b. Identify orientation requirements for Project employees, site visitors, material, and service contractors. c. Describe method for records maintenance of training and qualification (append relevant records).
11	Emergency Contacts and Procedures	a. Provide contact information for internal (Argentia Renewables) reporting, as well as incident reporting (e.g., HSE emergencies). b. Include reporting forms to utilize in addressing emergencies.
12	Auditing	Identify audit procedures and provisions to facilitate task completion by internal audit team.
13	Plan Review and Updating	Describe procedures for participating in plan review, and for submitting suggestions for changes, improvements, and updating.
14	Appendices	As required to supplement plan documentation. All appendices need to be referenced in the main document.

Table 4.6.2-2 provides a summary of the required plans as laid out in the Environmental Assessment Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects (EAR-GWH), and as required by various government agencies. The plans that will be required to be developed by Argentia Renewables are shown as **bold** in Column two. Each of the **bolded** documents has been prepared to at least a full draft stage, subject to internal and/or external/regulatory review. These plans, and others to be developed, as and when a need is identified, will be implemented in all Project phases including Construction, Operation and Maintenance, Decommissioning and Rehabilitation, and ultimate closure.

Table 4.6.2-2 Summary of Plans Required for Argentia Renewables Project.

#	Plan Title	Components	Notes
1	Business Plan / Development Plan	a. Market analysis b. Products c. Marketing and sales strategy d. Management and Organization e. Financial Projections	Provides a detailed description of target market, competition, financial projections, and the strategies that will be used to achieve success. Long-term strategic goals and objectives for the Project will be set.
2	Project Execution Plan	a. Project Overview b. Scope and Objectives c. Project Organization d. Schedule e. Budget and Cost Control f. Quality Management g. Risk Management h. Health, Safety, and Environment (HSE) i. Procurement and Contracts j. Stakeholder Management k. Change Control l. Resource Control m. Closeout and Handover	Outlines the specific strategies, activities, and procedures to be followed during the execution phase of the Project. Essential for ensuring the Project is completed on time, within budget, and to the specified quality standards. Can be issued separately for each phase of the Project.

#	Plan Title	Components	Notes
3	Environmental Protection Plan	a. Document Control b. Purpose c. Corporate Environmental Policy d. Regulatory Requirements e. Scope and Objectives f. Project Overview g. Roles and Responsibilities h. General Environmental Protection Procedures i. Resource Specific Protection Procedures j. Area Specific Protection Procedures k. Mitigation Measures l. Monitoring and Reporting m. Contingency Planning n. Training	Can be issued separately for each phase of the Project. Drafted annotated table of contents appears in Project Registration Section 9.
4	Emergency Response/Contingency Plan	a. Inspections b. Preparedness c. Facilities, supplies, and equipment d. Fire/explosion e. Spills f. Medical emergencies g. Recovery h. Site clean-up and restoration operations i. Post Emergency Reporting	Developed to provide an organizational and procedural framework for the management of emergency incidents that personnel may encounter in the daily activities associated with the Project worksite. Provides further protection of personnel and property, as well as that of the surrounding environment.
5	Waste Management Plan	a. Organics b. Bulk material c. Hazardous materials	Describes all liquid and solid waste expected to be generated during Project activities for all components of the Project. Provides methods to reduce, reuse, recycle, recover, and/or manage residual waste through disposal. Can be issued separately for each phase of the Project.
6	Hazardous Materials Response and Training Plan	a. Objective b. Overview c. Responsibilities d. Training Requirements e. Emergency Response Equipment and Vehicles f. Review and Auditing Procedures	Outlines the requirements for hazardous material training and performance within the Argentia Renewables Site. Prescribes mandatory practices that assure adequate training and qualification of personnel whose job duties impact and influence hazardous material response. The program includes initial, and refresher training and qualification.
7	Transportation Impact Study and Traffic Management Plan	a. Scope and Objectives b. Roles and Responsibilities c. Road Infrastructure d. Traffic Analysis e. Transport Methods	This plan focuses on the road networks for the Project, comprising the wind turbine access roads and traffic movement through Argentia and the Port of Argentia.

#	Plan Title	Components	Notes
		f. Traffic Management Plan g. Monitoring and Reporting h. Training i. Emergency Contacts and Reporting j. Review and Auditing Procedures	Describes the utilization of existing infrastructure for transporting oversized Project materials and equipment during the Argentia Wind Facility construction, and the analysis of traffic volume along preliminary transportation routes. Delineates control measures for Project-related traffic and provides a description of transporter vehicles for oversized and overweight Project components.
8	Public Participation Plan	a. Engagement Strategies b. Engagement and Communications Tools c. Community and Stakeholder Feedback / Response Protocol d. Indigenous Engagement	Describes how the public would meaningfully participate in the planning of all phases of the Project and how they would continue to be consulted throughout the life of the Project, including in the monitoring of environmental effects.
9	Workforce and Employment Plan	a. Workforce Forecast b. Recruitment Strategy c. Employment Equity d. Benefits Agreement e. Tracking and Reporting	Outlines the positions required, timelines for employment, and a reporting schedule of the workforce and employment statistics throughout all phases of the Project.
10	Environmental effects follow up and monitoring programs (EEMPs)	a. Species at Risk Impact Monitoring and Mitigation Plan b. Post Construction Monitoring Plan	Mitigation, monitoring, and adaptive management frameworks for the SAR and species of concern, as it relates to the Project. Aims to meet the requirements for the issuance of a Section 19 permit under the NL ESA.

4.6.2.4 Plan Implementation

Implementation of each plan will include training and orientation for assigned tasks and responsibilities. Briefings will be arranged to familiarize all staff with the Argentia Renewables HSE Management System, and workshops used to familiarize staff with monitoring and documentation requirements.

Continuous Improvement follows the Plan-Do-Check-Act (PDCA) model, which is an iterative, four-stage approach for achieving continual improvement. The Check phase involves an evaluation of performance to confirm the effectiveness of management plans. This is achieved through a process of measuring performance against the environmental objectives and targets set within each plan. In all cases performance targets are made with awareness of regulated standards. Where possible, internal performance standards are set well within regulatory requirements. In that manner, corrective action can be taken in advance of any compliance failure.

Where there is an incident or performance failure (e.g., material spill), a review will be conducted to identify lessons learned and opportunities for improvement. This review will form the basis of implementing corrective action to reduce the likelihood of future system failures.

4.6.2.5 Management Reviews and Assurance

It is important that senior management regularly review the HSE Management System as well as individual plans to determine their continued suitability, adequacy, and effectiveness. Argentia Renewables will conduct internal audits to determine the degree of success in implementation of its HSE Management System, and to verify the level of performance within individual management plans. At least once a year, Argentia Renewables will conduct a formal review to assess corporate environmental, health and safety performance and to reconfirm their commitment to the Sustainable Development Policy.

5.0 Residual Effects

The Registration document has presented an assessment of the environmental effects of the proposed Project on the biophysical and socio-economic environments. Valued Components (VCs) were identified using guidance from NL DECC and based on the Project description developed for this Registration. A set of Key Indicators (KIs) were identified for each VC, and information was collected by assembling material available from Government and other agencies. Where gaps were identified, a program of field data collection was carried out using standard accepted practices.

Table 5.0-1 lists the VCs, the associated KIs, and the conclusion of the effects assessment. Note, that in some cases, a KI was not assessed due to an absence of any potential interaction. For example, the review of Historic Resources revealed that no Paleontological Resources or Burial, Cultural, and Heritage Sites were present in the Project Area, hence the lack of any potential interaction resulted in the exclusion of these KIs from the effects assessment. In one other case, there was an overlap between KIs. The Land and Resource Use VC included the KI “Protected, Special and Sensitive Areas”. Under the Terrestrial VC, a similar KI was identified as “Areas of Conservation Concern”. The effects assessment of these two KIs was carried out once and was presented under the Land and Resource Use VC.

Residual effects are those adverse environmental effects which cannot be avoided or mitigated, or that remain after the application of environmental control technologies and best management practices. Detailed mitigations are presented in Appendix W. In several cases, the indicated mitigation measures will be essential to the reduction of potential negative environmental effects; hence, an associated monitoring effort will be employed to confirm predictions and support a continuous improvement approach to environmental management. This requirement and commitment are especially applicable to interactions with Species at Risk.

This Registration presents information about the proposed Project and describes the existing biophysical and socio-economic environment to a level of detail that enabled a thorough assessment of environmental effects. Therefore, Argentia Renewables is confident in stating that the overall conclusion of its assessment is that there will be no significant residual adverse environmental effects from the Project.

Table 5.0-1 Index of Effects Assessment Conclusions by Valued Components and Key Indicators.

Valued Component	Key Indicator	Residual Effect
Atmospheric Environment	Greenhouse Gas (GHG) Emissions	Not Significant
	Air Quality	Not Significant
	Light	Not Significant
	Sound Quality (Noise)	Not Significant
	Vibration	Not Significant
Aquatic Environment	Surface Water Resources	Not Significant
	Ground Water Resources	Not Significant
	Freshwater Environment (Fish and Fish Habitat)	Not Significant
	Marine Environment (Fish and Fish Habitat)	Not Significant
	Fisheries and Aquaculture	Not Significant
	Species at Risk	Not Significant
	Habitats of Conservation Concern	Not Significant
	Marine Biosecurity	Not Significant
Terrestrial Environment	Flora	Not Significant
	Wetlands	Not Significant
	Fauna (Mammals)	Not Significant
	Avifauna	Not Significant
	Species at Risk	Not Significant
	Habitats of Conservation Concern[1]	Not Significant[1]
Land and Resource Use	Zoning	Not Significant
	Commercial and Industrial Resource Use	Not Significant (Positive)
	Recreational and Subsistence Resource Use	Not Significant
	Protected, Special and Sensitive Areas	Not Significant
	Indigenous Land Use	N/A
Heritage and Cultural Resources	Historic and Archaeological Resources	Not Significant
	Paleontological Resources	N/A
	Architectural Resources	Not Significant
	Burial, Cultural, and Heritage Sites	N/A
Socio-Economic Environment	Population Demographics	Not Significant (Positive)
	Community Health and Wellbeing	Not Significant
	Infrastructure and Services	Not Significant
	Economy	Not Significant (Positive)
	Employment	Not Significant (Positive)
	Business	Not Significant (Positive)
Human Health and Quality of Life	Air Quality[2]	Not Significant[2]
	Light[2]	Not Significant[2]
	Sound Quality (Noise)[2]	Not Significant[2]
	Vibration[2]	Not Significant[2]
	Shadow Flicker	Not Significant
	Ice Throw	Not Significant
	Recreational and Subsistence Resource Use[3]	Not Significant[3]
	Indigenous Land Use[3]	N/A[3]

NOTES
N/A = not applicable
[1]Assessed under Land and Resource Use – “Protected, Special and Sensitive Areas”
[2]Assessed under Atmospheric Environment.
[3]Assessed under Land and Resource Use.

6.0 Cumulative Effects

The Cumulative Effects of the proposed Project are to be considered, both with respect to within-Project interactions, as well as in terms of the potential environmental effects of the undertaking in combination with other ongoing and planned projects. Within-Project Cumulative Effects have been considered and incorporated into the Effects Assessment conducted for all VCs and associated KIs (See Section 4.0). In order to carry out a broader review of Cumulative Effects, it is necessary to identify these contributing activities which, along with the proposed Project, have the potential to interact with the receiving environment.

Listed below is a description of the contributing project/activities that has been identified for consideration of Cumulative Effects. By definition, the listing includes only candidates that overlap with the boundaries of the Project (i.e., Project Zone of Influence).

Past Activities:

- A key past undertaking is the Operation, Decommissioning and Site Restoration of Naval Air Station Argentia (McAndrew Air Force Base). Of particular note is the current condition and status of the land comprising the POA and its designation as an industrial site.

Ongoing Activities:

- Argentia Peninsula activities, including:
    - Commercial traffic to and from POA, including marine shipping and road traffic associated with POA activity;
    - Seasonal passenger Marine Atlantic ferry traffic;
    - Cenovus Concrete Gravity Structure Construction (West White Rose Project);
    - Aquaculture on-land support infrastructure (salmon rearing cage sites); and
    - Fish Plant operation.
- Government services and infrastructure, including federal, provincial and municipal (Town of Placentia) activities. These include water and sewer supply/maintenance, roadway upkeep, building construction and facilities maintenance;
- Local tourism industry, including sites operated and maintained by Government (e.g., Castle Hill, Visitors Centres), and private tourism accommodations (such as vacation rental properties);
- Inshore and nearshore Fishery (Argentia Harbour);
- Small quarry operations on the Argentia Peninsula and Argentia Backlands; and
- Long Harbour Nickel Refinery operation.

Planned Activities:

- Expansion of POA:
    - Plans are being developed for expansion to wharfage at POA and an Initial Project Description has been released from further assessment by the Government of Canada Impact Assessment Agency (IAA) as well as the Department of Environment and Climate Change (EA Division).
- Placentia Area Hiking Trails:
    - A local volunteer organization (Hike Placentia Inc.) with support from the Town of Placentia and the POA has proposed the expansion of hiking trails in and near the community, including the Argentia Backlands property of POA. The Undertaking has been approved subsequent to submission of a Project Registration in July 2023. Planning is under way for trail construction.
- Several potential wind-to-hydrogen projects are currently being planned for the island of Newfoundland, however, only one to date has demonstrated a firm intent to proceed as evidenced by the submission of a Registration under the provincial EA process. World Energy GH2 Inc. (Registration Number: 2202) proposes the Port au Port-Stephenville Wind Power and Hydrogen Generation Project (Project Nujio'qonik GH2). The project was released from EA in April 2024.

Each of the identified contributors to Cumulative Effects have been considered with respect to potential temporal and spatial overlap with the assessment boundaries of the Project. Table 6.0-1 provides an overview of the potential interactions that contribute to Cumulative Effects by VC.

Both the past activity at Argentia (Base construction, operation, closure and decommissioning) as well as the present ongoing activities and undertakings (i.e., Argentia Peninsula, Government Services, Tourism, Fishing, and Vale Long Harbour Nickel Processing Plant operations) interact with many of the VCs under consideration with respect to the Project. Past and present undertakings have been considered in the predicted future conditions of the Environment without the Undertaking (Section 3.3) and in the predictions of the Environmental Effects of the Undertaking (Section 4.1). Consequently, the identification of the Project Cumulative Effects will focus on planned projects and activities.

Table 6.0-1 Potential Interactions from Other Projects Contributing to Cumulative Effects.

Projects	Valued Components						
	Atmospheric	**Aquatic**	**Terrestrial**	**Land and Resource Use**	**Heritage, Culture**	**Communities**	**Economy, Employment, Business**
Past Activities							
Argentia Base*	N/A	N/A	Peninsula brownfield status; Argentia Backlands road network	Remediated status; zoning.	WW II installations; relocated communities	Relocated communities	N/A
Present Activities							
Argentia Peninsula*	Road traffic	Marine vessel traffic, existing marine outfalls	Road traffic	Road usage; water consumption/discharge	N/A	Accommodation, service, facilities consumption	Local hires, contract services
Government Services*	Vehicle operations	Water supply, sewage discharge	Road traffic	Zoning, land use management	Funding and provision of facilities	Provision of Community services	Employment
Tourism*	Vehicle operations	N/A	N/A	Camping, hiking, road traffic	Product consumption	Accommodations, service, facilities consumption	Accommodations, employment, goods and services consumption
Fishing*	Vehicle, boat operations	Commercial fishery - marine	N/A	N/A	Maintain cultural identity	Accommodations, service, facilities consumption	Maintained economic activity, employment, procurement of goods and services.
Vale Long Harbour*	N/A	N/A	N/A	N/A	N/A	Accommodations, services, facilities consumption	Continuing employment for local residents
Planned Activities							
Argentia Port Expansion	Construction equipment; vessel operations	Marine environmental quality from increased traffic.	N/A	Continued usage as per zoning designations.	N/A	Increased demand on services during construction	Increased economic activity during construction, operation
Trails	N/A	N/A	Trail construction	Continued usage as per zoning designations.	N/A	Improved services	Modest expenditures for trail construction, maintenance

Projects	Valued Components						
	Atmospheric	**Aquatic**	**Terrestrial**	**Land and Resource Use**	**Heritage, Culture**	**Communities**	**Economy, Employment, Business**
			and operation				
Wind-Energy	N/A	N/A	N/A	N/A	N/A	N/A	Potential competition for skilled labour and services.

*Note: Past (Argentia Base) and present (Argentia Peninsula, Government Services, Tourism, Fishing, Aquaculture) undertakings form part of the "existing environment" and are addressed in the effects assessment sections for all VCs and Key Indicators.
N/A = not applicable - no interaction identified/predicted.

6.1 Effects Predictions

The Cooper Cove Marine Terminal Expansion (Argentia Port Expansion) as proposed by POA will provide additional wharf space and quayside infrastructure to enhance berthage and cargo flow. The expansion would include a roll-on-roll-off ramp to streamline vessel loading and increased storage to support cargo activities. A phased approach spanning 29 months is proposed and construction would include seabed dredging, armour stone shoreline protection and infilling. A description of the Project can be found on the NL DECC webpage at: https://www.gov.nl.ca/ecc/projects/project-2279/. The undertaking was released from further environmental assessment by the Minister on January 18, 2024. The Impact Assessment Agency of Canada completed its review of the Initial Project Description and on April 08, 2024, posted its Notice of Opinion that an impact assessment would not be required for the project (https://iaac-aeic.gc.ca/050/evaluations/document/157097?culture=en-CA). All phases of the Cooper Cove Marine Terminal Expansion will generate interactions with several of the VCs associated with the Argentia Renewables Project. The Cooper Cove Marine Terminal Expansion area encompasses a section of the Argentia Peninsula brownfield site, as well as the adjacent coastline where dredging and infilling is anticipated. As well, the undertaking is anticipated to result in increased marine traffic for the POA. As a result, there will be interactions with the Atmospheric VC (noise, dust, exhaust emissions) from vehicle traffic. The Cooper Cove Marine Terminal Expansion will interact with the marine component of the Aquatic VC through potential changes in water quality as well as habitat alterations. Further, it will result in a marginal change in current and anticipated vessel traffic for POA. The Community VC interactions will include increased demand on municipal services, especially during Construction Phase. The Economy, Employment and Business VC will see increased levels of activity during all stages of the undertaking.

The Placentia Area Hiking Trails involves the extension to an existing network of trails in the Placentia area, including through the Argentia Backlands (https://www.gov.nl.ca/ecc/projects/project-2257). These will serve both area residents and visitors. Hiking has become a major outdoor activity in the region and the province and has attracted tourists seeking outdoor experiences. In a September 13, 2023 Decision Letter issued by the Minister (https://www.gov.nl.ca/ecc/files/env_assessment_y2023_-2257_Decision-Letter.pdf), the Placentia Area Hiking Trails was released from further assessment subject to conditions including application of buffer zones for vegetation clearing to protect both raptor nesting sites, as well as wetlands and water bodies. A cooperative arrangement has been reached between Argentia Renewables and Hike Placentia Inc. to take advantage of potential synergies and avoid conflicts associated with route selections (access roads, trails) and access. The construction and operation of the trails will generate modest interactions with four VCs - Terrestrial, Land and Resource Use, Communities, and Economy Employment and Business. The Terrestrial VC will be affected by vegetation removal required for trail construction; however, this interaction will be minimized through a process of careful planning of routes and integration into the linear access network required for Construction and Operation and Maintenance Phases of the wind turbines. The interaction with the Land and Resource Use VC will

be fully compatible with the property zoning of the Argentia Backlands area and result in a modest increase in utilization of the area. Interaction with the Communities VC will be positive by making an outdoor recreational resource available to residents and tourists. The interaction with the Economy Employment and Business VC will be small but positive through the purchase of materials and services and employment (other than volunteer efforts) required for trail construction and maintenance.

The Port au Port-Stephenville Wind Power and Hydrogen Generation Project (Project Nujio'qonik GH2) has recently been released from the Environmental Impact Assessment process (https://www.gov.nl.ca/ecc/projects/2202-2/). While physically distant from the Argentia area, the project would potentially involve construction over the same timeframe as the Argentia Renewables Project and would likely draw on similar construction skills and trades. The inclusion of this project in the Cumulative Effects Assessment is therefore confined to consideration of the "Economy, Employment and Business" VC. On a Province-wide scale, the available labour force has the capacity to meet the anticipated demands of the Argentia Renewables Project in combination with other planned projects. For selected trades, additional training resource needs have been identified and measures have been identified and commitments made to meet this anticipated demand.

The West White Rose project, located on the Argentia Peninsula, is nearing completion and scheduled for tow out prior to the commissioning of the Argentia Renewables Project. This West White Rose project is an existing user of the municipal water supply in Placentia and once complete will reduce the demand on the municipal system. The population of Placentia was 3,289, according to the latest census completed in 2021. Compared with the 2021 census, a 6.0% decrease in population was observed since the 2016 census (3,498), and a 9.8% decrease was observed since the 2011 census (3,646). Additional information on the Town of Placentia's population decline is provided in Appendix G -Socio-Economic Baseline Study. Given the above, the cumulative effects of future municipal and industrial users on the municipal system are predicted to be "not significant".

In summary, it is predicted that the effects of the Project at all stages will result in minimal overlap with interactions from other undertakings and activities. As a consequence the Cumulative Environmental Effects of the Project on Valued Components of the environment, in combination with effects from other planned or ongoing undertakings are predicted to be "not significant".

7.0 Assessment Summary and Conclusions

This Registration document includes all the elements for a comprehensive environmental assessment, according to (1) the *Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects,* (2) *Environmental Assessment: A Guide to the Process,* and (3) the *Environmental Assessment Regulations (2003)* under the **Environmental Protection Act.**

For this Undertaking, predictions were developed for:

- The future condition of the environment in the absence of the Project;
- The predicted environmental effects of the Undertaking, including the effects of Accidents and Malfunctions (Unplanned Events);
- The effects of the environment on the Project; and
- The cumulative effects of the Project when combined with the effects of past, present, and planned projects/activities.

The scope of the Project includes a modest Project infrastructure footprint, mostly limited to the private property of the POA. Temporal, spatial and administrative boundaries were established for the Project, terminology was standardized, and the assessment methodology was developed through consultation with appropriate agencies.

Effects predictions for the Project were derived from empirical results. In all cases, conservative assumptions were made, especially where Project details (e.g., final designed turbine and transmission structure siting) are yet to be determined, or where alternatives were still under consideration.

7.1 Assessment Summary

The future condition of the environment in the absence of the Project would be a presumed continuation of the status quo for the area. The private land of the Backlands would remain in its mosaic condition of several ecotypes of forest, wetland and scrub, and anthropogenic use would be primarily limited to outdoor enthusiasts. Meanwhile, the Argentia Peninsula would continue to be dominated by industrial anthropogenic use. However, accompanying the status quo would be the forgone benefits of the Project to the region associated with socio-economic benefits to the economy, employment, business, and community health.

The effects of the environment on the Project will be predominantly attributed to climate change predictions for increased variability in storms and storm surges, precipitation, and temperature. These phenomena have been considered in Project design. Meteorological monitoring stations will characterize and model local climate phenomena throughout the Project life.

Several other projects could contribute to cumulative environmental effects for the Project Area, LAA, and RAA. One notable planned undertaking is the Cooper Cove Marine Terminal Expansion (Registration No. 2279) at the POA, which has been released from provincial and federal environmental assessment.

The Project effects assessment (below) incorporated (as a Project phase) the effects of Unplanned Events (Accidents and Malfunctions).

7.1.1 Project Effects Assessment

The following text is intended to provide an overview summary of the results from the detailed assessment presented in Chapter 4.0. Refer to Chapter 4.0 for detailed explanations of the interactions with Project phases and activities, descriptions of effects predictions (by KI), details on mitigation and monitoring measures, and the rationale for each effects prediction.

Atmospheric Environment

This VC comprises airborne contaminants, greenhouse gases, light, noise and vibration. Modelling was conducted to provide quantitative predictions for each. Interactions were identified for all Project phases, including Unplanned Events. A specific Energy and Emissions Study (Appendix H) was conducted to provide emission rates and dispersion for the Construction and Operation and Maintenance Phases. Conservative assumptions were employed throughout.

Greenhouse Gas (GHG) emissions were a high priority for the Atmospheric Environment. Results from modelling indicated that atmospheric levels of GHGs will not be measurably changed because of the Project. From a GHG perspective, the Construction and Operations and Maintenance Phases will have low GHG emissions, with the only possible exception being the marine shipping of the ammonia overseas during Operations. Decommissioning will also have low GHG emissions. Since the primary goal of this Project is decarbonization, the Project will produce ammonia from renewable energy (i.e., instead of using natural gas as is common around the world) and the Project will likely have a net positive benefit concerning GHGs.

The extent to which artificial lighting and sound will affect receptors (including nearby residents) was modelled. Given the Project location, there will be limited potential for interactions of receptors with Project lighting. Modelling results indicate the Project will be in full compliance with applicable guidelines

associated with light emissions. Modelling of turbine blade noise was based on the worst-case scenario (i.e., the largest turbines possible for the Project were modelled, even though their likelihood of being employed was extremely low). Construction noise was predicted to have a minimal to negligible effect on nearby receptors. During Operations, noise levels will also remain within guidance levels.

Due to the establishment of minimum setback distances of at least the greater of 600m or 3.0 times the blade tip height of the wind turbines sensitive receptors will not be impacted by vibration, therefore vibration was considered negligible.

Aquatic Environment

The Aquatic Environment encompasses both freshwater and marine environments, with the freshwater environment likely experiencing more interaction with the Project given that the only marine interactions would be through the shipping of product and the outfall of wastewater.

Surface water will be required for the Argentia Green Fuels Facility and will interact with construction activities. Therefore, both surface water quantity and quality were considered for the assessment. The assessment was based on regulatory standards and guidance to protect water quality, including for outfalls and discharges. Surface water resources will experience disturbance associated with civil construction, especially in the Argentia Backlands where access roads and tower foundations will be constructed. By applying proven mitigation measures (e.g., stormwater controls, Project drainage plan), there will be minimal and ephemeral effects on water quality. During Project Operations, there will be a steady extraction of freshwater for the Argentia Green Fuels Facility. Approximately 80% of the inflow water will be released for marine discharge, with minimal change in water quality and adherence to provincial regulations. An examination of hydrological cycles confirms the capacity of the selected watersheds to provide this quantity of water without compromising other uses. Argentia Renewables commits to the curtailment of water use if water quantity becomes a concern for the other users.

Groundwater in the Project area is not planned to be utilized to meet Project requirements and there will be few aspects of the Project that will interact with groundwater. The potential effects of the Project on groundwater are considered minimal.

Small portions of the watersheds within the Project Area will be affected by habitat alteration and changes in streamflow rates during the construction of access roads, transmission lines, and turbine foundations. These short-term disruptions will be subject to a set of standard mitigation measures to avoid or minimize negative effects. During the Operations Phase, there will be minimal to negligible interactions.

Interactions with marine fish and fish habitats could result from surface runoff during Construction (although that interaction is unlikely to be significant) as well as freshwater discharges at an industrial outfall. Compliance with regulatory standards will reduce or eliminate potential negative effects.

Local fisheries and aquaculture operations in the LAA and RAA will not be meaningfully impacted by Project construction or the monthly product shipments during Operations. The FFAW has been consulted and was not concerned with the level of marine interaction of this Project.

Several freshwater and marine SAR were identified as present or potentially present in the RAA. However, there were no interactions identified that would affect these species or the areas containing habitats of conservation concern.

Aquatic invasive species can be present in ballast water or attached to vessel hulls. Several such species are currently present in Placentia Bay, and DFO has taken measures to limit their spread. All appropriate precautions will be taken during vessel operations to prevent the introductions or spread of invasive species.

Terrestrial Environment

The major biophysical interactions resulting from the Project will be with the Terrestrial Environment. Extensive field surveys were conducted on several KIs to support the effects assessment. First, an Ecological Land Classification (ELC) was conducted to serve as the foundation for assessing habitats for KIs and for stratifying field surveys by habitat type. Interactions with flora and fauna could then be assessed according to the habitats present within the Project Area (or LAA, if necessary). While many of the interactions with the Terrestrial Environment VC will occur during the Construction Phase of the Project, several will continue during Operations and Maintenance, including perhaps the most important interactions, with avifauna and with SAR bats and avifauna.

Some areas of vegetated land will be altered, lost, or fragmented due to the development of Project infrastructure like roads, transmission lines, and turbine foundations. Any habitats known to contain SAR plants or lichens will be avoided during site planning (e.g., the yellow birch stands known to contain blue felt lichen).

Wetlands are primarily represented by many bogs and fens (and complexes of each) in the Backlands portion of the Project area. Planning the road routes and turbine locations to avoid and minimize effects on wetlands will help minimize any direct wetland loss, and special precautions during construction near wetlands will avoid or minimize interactions.

For the brownfield portion of the Project Area (i.e., the Argentia Peninsula,) the anthropogenically altered landscape limits the potential for many terrestrial species, especially those that are habitat specialists of forested landscapes. Most of the species using the Argentia Peninsula would be limited to habitat generalists (that are rarely of any conservation concern) or those that specialize in disturbed (e.g., water pygmy-weed) or open habitats (e.g., Short-eared Owl). A greater number of interactions are possible in the Backlands portion of the Project Area due to the more forested nature of the area, and the mosaic of different species compositions and age structures provides niches for a diversity of species to use the area. Bird species surveyed were comprised of a typical suite of resident and migratory species. Generally, during the temporal window of Construction, there will be avoidance behaviours exhibited for many species of birds and mammals. Road, transmission line, and turbine foundation construction will fragment habitats for some species, but mitigation measures (e.g., using existing roads and disturbed areas) will help reduce the potential for negative effects. The Operations Phase will likely have an overall reduction in potential interactions from a species diversity perspective, due to reduced activity. However, wind turbine operation will provide the possibility of continuing interactions with some species, including bat and bird SAR.

The SAR observed in the Project Area included four birds, four bats, two plants, two lichens, and one insect species. Additional survey time was allocated to ensure all SAR using the Project Area had a higher probability of detection. A draft Species at Risk Impacts Mitigation and Monitoring Plan (SAR IMMP) (Appendix R) was developed and includes a suite of proposed mitigation and monitoring measures that were developed through consultations with regulatory agencies and scientific literature. As more Project planning and implementation is conducted, adaptive management principles will be incorporated to ensure that appropriate mitigation measures will be applied during all Project phases.

An extensive suite of mitigation measures was compiled in consultation with Newfoundland and Labrador Wildlife Division, and mitigations will be implemented during all Project phases. As a result, there will be no significant negative residual environmental effects from the proposed Project on the Terrestrial Environment VC. Collisions with turbines by SAR bats and birds will be monitored extensively with a Post Construction Monitoring Plan (Appendix S), and a curtailment schedule will help protect SAR bats during their most vulnerable temporal windows.

Land and Resource Use

The Land and Resource Use VC included several KIs, including Zoning, Commercial and Industrial Resource Use, Recreational and Subsistence Resource Use, Protected, Special and Sensitive Areas, and Indigenous Land Use. Given the location of the Project Area (primarily within the boundaries of private property owned by the POA), there were few potential interactions of concern. The Project is within the Town of Placentia municipal boundaries and complies with most existing zoning (applications

will be submitted where changes are required). The Project has the potential to affect access to mineral land tenure, but the location of properties is such that no direct conflict results.

The Canadian Coast Guard Vessel Traffic Centre is supported by a radar system within the POA property. A detailed examination of wind turbine and permanent meteorological tower locations, in consultation with the Canadian Coast Guard, will ensure there is no unacceptable interference with the operation of the radar system. Several consultations have taken place with the Canadian Coast Guard, and it is anticipated that several turbines will be relocated in the final Project wind turbine layout to avoid interference.

Recreational and subsistence activities are common in the Project Area, particularly in the Backlands, but the Project will result in minimal interference with these usages. A planned hiking trail expansion (by Hike Placentia Inc., Registration 2257) is being developed and includes the Backlands. This trail system may avail of Project linear features, with routing selected to ensure safe access along the trail. The Project is working closely with Hike Placentia Inc. to ensure not only mutual compatibility between the Project and the hiking trail expansion but also collaboration (e.g., incorporation of wind energy into educational components of the hiking trail expansion).

Heritage and Cultural Resources

A review of known and potential archaeological resources identified some areas where precautions will need to be taken, but there are no sites in direct conflict with the Project footprint.

Socio-Economic Environment

This VC was assessed in terms of Community interactions, as well as Economy, Employment and Business.

Community population growth, as well as changes in age structure and diversity, were considered. Community health and well-being was examined with respect to education, income, housing, food security, health and social services, and diversity, equity and inclusion. The consideration of community infrastructure and services included water and sewer, waste management, transportation, utilities, communications, emergency and prevention services, and recreation.

The local economy, employment and business were examined in terms of GDP, tax revenue, labour supply, employment equity and diversity, other economic sectors, and capacity and growth.

Overall, the effects on the local communities will be positive, given the size and duration of the Project. The effects on socio-economic factors will be generally positive for the regional economy, employment

and business. The presence of Argentia Renewables at the POA industrial site will contribute to increased employment through direct hires, as well as associated economic activity, leading to improved stability of demographics, community health and well-being. Additionally, the Project will develop, in consultation with community stakeholders, a community benefit program to advance civic interests in the area that will include not only specific projects (e.g., working with Hiking Placentia Inc., long-term funding of the Cape St. Mary's Ecological Preserve) but also general funds that will be used based on community stakeholder priorities).

Human Health and Quality of Life

Many of the interactions with the potential to affect human health and quality of life were considered under other VCs. Atmospheric Environment included assessments of air quality, GHGs, light, noise, and vibration. The results of modelling concluded there will be no significant negative residual effects from these interactions.

Recreational and Subsistence Resource Use were considered under the Land and Resource Use VC and it was concluded that there will be no significant negative residual effects, and may perhaps result in a net positive given the creation of a new hiking trail and the potential contributions that Argentia Renewables will be able to make to that trail system.

Shadow flicker and ice throw from wind turbine blades during Operations were considered in the Human Health and Quality of Life VC. Shadow flicker occurs when sunlight passes through the moving blades and results in a moving shadow. Modelling indicated only one potential wind turbine location where mitigation measures may be required to reduce or avoid this interaction. Ice throw can occur during changes in air temperature such that accumulated ice on the turbine blades is thrown from the turbines. Modelling produced estimates of ice throw distances under extreme conditions. In no case do the distances reach residences or properties adjacent to the Project Area. Moreover, additional mitigation measures have been implemented on top of residence setback distances (e.g., all wind turbines will be equipped with winter weather and deicing features).

7.2 Assessment Conclusions

There are no predicted significant negative residual environmental effects of the proposed Project on the environment. The two key considerations were concerning SAR (i.e., the collision of SAR birds and bats with turbine blades) and the potential effects of catastrophic Unplanned Events (e.g., hydrogen leak with fire, ammonia leak).

There are several uncertainties associated with the effects on SAR, especially bats. Population estimates are unclear due to a general lack of survey effort in the province, migratory routes for certain species are

unknown, and responses to mitigation measures are unclear. The Province has taken a cautionary approach with curtailment guidelines and Argentia Renewables is committed to adherence to these standards. In addition, a draft Species at Risk Impact Mitigation and Monitoring Plan and Post Construction Monitoring Plan have been included in this Registration document (Appendices R and S, respectively). However, the Project has committed to operational seasonal curtailment to minimize impacts to bats as well as state of the art technology to refine operational minimization of bat impacts (e.g., thermal cameras and acoustic monitoring utilizing machine learning to develop 'smart' curtailment).

Using a risk assessment approach, modelling was carried out for "worst case" scenarios for Unplanned Events. The two possibilities with the potential for severe consequences would be the uncontrolled release of plant products – hydrogen and/or ammonia. Modelling indicated that the effects in both cases would be brief and confined to the Argentia Peninsula. Measures will be taken to ensure that the risk of such incidents would be extremely remote, and a high level of emergency preparedness will be at the core of Argentia Renewables Environment, Health, and Safety Management System.

Overall, most interactions will occur during Project Construction, over a proposed 29 month period. During this time a suite of standard mitigation measures will help avoid interactions, minimize effects, or both. Interactions with VCs will decline during Operations and Maintenance, but some will require monitoring and adaptive measures (in particular to address concerns with SAR). Once in the Operations and Maintenance Phase, there will be minimal other interactions with the biophysical environment but continuing positive interactions with the surrounding communities. Interactions during Decommissioning and Rehabilitation will be similar to, but reduced from, Operations and Maintenance. Unplanned Events are unlikely to result in interactions that result in significant negative residual effects.

The overall conclusion of the Environmental Effects Assessment for this Project Registration is that there are no significant negative residual environmental effects predicted for the proposed Argentia Renewables Project. Given the small spatial scale (relative to other proposed wind-to-hydrogen projects) and the environmental and socio-economic benefits of this Project, it is reasonable to conclude that there are few predicted negative environmental effects but many positive effects.

8.0 Stakeholder and Indigenous Consultation

Argentia Renewables recognizes that consultation is the cornerstone of the EA process. Argentia Renewables' commitment to clear and transparent consultation with stakeholder and Indigenous Peoples started at the earliest stages of planning for the Project and will continue throughout the duration of the Project.

Argentia Renewables' commitment to respecting communities and culture is the foundation for its engagement approach. At the core of this commitment is the establishment of trust and accountability with local communities; this starts with meaningful consultation where stakeholders and Indigenous Peoples have a clear understanding of the Project early in the EA process.

Argentia Renewables, and affiliate of Pattern Energy Group LP, communicates with stakeholders early and often, incorporating the feedback received to create lasting positive impacts for the communities where they have a presence. Argentia Renewables supports communities through local investment, job creation, and long-term philanthropic giving.

When Argentia Renewables identifies an area for development, they collaborate with landowners, individuals, groups, and local community members to gather information. Research and local engagement inform the risks and opportunities assessments, aiding in the creation of a project-specific community engagement plan.

Argentia Renewables' engagement team supports development efforts by conducting area research, devising tailored engagement plans, and representing the company in the community. Argentia Renewables proactively engages in regular and respectful information sharing, and problem-solves with stakeholders to shape a project or outcome.

During Project development, Argentia Renewables strives to set expectations about what construction and operations will look like, how their relationships with landowners and communities will evolve over the next 30 years, what communications stakeholders should expect from the company, and what community benefits may entail.

Argentia Renewables strongly believes in the value and opportunity that exist through meaningful partnerships with Indigenous communities. Argentia Renewables' Principles and Best Practices for Indigenous Engagement guide their work. Argentia Renewables bases their approach on respect for the rights of Indigenous Peoples and their diverse cultures, and on a commitment to sharing economic growth opportunities with them – a commitment upheld for over a decade.

Argentia Renewables' engagement with landowners and the community does not end after Project development. Argentia Renewables strengthens their involvement during construction by creating construction jobs and direct spending with local suppliers. Once a facility becomes operational, Argentia Renewables continues to give back to local economies over the long-term through landowner lease payments, property taxes that support civic and emergency services and local schools, and contributions to local causes through sponsorships, donations, and formal benefit agreements. Argentia Renewables also builds relationships during operations by giving presentations and hosting tours for students and community groups at their sites.

Community relations plans unique to each facility continue documenting Argentia Renewables' engagement, communications, and giving activities during Operations and Maintenance. These plans are regularly updated as actions evolve from community feedback and experiences.

Argentia Renewables has used various methods to engage with interested groups to establish a flow of information with the objective of identifying questions and concerns and seeking perspectives and feedback for consideration in Project planning.

Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects recommends that public and Indigenous consultation is undertaken to address any concerns prior to registering the undertaking for EA, and to consider identifying and contacting local community representatives, government representatives (municipal, provincial, and federal), Indigenous Peoples, and other stakeholders who may have an interest in the proposed undertaking. Consultation and associated issues scoping activities for the Project that involved government departments and agencies, stakeholder and Indigenous Peoples, and the general public are summarized in this chapter.

8.1 Key Stakeholder and Indigenous Groups

Prior to commencing consultation activities, key stakeholder and Indigenous Peoples were identified through desktop research and consultation with local groups and organizations. The list of key stakeholder and Indigenous Peoples is presented in Table 8.1-1. As the Project advances through the subsequent phases, the list will evolve as new groups and organizations express an interest.

Table 8.1-1 Key Stakeholders and Indigenous Peoples List.

Category	Group/Organization
Government	Government of Newfoundland and Labrador Government of Canada
Indigenous	Miawpukek First Nation Qalipu First Nation First Light
Municipalities	Town of Placentia Town of Fox Harbour Town of Long Harbour – Mount Arlington Heights Town of St. Brides Town of Point Lance Town of Placentia Volunteer Fire Department
Industry	Energy NL NL Hydro NL Construction Association Women in Resource Development Corporation Professional Engineers and Geoscientists of Newfoundland and Labrador Atlantic Groundfish Council Newfoundland Aquaculture Industry Association
Business	Port of Argentia Placentia Chamber of Commerce Avalon West Community Business Development Corporation Newfoundland and Labrador Organization of Women Entrepreneurs Marine Atlantic
Education	Memorial University of Newfoundland College of the North Atlantic
Environmental advocacy	Econext Nature NL Aquatic Conservation Initiative (Formerly Northeast Avalon Atlantic Coastal Action Program (NAACAAP)) Nature Conservancy of Canada
Unions and Labour	Fish Food and Allied Workers Union (FFAW) Trades NL Construction Labour Relations Association (CLRA) Indigenous Skilled Trades Office
Local interest groups and organizations	Hike Placentia Community Connections Housing Coalition Land users (wood harvesters, hunters, recreational vehicle users)

8.2 Government Department and Agency Consultation

Argentia Renewables' regulatory and stakeholder engagement has been ongoing since August 2022. Argentia Renewables is dedicated to active and ongoing consultation with federal and provincial regulators, staring early in the Project conceptualization phase and maintaining regular communication throughout the EA planning process. Argentia Renewables is committed to an iterative approach, actively seeking and integrating feedback into Project development and planning.

Email correspondence and meetings have been held to provide an overview of the proposed Project and to discuss each department and agency's expectations as they relate to the *Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects* (Government of Newfoundland and Labrador 2023). In addition, government departments and agencies were invited to four public information sessions to hear comments directly from the community.

A summary of Project related consultation with provincial and federal government departments is provided in Table 8.2-1, including the method of consultation and the purpose and focus. These activities were arranged through email and phone call correspondence. Questions and concerns received from government, and Argentia Renewables' responses, are included in Section 8.5.

Table 8.2-1 Summary of Regulator Consultation.

Date	Department/Agency	Method	Purpose and Focus
August 31, 2022	Department of Fisheries, Forestry and Agriculture	Email	Communication regarding the status of the Cape Shore Caribou herd.
September 21, 2022	NL Hydro	Meeting	Initial Project introduction and overview.
September 28, 2022	Department of Fisheries and Oceans	Email	Request for information regarding the Placentia Bay shipping corridor.
September 29, 2022	Department of Industry, Energy and Technology	Email	Discussion regarding the land nomination submission and meteorological tower permits.
October 5, 2022	Department of Municipal and Provincial Affairs	Email	Communication regarding Local Service Districts in the Cape Shore area.
October 7, 2022	Department of Industry, Energy and Technology	Phone call	Conversation to confirm that there are no active local service districts in the Cape Shore area.
November 8, 2022	Department of Environment and Climate Change - Water Resources Management Division	Email	Correspondence to provide background information on green hydrogen projects.
November 14, 2022	Department of Environment and Climate Change - Water Resources Management Division	Email	Correspondence regarding preliminary project infrastructure.
November 23, 2022	Department of Environment and Climate Change - Water Resources Management Division	Email	Correspondence regarding Project activities near Public Protected Water Supply Areas.
May 15, 2023	Department of Environment and Climate Change - Environmental Assessment Division	Email	Provide information on proposed air quality baseline studies.
May 18, 2023	Department of Environment and Climate Change - Environmental Assessment Division	Email	Request for guidance regarding notifications for public information sessions.
May 17, 2023	Department of Health and Community Services	Meeting	Discussion regarding proposed air quality baseline studies.

Date	Department/Agency	Method	Purpose and Focus
May 24, 2023	Department of Environment and Climate Change - Environmental Assessment Division	Email	Introduction to the baseline studies team.
June 1, 2023	Department of Fisheries, Forestry, and Agriculture -Paddy's Pond District Office Forest Management	Phone call	Discussion regarding permitting for Meteorological (MET) towers.
June 8, 2023	Department of Fisheries, Forestry, and Agriculture	Email	Request for information on commercial woodcutting permits.
June 28, 2023	NAV Canada	Email	Request for information regarding the process to change a MET tower height.
July 12, 2023	Department of Environment and Climate Change - Water Resources Management Division	Meeting	Discussion regarding the methodology used to delineate wetlands, water use license, and consultation with watershed users.
July 20, 2023	Department of Indigenous Affairs and Reconciliation	Meeting	Initial Project introduction and discussion regarding Indigenous consultation
September 6, 2023	Department of Industry, Energy, and Technology – Mineral Lands Division	Meeting	Initial Project introduction and discussion regarding the division's expectation for Registration.
September 7, 2023	Department of Environment and Climate Change - Pollution Prevention Division	Meeting	Project update and discussion of Department expectations regarding the EA Registration. Discussion regarding Project wastewater discharge.
September 7, 2023	Transport Canada	Meeting	Discussion regarding marine components of the Project and transportation of dangerous goods.
September 8, 2023	Department of Health and Community Services – Public Health Division	Meeting	Initial Project introduction and discussion regarding the Department's expectation for the Registration, with respect to the human components of the Project. Interest in information such as shadow flicker modeling, impact on receptors, and setbacks.
September 12, 2023	Department of Tourism, Culture, Arts and Recreation – Tourism Product Development Division	Meeting	Discussion regarding the viewscape (viewshed) assessment, approaching from water and land, and recommendations for consultation/collaboration with local businesses and Visitor Centre.
September 12, 2023	Department of Environment and Climate Change-Natural Areas Division	Meeting	Discussion regarding baseline studies, best management practices, shipping traffic, and ecosystem components.
September 14, 2023	Environment Canada - Meteorological Services	Meeting	Initial Project introduction and discussion regarding the location of

Date	Department/Agency	Method	Purpose and Focus
			Environment Canada's radar station in proximity to turbine locations.
September 18, 2023	Department of Digital Government and Service NL	Meeting	Initial Project introduction and discussion regarding department requirements.
September 18, 2023	Department of Fisheries and Oceans Canada	Meeting	Discussion regarding freshwater drawdowns, baseline studies, and triggers for federal impact assessment.
October 5, 2023	Department of Fisheries, Forestry, and Agriculture - Wildlife Division	Meeting	Discussion regarding targeted surveys for short-eared owls.
November 15, 2023	Department of Justice and Public Safety - Fire Services Division	Meeting	Discussion regarding an Emergency Response Plan.
December 5, 2023	Department of Fisheries, Forestry, and Agriculture - Wildlife Division	Meeting	Discussion regarding a comprehensive muskrat survey.
January 9, 2024	Department of Tourism, Culture, Arts and Recreation	Email	Provided a draft of the viewshed analysis.
January 9, 2024	Department of Environment and Climate Change	Email	Request for guidance regarding regulated and prohibited activities in a Public Protected Water Supply Area.
January 10, 2024	Department of Fisheries and Oceans	Email	Correspondence regarding the location of wind turbines in proximity to Canadian Coast Guard (CCG) radar towers.
January 16, 2024	Department of Environment and Climate Change	Email	Provided information regarding the Project geotechnical investigation for review and response.
January 18, 2024	Department of Environment and Climate Change	Email	Invitation to review scope of desktop work for the Placentia water supply.
January 19, 2024	Canadian Coast Guard	Meeting	Discussion regarding Canadian Coast Guard radar towers.
January 21, 2024	Department of Industry, Energy, and Technology	Phone call	Inquiry made to acquire additional data, maps or descriptions of the historic Silver Cliff Mine, located near Broad Cove, Argentia.
January 22, 2024	Department of Environment and Climate Change	Email	Correspondence regarding conducting the geotechnical scope
February 5, 2024	Department of Environment and Climate Change	Email	Provided the Argentia Renewables Green Ammonia Plant Feasibility Study.
Feb 6, 2024	Department of Environment and Climate Change	Email	Correspondence regarding rare lichen
February 7, 2024	Department of Municipal and Provincial Affairs – Land Governance and Planning Division	Meeting	Discussion regarding the role of municipalities in project development and the Departments expectation regarding the EA registration.

Date	Department/Agency	Method	Purpose and Focus
February 13, 2024	Department of Transportation and Infrastructure	Email	Correspondence regarding traffic information and usage data for Route 100 and 102, in the Placentia and Argentia areas.
February 13, 2024	Department of Environment and Climate Change	Meeting	Discussion regarding the Waste Management Plan
February 29, 2024	Department of Industry, Energy, and Technology	Meeting	Discussion regarding quarry sites
March 5, 2024	Department of Environment and Climate Change	Meeting	Discussion regarding Management of Greenhouse Gas Regulations
March 8, 2024	Department of Immigration, Population Growth and Skills	Meeting	Discussion regarding workforce and labour opportunities and challenges
March 14, 2024	Department of Environment and Climate Change	Email	Correspondence regarding rare lichen
March 18, 2024	Department of Environment and Climate Change	Email	Correspondence regarding rare lichen
March 25, 2024	Environment and Climate Change Canada's Canadian Wildlife Services	Email	Correspondence regarding bird surveys outside of breeding season
March 25, 2024	Department of Fisheries and Oceans	Meeting	Discussion regarding one Canadian Coast Guard radar site and one VHF site for proposed wind turbines
March 27, 2024	Department of Fisheries, Forestry, and Agriculture	Meeting	Discussion regarding process for transmission line siting on Crown Lands
March 27, 2024	Department of Fisheries, Forestry, and Agriculture - Land Management Division	Meeting	Discussion regarding Transmission Line on Crown Lands
April 9, 2024	Department of Transportation and Infrastructure	Meeting	Discussion regarding Traffic Counts for the Project Area
April 12, 2024	Department of Environment and Climate Change - Environmental Assessment Division	Email	Correspondence regarding the geotechnical study
May 2, 2024	Department of Fisheries, Forestry, and Agriculture - Wildlife Division	Meeting	Discussion regarding findings from the Project Area concerning SAR, birds, plants, and lichens, and discussion of the proposed mitigations and monitoring
May 8, 2024	Department of Environment and Climate Change - Water Resources Management Division	Meeting	Discussion regarding the Water Balance Analysis Report

8.3 Public and Stakeholder Consultation

A variety of consultation and communication tools have been used to engage with stakeholders and the public during the EA planning process. The tools used were designed to proactively engage in respectful two-way information sharing with a focus on gathering local knowledge and perspectives on potential effects (both adverse and positive), bridge the gap between technical and non-technical audiences, and build consensus to shape the Project's design and outcome.

A Public Participation Plan for the development, construction, operation and maintenance, and eventual decommissioning and rehabilitation of the Project is available in Appendix P. The purpose of the plan is to ensure that interested and affected parties, including local communities, are engaged in a meaningful way during all phases of the Project. The plan describes the communication and outreach approaches that will be used to ensure that productive and meaningful public engagement continues.

A list of the consultation and communication tools used to-date to share information and encourage participation and feedback is presented in Table 8.3-1.

Table 8.3-1 Consultation and Communication Tools.

Tool	Description
Project website	A regularly updated Project website is hosted at https://patternenergy.com/projects/argentia-renewables/. It provides the following information: • Project overview • Projected schedule • Economic benefits • Project supporters • Frequently asked questions • Fact sheet • Featured Press • Form for local sponsorship requests • Form for information requests
Fact sheet	A Project fact sheet is hosted on the Project website and printed for distribution during in-person community information sessions.
Digital comment form	A digital comment form, with associated QR code, is available as an accessible method for capturing and managing feedback through mobile devices.
Email address	A dedicated email, argentiarenewables@patternenergy.com , has been set up and promoted as a key communication tool, encouraging all interested parties to contact the Argentia Renewables team with questions, comments, and feedback. Communications received and responses provided are recorded in Project consultation records.

Tool	Description
Toll-free number	A dedicated toll-free number, (844) 486-3323, has been set up for interested parties to contact the team with questions, comments, and feedback.
Local office	A Pattern office was set up at 71-77 Blockhouse Road, Placentia. Office hours were from 11am-6pm Tuesday-Thursday. The office was operational from June 15, 2023, to September 15, 2023.
Online meeting booking tool	CALENDLY: **https://www.growlerenergy.com/pattern-argentia** is available for the public to book meetings with the project team.
Public information sessions	Public Information Sessions are hosted at key points in the EA process to provide stakeholders and the public an opportunity to meet the Argentia Renewables Team, learn about the project, ask questions, and provide feedback.
Community social events	Social events are hosted in the community to provide an opportunity to meet the Project team and ask questions in a relaxed, informal setting.
Meetings	Face-to-face and virtual meetings are hosted to provide up-to-date information. PowerPoint presentations aid discussions. Feedback collected is used to inform the EA process.
Surveys	Surveys are used to capture feedback and data specific to land and resource use.
Print materials	Information posters, boards and maps are used for public information sessions and then digitized for the website.
Social media	Social media posts, to share information about public information sessions and project notifications, are shared through the Pattern Energy Canada, Port of Argentia, Placentia Chamber of Commerce, and Town of Placentia Facebook pages.
Direct mailouts	Direct mailouts, via Canada Post, are used to raise awareness of public information sessions.
Posters	Posters are displayed in public spaces throughout the community to increase awareness of public information sessions.
Press releases	Press releases are used to inform the media of Public Information Sessions and other project updates.
Public Service Announcements (PSA)	PSAs are used to inform local residents of upcoming activities. They are shared with all media, local websites, including the Town of Placentia and the Port of Argentia, and via social media.
Personal email invitations	Personal invitations are sent to key stakeholders to request meetings, set up phone calls, and share invitations to Public Information Sessions.

8.3.1 Public Information Sessions

Four rounds of public information sessions were conducted in the Town of Placentia. The purpose of these sessions was to introduce the Project concept to the public and to identify any issues or concerns to be addressed during Project planning. Table 8.3-2 summarizes the locations of each event, including date and time, format, and the number of participants.

The public information sessions were designed to facilitate an exchange of information through Project presentations, information displays, and open dialogue. At each session, information and maps were on display. Team members and subject matter experts were available to provide information and answer questions. Print and digital comment cards were available to capture feedback. The first two sessions were held in a town hall format, with a presentation by Argentia Renewables followed by a question-and-answer period. The third and forth sessions were “Ask the Expert” open house events with an information circuit format, where topic specific stations were staffed by subject matter experts supported by information, graphics, and maps. The venues were selected for the events based on accessibility, capacity, location, parking, and local recommendations.

Questions and concerns that were identified during the public information sessions are included in Section 8.5. Copies of information and materials distributed through these sessions are included in Appendix U.

Table 8.3-2 Public Information Sessions Summary.

Location	Date	Time	Format	Number of Participants
Placentia Town Hall, Placentia, NL	October 28, 2022	6-8 pm	Town hall	61
Cultural Arts Centre, Placentia, NL	February 27, 2023	6-8 pm	Town hall	25
Star of the Sea, Placentia, NL	November 16, 2023	6-8 pm	Open house	75
Star of the Sea, Placentia, NL	June 3, 2024	4-7 pm	Open House	44

8.3.2 Public Notifications

To ensure broad community awareness and encourage participation, Argentia Renewables’ shared information regarding the public information sessions via multiple channels:

- Direct mail-outs;
- Posters in public locations;
- Social media posts;
- Town of Placentia and Port of Argentia websites;
- Press releases to media; and
- Personalized invitations sent to members of Indigenous communities, key stakeholders, municipalities, and government departments.

8.3.3 Public Service Announcements

To ensure the public receives accurate and timely information regarding work activities, Argentia Renewables provides updates through Public Service Announcements (PSAs). To date, two PSAs were issued via media, local websites (including the Town of Placentia and the Port of Argentia) and social media, to advise of work on Port lands associated with the placement of meteorological towers.

8.3.4 Land and Resource Use Survey

In consultation with the Fish Food and Allied Workers Union (FFAW), Argentia Renewables created an online survey to gather feedback from local fish harvesters. In February 2024, the FFAW distributed the survey to its members in the Placentia Bay area. At the end of March 2024, the FFAW had received four completed surveys. The survey and responses are presented in Appendix U.

8.3.5 Summary of Stakeholder Consultation Activities

In addition to public information sessions, several stakeholder meetings and communication exchanges have occurred since September 2022. A summary of stakeholder consultation activities to-date is provided in Table 8.3-3. These activities were arranged through email and phone call correspondence. Questions and concerns received from stakeholders as a result of these activities, and Argentia Renewables' responses, are included in Section 8.5.

Table 8.3-3 Summary of Stakeholder Consultation Activities.

Date	Stakeholder Group	Method	Purpose and Focus
September 30, 2022	Placentia Chamber of Commerce	Email	Request for membership contact information.
October 4, 2022	College of the North Atlantic	Email	Initial introduction and request for a meeting.
October 11, 2022	Placentia Chamber of Commerce	Email	Information sharing with members and notification of public information session.
October 11, 2022	Town of Placentia	Email	Invitation to public information session
October 11, 2022	Town of Fox Harbour	Email	Invitation to public information session
October 12, 2022	Town of St. Brides	Email	Invitation to public information session
October 13, 2022	Residents of Fox Harbour	Email	Invitation to public information session
October 17, 2022	Residents of Placentia	Email (via Port of Argentia email distribution)	Invitation to public information session
October 20, 2022	Community member	Email	Expression of support for the project and question regarding operations and maintenance employment.
November 15, 2022	Hike Placentia	Email	Request for information regarding local trail routes

Date	Stakeholder Group	Method	Purpose and Focus
December 1, 2022	Nature Conservancy of Canada	Meeting	Discussion regarding protected land between access road and turbine pads.
December 22, 2023	Community Connections Housing Coalition	Meeting	Discussion regarding affordable housing concerns and a request for sponsorship.
January 31, 2023	College of the North Atlantic	Email	Request for meeting.
March 29, 2023	PEGNL	Meeting	Initial Project introduction
July 20, 2023	General public	Community social event	Community BBQ where residents could meet the project team and ask questions in a relaxed, informal setting.
August 25, 2023	General public	Public Service Announcement	Notification of the placement of meteorological towers at the Port of Argentia
October 17, 2023	General public	Postcard mailer, press release, social media posts, poster campaign	Notification of upcoming public information session
October19, 2023	Fox Harbour resident	Phone call	Discussion regarding concerns with respect to wind turbine siting, changes to viewscape, human health effects from wind turbine operations.
November 28, 2023	FFAW	Meeting	Initial Project introduction and discussion regarding fishing activities in the area and consultation methods
January 18, 2024	FFAW	Email	Correspondence regarding the development of a survey to gather feedback from fish harvesters.
January 31, 2024	Town of Placentia	Phone call	Discussion regarding the development permit for the geotechnical program.
February 6, 2024	Town of Placentia	Meeting	Discussion regarding the development of the Emergency Response Plan, and mutual aid tasks.
February 7, 2024	Town of Placentia	Email	Correspondence regarding a rezoning application.
February 7, 2024	Construction Labour Relations Association (CLRA)	Meeting	Initial Project introduction and overview of CLRA's mandate and work.
February 16, 2024	FFAW	Email	Correspondence regarding the status of the survey.
February 21, 2024	FFAW	Email	Sharing the survey link for distribution to fish harvesters.
February 26, 2024	Port of Argentia	Email	Correspondence regarding port infrastructure.
February 28, 2024	Marine Atlantic	Meeting	Discussion regarding ferry movement.
February 28, 2024	Town of Placentia	Meeting	Discussion regarding the Emergency Response Plan
March 11, 2024	FFAW	Email	Correspondence regarding the status of the responses to the survey.
March 13, 2024	Memorial University	Email	Correspondence regarding inquiry on vessel traffic

Date	Stakeholder Group	Method	Purpose and Focus
March 21, 2024	Key community stakeholders	Email	Invitation to virtual project update
March 25, 2024	Hike Placentia	Email	Correspondence to set-up a Project update

8.4 Indigenous Consultation

Indigenous engagement began in August 2022, with the goal of establishing long-term relationships for all phases of the Project. Argentia Renewables strongly believes in the value and opportunity that exists in meaningful partnerships with Indigenous Peoples throughout all Project phases. Argentia Renewables respects the rights, diverse cultures, histories, and cultural resources of Indigenous Peoples. The value of meaningful consultation and partnerships is deeply upheld. Argentia Renewables demonstrates their commitment to land rights through diligent practices, active engagement, communication, and the protection of land rights in land lease agreements. Argentia Renewables' commitment to conduct meaningful consultation, build partnerships, respect all cultures and the environment, and create lasting benefits for communities is supported by Pattern's Statement of Community and Cultural Commitments found in Appendix P Public Participation Plan.

8.4.1 Miawpukek First Nation

Miawpukek Mi'kamawey Mawi'omi, also known as Miawpukek First Nation (MFN), is a First Nations Reserve on the south coast of Taqamkuk (Newfoundland) (MFN, 2024). Miawpukek was historically used by Mi'kmaq as a semi-permanent camping site, and became a permanent community around 1822 (MFN, 2024). The Miawpukek Reserve was officially designated as Samiajij Miawpukek Indian Reserve in 1987 under the Federal Indian Act (MFN, 2024). There are about 3,060 members of the MFN, living both on and off the Reserve (MFN, 2024).

Argentia Renewables initially approached Miawpukek in August 2022, to establish a relationship and process for ongoing consultation. This led to the development of a memorandum of understanding (MOU) that provides for the creation of a working group to keep the parties informed and explore opportunities to work together. On February 23, 2023, the MOU was signed. It identifies potential collaboration in the areas of stakeholder engagement, environment, and economic development.

8.4.2 Qalipu First Nation

Qalipu Mi'kmaq First Nation (QFN) was established as an Indigenous Band under the **Federal Indian Act** in 2011, and consists of approximately 24,000 members (HNL, 2024). While QFN does not manage reserve lands and has no official land base, its members reside within 66 communities across the island

(HNL, 2024). To represent their members, QFN maintains a central administrative office in Corner Brook and satellite offices in Glenwood, Grand-Falls Windsor, St. George's, and Stephenville (HNL, 2024).

Initial consultation with Qalipu First Nations began in September 2022, and has led to an ongoing data sharing agreement for Project field studies. Argentia Renewables will seek to expand upon this relationship with similar collaboration in the future.

8.4.3 Summary of Consultation with Indigenous Communities

To date, consultation has been in the form of meetings and information exchanges as described in Table 8.4-1.

Table 8.4-1 Summary of Indigenous Consultation.

Date	Indigenous Organization	Method	Purpose and Focus
August 30, 2022	Miawpukek First Nation	Email	Initial contact to begin discussions and establish a process for ongoing engagement.
September 15, 2022	Miawpukek First Nation	Email	Sharing of the draft MOU for review and comment.
September, 2022	Miawpukek First Nation	Meeting	Project update and information sharing
September 23, 2022	Qalipu First Nation	Phone call	Discussion regarding Qalipu's involvement in bat monitoring and mitigation.
October 13, 2022	Miawpukek First Nation	Meeting	Project update and inviting Miawpukek First Nation (MFN) to visit Pattern Energy's Meikle Wind Farm, in B.C.
October 26, 2022	Miawpukek First Nation	Meeting	Discussion regarding the draft of the MOU.
January 27, 2023	First Light	Email	Initial Project introduction and discussion regarding training and employment of Indigenous workers.
July, 2023	Miawpukek First Nation	Letter	MFN informed Argentia Renewables of existing partnership with Allnorth.
September 20, 2023	Miawpukek First Nation	Meeting (Placentia Bay Industrial Showcase)	Discussion regarding potential business opportunities, construction timelines, land acquisition, and opportunities for equity partnerships.
October 16, 2023	Miawpukek First Nation Qalipu First Nation	Email	Personal invitation to Chiefs for the public information session.
January 19, 2024	Miawpukek First Nation	Meeting	Discussions about Project overview, timeline, funding, equity partnerships, and document sharing.

Date	Indigenous Organization	Method	Purpose and Focus
January, 2024	Qalipu First Nation	Phone call	Call to organize a meeting between Pattern and Qalipu economic development representatives.
February 21, 2024	Qalipu First Nation	In-Person Meeting	Sharing of project details and development status; commitment to further engage with each other on opportunities to work together on the project
March 18, 2024	Qalipu First Nation	In-Person meeting	Introductory meeting to Chief & undertaking to engage further on project
Mar 21, 2024	Qalipu First Nation	Email	Correspondence to share bat data
April 22, 2024	Miawpukek First Nation	In-Person meeting	Detailed project update & commercial discussion regarding participation and community benefits; Introduction to new Chief

8.5 Questions and Concerns Identified During Consultation

Stakeholder and Indigenous questions and concerns raised during consultation have been collected and inventoried throughout the Project planning process. A summary of the questions and concerns identified to date, and responses provided, are listed in Table 8.5-1. The table is categorized by theme and notes the section of the EA Registration document that addresses the topic.

Table 8.5-1 Summary of Stakeholder and Indigenous Questions/Concerns, and Responses.

Question/Concern	Source	EA Registration Reference and Response
Environmental Assessment Registration Document		
Recommendation to use Environmental Impact Statement approach to baseline studies.	Department of Environment and Climate Change	Section 3.2
Recommendation to include waste management and environmental protection plans in the EA	Department of Environment and Climate Change	Appendix N Waste Management Plan, Chapter 9 Environmental Protection Plan (annotated table of contents)
Request to review the human components in draft prior to formal submission	Department of Health and Community Services – Public Health Division	See Appendices I,J,K, and L for further details regarding light, noise, vibration, shadow flicker, and ice throw.
Project Planning		
Impact of government crown lands process on Project	Public comment from open house	The Project is sited on POA owned lands, which is not part of the Crown Land Nomination process for Onshore Wind Energy Projects (Section 2.1.2)
Realistic Project schedule	Public comment from open house	Project schedule will depend on the EA process and post-EA permitting applications.

Question/Concern	Source	EA Registration Reference and Response
Siting of wind turbines near two Canadian Coast Guard radar towers	Department of Fisheries and Oceans Canada	Pattern is actively working with CCG to find a mutually beneficial arrangement.
Use power for local needs instead of export	Public comment from open house	Rationale for the Undertaking is provided in Section 2.2. Economic benefits of the Project are discussed in Sections 3.1.6.
Project Planning		
Energy efficiency of the hydrogen/ammonia process	Public comment from open house	Conversion of hydrogen to ammonia is a chemical process which uses the established Haber-Bosch method.
Status of offtake agreements	Public comment from open house	The POA and Hamburg Port Authority, Hamburg, Germany recently signed a Letter of Intent (LOI) to collaborate on the export and import of green hydrogen from Canada to Germany. Argentia Renewables are in the process of finalizing further offtake agreements.
Project Description		
Inclusion of information on turbine locations, hub height, and length of blades in EA	Environment Canada	The current wind turbine model has a hub height of 119 m, and a rotor diameter of 162 m. See Section 2.3 Project Description for map of proposed locations.
Quantity of ammonia stored on-site.	Public comment from open house	Liquified ammonia will be stored on-site in a 15 kilo-tonne (kT) tank as a temporary measure between continuous ammonia production and routine ship pickups. See Section 2.3 Project Description.
Atmospheric Environment		
Recommendation to include lighting restriction/mitigations in the EA and include all best management practices that will be incorporated into the Project design.	Department of Environment and Climate Change	A listing of best management practices and mitigations are presented in Section 4.5 Mitigations. See also Appendix I Light Impact Assessment.
Terrestrial Environment		
Concern regarding Moose migration and population in the area.	Public comment from open house	Effects assessment for terrestrial environment is presented in Section 4.2.3. Terrestrial environment baseline study of mammals is provided in Appendix D4.
Inquiry regarding surveys for short-eared owls.	Department of Fisheries, Forestry and Agriculture	Terrestrial environment baseline study of birds is provided in Appendix D1.
Water Resources		
Recommendation for a water balance study to evaluate the drawdown effect on the municipal supply.	Department of Environment and Climate Change	Water Source Hydrology is presented in Appendix C1. An evaluation of effects to water resources appears in Section 4.2.2.
Recommendation to complete a water balance assessment for the Town of Placentia.	Department of Environment and Climate Change	Source Water Hydrology is presented in Appendix C1. An evaluation of effects to water resources appears in Section 4.2.2.
Recommendation for consultation with watershed users to identify concerns.	Department of Environment and Climate Change	An evaluation of effects to water resources appears in Section 4.2.2.

Question/Concern	Source	EA Registration Reference and Response
Concern regarding development within the protected public water supply (road, transmission line).	Town of Placentia	An evaluation of effects to water resources appears in Section 4.2.2. Mitigation measures for development within a watershed are included in Section 4.5.
Terrestrial Environment		
Concerns regarding the town water supply.	Town of Placentia	An evaluation of effects to water resources appears in Section 4.2.2. Mitigation measures for development within a watershed are included in Section 4.5.
Requirement for surface water treatment for use in the plant	Public comment from open house	A description of water resources requirements involved in the Argentia Green Fuels Facility is described in Section 2.3.1. An evaluation of effects to water resources appears in Section 4.2.2. Mitigation measures for development within a watershed are included in Section 4.5.
Potential for the Town to access treated water through a cost sharing agreement	Public comment from open house	Argentia Renewables is committed to working closely with the Town of Placentia regarding appropriate financial arrangements for the use of municipal water sources, which is likely to include sharing of costs associated with local water infrastructure improvements.
Concern regarding the source of water to be used, what watershed will be impacted	Public comment from open house	A description of water resources requirements involved in the Argentia Green Fuels Facility is described in Section 2.3.1. An evaluation of effects to water resources appears in Section 4.2.2. Description of watersheds are provided in Section 3.1.2.
Concern regarding the siting of the transmission line through the Public Protected Water Supply Area	Town of Placentia	Maps of Project infrastructure are included in Section 2.3. An evaluation of effects to water resources appears in Section 4.2.2.
Marine Environment and Shipping		
Recommendation that all potential marine components are included in the EA	Transport Canada	Maps of Project infrastructure are included in Section 2.3. An evaluation of effects to the marine environment appears in Section 4.2.2.
Potential for use of salt water for operation of the plant	Public comment from open house	Saltwater cannot be used in the process, only freshwater; saltwater would require a desalinization process. A description of the electrolysis process and water resources requirements involved in the Argentia Green Fuels Facility is described in Section 2.3.1.
Concern regarding impact to fish harvesters in the area.	FFAW	Effects assessment for fish harvesting is presented in Section 4.2.2.
Requirement for a new dock and potential to interfere with existing marine traffic		The new dock being proposed as part of the separate Cooper Cove Marine Terminal Expansion Project will be of benefit to the Argentia Renewables Project. However, the Project is not contingent on this new facility, alternatives to which are presented in Section 2.4. A discussion of marine traffic is presented in Section 3.1.2.12.
Type of ship needed to transport ammonia	Public comment from open house	An ammonia carrying vessel will be used for transport, see Section 2.3 Project Description. The vessel specifics will be determined upon finalization of offtake agreements.

Question/Concern	Source	EA Registration Reference and Response
Marine Environment and Shipping		
Requirement for shipping traffic details such as frequency, ship size, lighting, bird stranding and mitigations	Department of Environment and Climate Change	A description of marine vessel specifications and frequency appears in Section 2.3 Project Description. A discussion of marine traffic is presented in Section 3.1.2.12. A listing of best management practices and mitigations are presented in Section 4.5 Mitigations. See also Chapter 9 Environmental Protection Plan and Appendix R - Species at Risk Impact Mitigation and Monitoring Plan.
Land and Resource Use		
Recommendation to incorporate potential quarry developments or use of existing quarries into the EA	Department of Industry, Energy, and Technology	Quarry requirements for the Project are described in Table 2.5.2-1. A description of existing quarries in the region appears in Section 3.1.4.2 Commercial and Industrial Resource Use.
Concern regarding impact on local trails. Requested help with developing trail around the Project area.	Hike Placentia	Results of the land and resource use effects assessment are presented in Section 4.2.4.
Species at Risk		
Concern regarding species at risk in the Project area	Public comment from open house	Effects assessment for SAR is presented in Section 4.2.2 and Section 4.2.3. See also the Species at Risk Impact Management and Monitoring Plan in Appendix R.
Adaptive management plan for bats will be required.	Department of Fisheries, Forestry and Agriculture	Effects assessment for terrestrial environment is presented in Section 4.2.3. Terrestrial environment component study of bats is provided in Appendix D2. Bats are included in the scope of the Species at Risk Impact Management and Monitoring Plan in Appendix R.
Socioeconomic Environment		
Timing of employment opportunities	Public comment from open house	Potential socio-economic benefits of the Project are presented in Section 3.1.6. See also Workforce and Employment Plan in Appendix Q.
Access to operational jobs	Public comment from open house	Potential socio-economic benefits of the Project are presented in Section 3.1.6. See also Workforce and Employment Plan in Appendix Q.
Number of local jobs during operations and maintenance	Public comment from open house	Potential socio-economic benefits of the Project are presented in Section 3.1.6. See also Workforce and Employment Plan in Appendix Q.
Union involvement in work	Public comment from open house	Potential socio-economic benefits of the Project are presented in Section 3.1.6. See also Workforce and Employment Plan in Appendix Q.
Recommendation to consult with local businesses	Department of Tourism, Culture, Arts and Recreations	See above Table 8.3-3. See also Workforce and Employment Plan in Appendix Q.
Socioeconomic Environment		
Types of businesses that benefit from wind Projects	Public comment from open house	Potential socio-economic benefits of the Project are presented in Section 3.1.6. See also Workforce and Employment Plan in Appendix Q.
Need for proactive supplier development with the local business community	Public comment from open house	Potential socio-economic benefits of the Project are presented in Section 3.1.6. See also Workforce and Employment Plan in Appendix Q.

Question/Concern	Source	EA Registration Reference and Response
Impact of Project on local taxes	Public comment from open house	Results of the socio-economic effects assessment are presented in Section 4.2.6.
Communities		
Concern regarding Project impact on local housing	Community Connections Housing Coalition	Results of the socio-economic effects assessment are presented in Section 4.2.6.
Concern regarding the location of MET towers and wind turbine as it relates to the viewscape.	Residents of Fox Harbour; Public comment from open house	Argentia Renewables communicated to the residents that the MET tower of concern will not be a permanent fixture. Wind turbine 33 on the proposed infrastructure maps in Section 2.3 is under evaluation to be sited further away from residences as show in Figure 2.4.2-1.
Request for public information session at another location along the Cape Shore	Public comment from open house	Appendix P - Public Participation Plan.
Requirement for a viewscape (viewshed) assessment arriving by ferry and by road.	Department of Tourism, Culture, Arts and Recreations	Viewshed assessment completed and submitted to the Department of Tourism, Culture, Arts and Recreations.
Requirement for a safety/fire water specialist to develop the fire water requirements	Justic and Public Safety – Fire and Emergency Services	Progressive Engineering Consulting hired to develop the Project fire flow requirements.
Recommendation to include assessment of existing community equipment, water supply, transportation plans, building code		Existing water supply and infrastructure is described in Section 3.1.2 Aquatic Environment and the Source Water Hydrology in Appendix C1. See also Appendix E -Transportation Impact Study and Traffic Management Plan. As they are a legislated requirement, Argentia Renewables will comply with applicable building codes.
Timing of opening a local office	Public comment from open house	An office in Placentia will be opening in 2024, with a starting term of 1 year, to be extended as appropriate in accordance with Project progress.
Communities		
Opportunity for the community to review the site layout and road infrastructure	Public comment from open house	During public information sessions preliminary maps of the project infrastructure were on display and team members were available to provide information and answer questions. Feedback regarding siting concerns was incorporated into the proposed site layout as described in Section 2.3.
Human Health		
Concerns regarding human health effects from wind turbine operations.	Residents of Fox Harbour	An evaluation of effects to the atmospheric environment appears in Section 4.2.1. See also Appendices I, J, K, L for further details regarding light, noise, vibration, shadow flicker, and ice throw.
Recommendation to include information regarding impact on nearby receptors.		An evaluation of effects to the atmospheric environment appears in Section 4.2.1.
Concern regarding noise generated by the Project	Public comment from open house	An evaluation of effects to the atmospheric environment appears in Section 4.2.1. See also Appendix J Noise and Vibration Impact Assessment.

Question/Concern	Source	EA Registration Reference and Response
Concern regarding the potential for an ammonia spill and the impact to residents	Public comment from open house	Potential outcomes of accidents and malfunctions are described in Section 4.3. See also Appendix M Emergency Response/Contingency Plan.
Concern regarding the smell emitted from the Ammonia plant	Public comment from open house	An evaluation of effects to the atmospheric environment appears in Section 4.2.1.
Operations and Maintenance		
Curtailment from July to September when wind is less than 6 m/s and temperature is greater than 6 C	Department of Fisheries, Forestry and Agriculture	Argentia Renewables has committed to follow curtailment guidance from the department. A listing of best management practices and mitigations are presented in Section 4.2.3.5 Mitigation Measures.
Concern regarding metals used for ammonia infrastructure. NL uses alternative materials (titanium) than other provinces, due to corrosion issues.	Public comment from open house	Materials used in the construction of the Argentia Green Fuels Facility and Infrastructure will be selected to optimize safety and efficiency. A description of the facility is provided in Section 2.3.1.

9.0 Environmental Protection Plan

An Environmental Protection Plan (EPP) represents a proactive response to the pressing issues of climate change, biodiversity loss, and resource depletion. Grounded in scientific rigor and guided by a commitment to responsible stewardship, the EPP will be adapted to fit the distinct Project phases from the Construction Phase, throughout the Operation and Maintenance Phase, and eventually during Decommissioning and Rehabilitation Phase. Each plan lays out the hierarchy of responsibility and reporting so that individual roles and documentation procedures are clearly understood. Site and activity-specific environmental procedures are organized for field utilization and worded to avoid ambiguity.

Table 9.0-1 provides an annotated table of contents for Project EPPs. Each individual EPP (Construction Phase, Operation and Maintenance Phase, Decommissioning and Rehabilitation Phase) will be tailored to reflect the relevant site activities and their associated protection procedures.

Table 9.0-1 Annotated Table of Contents for EPPs for the Argentia Renewables Project.

Section	Description
Cover Page	Includes the title (Environmental Protection Plan), corporate owner of the document, Project phase or activity, affected facility or location, and the effective date of the plan.
EPP Control and Revisions	Provides guidelines for document revisions and updates. Includes an approval page with the name, title, and signature of persons responsible for EPP development, approval, and implementation. A record of updates and amendments is provided, as well as the EPP distribution list.
Table of Contents	Provides a listing of sections, figures, tables, and appendices of the EPP.
1. Introduction	Introduces the EPP in the context of the Project Environmental Management Framework. Brief description of the Project location and Project overview including the Registration process and permit requirements.
1.1. Purpose	Describes the purpose of the EPP and why it is required.
1.2. Organization of the EPP	Provides a brief overview of each section of the EPP and appendices.
1.3. Corporate Environmental Policy	Describes Argentia Renewables' corporate Environmental Policy and how it is adapted to the Project to reflect commitments to sustainable development, environmental protection, and health and safety.
2. Regulatory Requirements	Outlines the regulatory requirements that apply to the Project at the federal, provincial, and municipal levels.
2.1. Potential Approvals, Authorizations, and Permits	Lists the environmental approvals, authorizations and permits applicable to site activities. Includes references to the appropriate Acts, regulations, and by-laws.
2.2. Environmental Compliance	Identifies reporting and compliance conditions associated with permits and approvals.

Section	Description
3. Scope of the EPP	Identifies the subject matter addressed and the relationship to other plans within the Environmental Management Framework. The potential for overlap / redundancy is described and how this is addressed/resolved. The relationship of the plan to employees, contractors and other entities is explained.
4. Objectives of the EPP	Describes the objectives of the EPP and how it will be used by employees. This includes long term goals, as well as interim objectives and achievable targets.
5. Project Description Overview	Provides an overview of the applicable Site activities by location for the subject phase (Construction Phase, Operation and Maintenance Phase, Decommissioning and Rehabilitation Phase) and schedule/ timing.
6. Roles and Responsibilities	Identifies personnel responsibilities and reporting relationships for environmental monitoring, incident response, reporting, performance evaluation, and approval.
7. Environmental Protection Procedures	Provides descriptions of environmental concerns and sensitivities associated with each subject activity for the applicable Project phase. This is followed by a detailed description of each applicable environmental protection procedure, including documentation and reporting protocols. Information on sensitive timing, buffer zones, and other mitigation measures will be incorporated into each description. At a minimum, procedures will address: • Surveying, ROW clearing; • Laydown and storage areas; • Clearing, grubbing, and overburden management; • Quarrying and aggregate removal; • Blasting; • Working in or near freshwater environment or wetlands; • Erosion control and sediment prevention; • Watercourse crossings – fording, culverts, and bridges; • Linear developments; • Vehicle traffic and site access; • Marine traffic; • Storage, transportation, and management of fuel and other hazardous materials; • Equipment use and maintenance; • Excavating, backfilling, and grading; • Concrete/Grout handling and placement; • Solid waste disposal; • Working in or near marine environment; • Sewage handling and disposal; • Borehole and water well drilling; • Lighting; • Air emissions, noise and dust control; and • Pumps and generators.

Section	Description
8. Resource Specific Protection Procedures	Provides a description of potential environmental concerns applicable to the Project for resources of concern, including: • Avifauna management; • Fish and fish habitat; • Rare plants and lichens habitat; • Historic resources; and • Wildlife management.
9. Area Specific Protection Procedures	Lists the specific Construction Phase activities, environmental issues, environmental protection procedures and monitoring requirements for each Project area.
10. Environmental Mitigation Measures	Each Project activity/environmental concern will be categorized in a table with each respective mitigation(s). Person(s) responsible for implementing mitigation measures will be identified.
11. Environmental Monitoring and Reporting	Describes site inspections and compliance monitoring requirements. Identifies personnel responsible for conducting monitoring, schedule for monitoring, types of activities to be monitored, locations and parameters to be monitored, overview of information recorded to track mitigation effectiveness, and procedures for correcting non-compliances. Internal and external reporting procedures are identified.
12. Contingency and Monitoring Plans	Outlines contingency and monitoring plans for Unplanned Events that could occur during the applicable Project phase. Contingency and Monitoring Plans include: • Fuels and Hazardous Materials Spills; • Extreme Weather; • Surface Water Quality Monitoring; • Wildlife Encounters; • Discovery of Historic Resources; and • Discovery of Human Remains. Plans such as Spill Prevention and Response Plan and Post-Construction Monitoring Plan will be developed under separate covers and appended to the EPP.
13. Training	Identifies required training by task and role. Environmental orientation requirements for Project employees, site visitors, material and service contractors are described. The method of training records maintenance will be identified.
14. Contact List	Lists key Project personnel and regulatory contacts.
15. References	Presents a list of references consulted in the creation of the EPP.
16. Signature Page	A page for employee and contractor signoff upon review.
Appendices	Documents to accompany the EPP, including the EPP distribution list, revision request form, revision history log, site inspection/monitoring/sampling forms, incident and reporting forms, and plans developed under separate covers.

10.0 References

Chapter 2

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11.0 Personnel

The names and qualifications of all key professionals responsible for preparing the Registration and supporting documentation have been provided below in Table 11.0-1.

Table 11.0-1 Key Professionals Involved in Preparing the Registration Document.

Name	Credentials	Role	Years of Experience	Company
Amy Copeland	B.Sc., P.Eng.	VP, Senior Engineer	22	SEM Ltd.
Andrew Sinclair	P.Eng.	Risk Assessment Facilitator	20	trajectorE
April Tucker	B.A.	Environmental Coordinator	4	SEM Ltd.
Bevin LeDrew	B.Sc., M.Sc.	Senior Environmental Specialist, Lead Author	55	SEM Ltd.
Brendan Meaney	B.Sc.	Terrestrial Biologist	5	SEM Ltd.
Brittany Connolly	B.Sc.(Hons), A.Dipl.	Environmental Scientist, Lead Author	10	SEM Ltd.
Chris Hearn	B.Sc.	Terrestrial Biologist	12	SEM Ltd.
Christina Burke	Dipl. Geomatics/Survey Engineering, B. Tech.	Geomatics Specialist	7	SEM Ltd.
Craig Ryan	Firefighter, ETech	Heath and Safety SME, lead ERP author	34	trajectorE
Dave Scruton	B.Sc., M.Sc., D.Sc.	Senior Scientist	48	SEM Ltd.
Don Stevens	B.Sc., M.Eng., P.Eng.	Senior Operations & Management Consultant	32	trajectorE
Emma Wells	B.Sc.	Aquatic Biologist	5	SEM Ltd.
Grant Vivian	B.Tech.	President, CEO	23	SEM Ltd.
Heather Murphy	B.Sc.	Director, Aquatic Resources	15	SEM Ltd.
Heiko Leers	B.Sc., M.Eng., P.Eng.	Risk Assessment SME	34	trajectorE
Jennifer Blundon	B.Sc.	Environmental Ecologist	5	SEM Ltd.
John Crocker	Dipl. GIS	Geomatics Specialist	5	SEM Ltd.
Kathryn Dawe	B.Sc., M.Sc.	Environmental Chemist	10	SEM Ltd.
Kelsey Menard	B.Sc., M.Sc.	Junior Environmental Chemist	8	SEM Ltd.
Kirsten Moores	B.Eng., EIT	Risk Workshop Scribe	3	trajectorE

Name	Credentials	Role	Years of Experience	Company
Mandy Palubicki	Dipl. Technical Productions	Marketing and Engagement Specialist	15	SEM Ltd.
Melanie Williams	P.Eng.	Regulatory Affairs Lead	15	SEM Ltd.
Mirelle Caouette Houle	B.Sc., M. Marine Studies	Aquatic Biologist	11	SEM Ltd.
Morgan Walsh	B.Sc., P.Eng.	Project Engineer	9	SEM Ltd.
Morteza Amiri	B.Sc., M.Sc., MBA, PMP	Cloud Dispersion Modeller	14	trajectorE
Nancy Griffiths	BDEP, MCIP	Senior Impact Assessment Specialist	20	GHD Ltd.
Nicole Button	B.A.	Communications and Engagement Manager	18	SEM Ltd.
Rosanne Williams	B.Sc., B. Bus. Admin.	Director, Corporate and External Affairs	18	SEM Ltd.
Roy Skanes	B.A., M. Phil.	Professional Archaeologist	34	SEM Ltd.
Sean Breen	B.Sc., B.Sc.-Eng, P.Eng.	Process Engineer	22	trajectorE
Shawn Duquet	B.Sc., P.Geo.	Geologist	17	SEM Ltd.
Sophie Dumont	M.Sc.	Socio-Economic Specialist	5	GHD Ltd.
Steve Gullage	B.Sc., M.Sc.	VP, Senior Scientist, Project Manager	23	SEM Ltd.
Tomer Katan	B.Sc., M.Sc.	Aquatic Biologist	11	SEM Ltd.
Tyler Brenton	M.Sc., P.Eng.	Environmental Engineer	6	SEM Ltd.

12.0 Commitments Made in the Registration Document

As Argentia Renewables works to transition the world to renewable energy, it does so in a way that respects the integrity of the environment. Argentia Renewables engages with stakeholders to understand the impacts of each project and develop robust plans to mitigate them. Argentia Renewables also strives to reduce its footprint within its corporate and operational facilities and to minimize adverse impacts through proper assessment, planning, avoidance, and mitigation. The company complies with laws and regulations as its minimum standard and implements industry best practices where local requirements are not as stringent. Argentia Renewables works collaboratively with diverse stakeholders – environmental organizations, landowners, communities, Indigenous Peoples, and governmental entities – during all stages of the project lifecycle.

Sections 12.1 - 12.4 comprise Argentia Renewables statement of commitments for safety and health, community and cultural, environmental, diversity, equity, and inclusion. Section 12.5 provides an indexed list of commitments made in the Registration document regarding environmental effects mitigation, monitoring, and follow-up.

12.1 Statement of Safety and Health Commitments

Argentia Renewables is committed to the safety and health of our employees, contractors, and people in the communities around the Project. We incorporate safety and wellness into our decision-making in everything we do and believe in having an injury-free workplace. To this end, Argentia Renewables strives to:

- Construct our projects and operate our facilities using best practices to prevent injury to employees, contractors, and the public. We will partner with contractors and companies that share our values and commit to supporting our vision of an injury-free workplace.
- Follow all applicable health and safety laws and regulations as our minimum standard and promote a culture of safety. In addition, we will continuously review and update our practices to reflect the latest advancements and best practices in safety.
- Engage our employees to identify potential hazards and develop proper mitigations. Argentia Renewables encourages open and transparent communication about safety concerns, incidents, and near misses. All employees and contractors will be encouraged to report any unsafe conditions or practices.
- Provide training to all employees so they may recognize and mitigate risks. We will take immediate action to mitigate risks, and hazard assessments will be conducted regularly. Controls will be

established to prevent accidents/injuries. We will monitor, report, and seek to continually improve our overall safety performance.

- Empower our workforce to use their “stop work” authority to halt activity if they perceive a hazard that may endanger themselves or others. We will strive to identify root causes and learn from any accidents that may occur.

12.2 Statement of Community and Cultural Commitments

Argentia Renewables understands that the success of this Project is dependent upon the well-being and prosperity of the communities and culture of the Placentia region. Argentia Renewables is committed to fostering long-lasting relationships with residents, landowners, and the communities near our projects, and to facilitating engagement in all phases of this Project.

To these ends, Argentia Renewables will:

- Engage with people of the Placentia region to understand concerns and wishes regarding the Project. Through open dialogue and collaboration, Argentia Renewables will contribute positively to the social and economic development of the region. We will continually evaluate feedback from stakeholders to ensure we are making a positive impact and addressing evolving needs effectively.
- Identify positive and negative community and cultural impacts to inform our planning and decision-making.
- Protect the environment, minimize our impact on the habitats around the Project, and enhance the area so that it may continue to be enjoyed recreationally.
- Create lasting economic benefits for communities by providing local job opportunities, supporting local businesses, and investing in infrastructure. By empowering local economies, we aim to foster long-term prosperity and resilience.
- Foster an inclusive, respectful work environment. Argentia Renewables celebrates cultural diversity and promotes cultural awareness within our company and beyond.
- Invest in initiatives that address community priorities and contribute to social progress.
- Offer transparency and accountability in our communications and actions, building trust and credibility in the Placentia region.
- Respect the heritage and history of Indigenous Peoples in Newfoundland and Labrador.

12.3 Statement of Environmental Commitments

Argentia Renewables is deeply committed to helping in the fight against climate change, sustainable solutions, and environmental stewardship. We believe climate change is the world's biggest environmental challenge, and producing energy from clean, renewable sources is essential to reducing the global carbon footprint.

Argentia Renewables will:

- Help expand the global awareness and use of wind power to produce hydrogen. By harnessing renewable electricity to power electrolysis, a process that safely splits water into hydrogen and oxygen, green hydrogen offers new, cost-efficient decarbonization solutions.
- Minimize the environmental impact of our operations. Through careful design and infrastructure planning, the ecological footprint of the Project will be minimized. Interactions with local flora and fauna will be identified and minimized.
- Argentia Renewables prioritizes waste reduction and recycling in our operations. By implementing sustainable waste management practices, we aim to minimize landfill disposal and reduce our environmental footprint.
- Argentia Renewables is committed to continual improvement in our environmental performance, with ambitious goals and regular monitoring and progress evaluation. We invest in research and development to advance renewable energy technologies and improve the efficiency and sustainability of our operations.
- Argentia Renewables will provide stakeholders with clear and accurate information about our environmental performance and initiatives. We are committed to open dialogue and collaboration with local communities, regulators, and environmental organizations to ensure that our operations align with the highest environmental standards and best practices.

12.4 Statement of Diversity, Equity, and Inclusion Commitments

Argentia Renewables is committed to a diverse, equitable, and inclusive workplace where all employees belong, regardless of background or gender. We believe in providing an environment where employees from underrepresented groups are encouraged and empowered, leading to a more engaged workforce and better business outcomes. We recognize diversity, equity, and inclusion are multifaceted and that changing behaviors and systems takes work and time.

Argentia Renewables commits to:

- Development and implementation of a Diversity, Equity, and Inclusion (DEI) strategy which will outline commitments and drive accountability.
- Identify, track, and report on DEI performance metrics and progress on DEI initiatives.
- Overcome DEI barriers that impact talent acquisition and development, retention, recognition, and advancement.
- Foster a community where employees are comfortable at work and are open to participating in difficult conversations.
- Encourage, support, and resource our employee-led Affinity Networks.
- Support the Pattern Energy DEI Council to provide input into our DEI initiatives.
- Apply a DEI perspective across our business activities and value chain, including procurement, community investment, and stakeholder engagement.
- Enhance our culture by demonstrating these commitments throughout all levels of the organization.

12.5 Environmental Effects Mitigation, Monitoring and Follow-up Commitments

Table 12.5-1 Environmental Effects Mitigation (Mi), Monitoring (Mo) and Follow-up (F) Commitments Index.

Type			Registration Section	Commitment
Mi	Mo	F		
		X	1.3 (Project Benefits)	Argentia Renewables will go beyond the electrical grid to begin decarbonizing other sectors of the global economy.
		X	1.3 (Project Benefits)	The Project is committed to maximizing long-term benefits for the Placentia area, its surrounding regions, the province of Newfoundland and Labrador, and Canada as a whole.
		X	1.3 (Project Benefits)	The Project will stimulate a new clean energy economy and ensure that the Placentia area is part of this emerging sector in Newfoundland and Labrador.
		X	1.3 (Project Benefits)	The Project will drive growth by creating local jobs in the Placentia area in the construction, operation, and maintenance of wind turbines and hydrogen and ammonia production facilities.
		X	1.3 (Project Benefits)	The Project will attract investment to the Placentia area and broader region and will help drive economic activity in related industries and local businesses.
		X	1.3 (Project Benefits)	This Project will generate revenue for the Placentia area and region taxes and financial agreements, contributing to municipal and provincial revenues.
		X	1.3 (Project Benefits)	Argentia Renewables will continue to conduct regular and open public engagement for the life of the Project.
		X	1.3 (Project Benefits)	Argentia Renewables will allocate a dedicated budget for a comprehensive Community Benefits Program in Placentia as well as an Environmental Stewardship Program.
		X	2.2.3 (Argentia Renewables Commitment to Environmental and Community Stewardship)	Argentia Renewables is committed to the sustainable development, construction, and operation of renewable energy facilities, while providing a workplace that is diverse, equitable, and inclusive.
		X	2.2.3 (Argentia Renewables Commitment to Environmental and Community Stewardship)	Argentia Renewables will develop lasting partnerships with local communities in the Project Area, including environmental and stewardship groups.
X			2.3.1 (Argentia Green Fuels Facility and Infrastructure)	Infrastructure will be sited based on property availability, ease of construction and infrastructure access, proximity to suitable dock space, adequate buffer space allowance from other industrial activities, and foundation conditions.

Type			Registration Section	Commitment
Mi	Mo	F		
X		X	2.3.1.4 (Water Requirements), 2.4.1.4 (Feedwater Treatment and Cooling Systems)	Non-evaporative cooling will be used at the Argentia Green Fuels Facility to significantly decrease water demand.
X			2.3.1.6 (Wastewater), 2.4.1.5 (Wastewater Treatment System)	Wastewater discharged to the environment will comply with emissions and effluent limits (contaminant concentrations, temperature, volume) to ensure regulatory compliance, at minimum.
	X	X	2.3.1.7 (Water Quality/Water Monitoring)	A RTWQ/hydrometric monitoring stations will be established to provide continuous monitoring of water availability and quality of the waterbody from which the Project will draw water. Locations and station design will be determined in consultation with NL DECC.
X			2.3.1.8 (Operations and Maintenance Building)	Solid waste (garbage and recycling) generated during maintenance activities will be collected and disposed of at an authorized facility.
X			2.3.2.6 (Laydown Areas)	Terrain disturbance will be minimized; laydown requirements on the Argentia Peninsula will utilize POA property and disturbance in the Argentia Backlands will be limited to 6 ha.
X			2.3.2.4 (Project Access Roads)	Road stream crossings will be designed for 1:100-year climate change flows to avoid waterlogging and drainage issues in the project area.
X			2.3.3 (Construction)	Wind turbine specifications will be selected based on site conditions, while also considering reliability, efficiency, curtailment capabilities, and cost.
	X		2.3.4 (Operation and Maintenance)	Routine inspections will be conducted to detect faults in the equipment, especially piping, storage facilities, and related infrastructure.
	X		2.3.4 (Operation and Maintenance)	A maintenance schedule will be developed and followed to ensure the Argentia Wind Facility is examined and maintained on a regular basis.
	X		2.3.4 (Operation and Maintenance)	Project personnel will receive regular safety training and follow safety procedures in place. This includes checking that the wind turbines are free of hazardous debris and that all electrical components are grounded correctly. Emergency procedures will be in place to address equipment failure or other unplanned events.
X			2.3.4 (Operation and Maintenance)	Surface runoff from potentially contaminated process areas will be drained into a potentially contaminated storm water pond.
X	X	X	2.3.4.2 (Effluent Discharge / Wastewater Treatment), 2.4.1.5 (Wastewater Treatment System)	Influent streams will be directed to the wastewater treatment system prior to discharge to the marine environment. Discharged effluent will not exceed limits prescribed in Schedule A of the NLR65/03.
	X		2.3.4.1 (Emissions and Energy Use)	Flares will be equipped with monitoring equipment to ensure adherence to environmental regulatory requirements.

Type			Registration Section	Commitment
Mi	Mo	F		
X	X	X	2.3.4.1 (Emissions and Energy Use)	Average sound levels will comply with limits set forth by Health Canada.
X	X	X	2.3.4.1 (Emissions and Energy Use), 3.1.1.7 (Vibration) 3.1.7 (Human Health and Quality of Life)	Wind turbines will be set back at least the greater of 600 m or 3.0 times the blade tip height of the wind turbines to minimize disturbance to sensitive areas.
X			2.3.4.1 (Emissions and Energy Use), 3.1.1.5 (Light)	Turbines in the Argentia Wind Facility will be equipped with navigation light fixtures, as necessary, to satisfy requirements of the Transport Canada Standard 621 – Obstruction Marking and Lighting (Canadian Aviation Regulations).
X	X		2.3.4.1 (Emissions and Energy Use)	The Argentia Green Fuels Facility will vent oxygen and argon into the atmosphere at a safe location, ensuring that local air quality is not affected.
X	X		2.3.4.1 (Emissions and Energy Use)	The Argentia Green Fuels Facility will be equipped with flare systems to mitigate, prevent, and disperse releases of off-gases from the ammonia production and storage areas.
		X	2.3.5 (Decommissioning and Rehabilitation)	A decommissioning and rehabilitation plan will be developed for all aspects of work in the Project Area. Rehabilitation measures will be implemented progressively as opportunities arise throughout the lifetime of the Project. The Project's decommissioning and rehabilitation activities will aim to restore the site to its original state or as close as possible. Such activities include: • Removing equipment and infrastructure when it is no longer required; • Re-grading and replacing soil in the area immediately surrounding turbine foundations; • Reclaiming access roads and removing gates; • Removing transmission lines, wood poles, steel poles and towers, and inactive conductors; • Dismantling piping, electrolyzers, water treatment systems, hydrogen handling systems, and ammonia loading infrastructure; • Purging and cleaning ammonia and water tanks prior to disassembly and removal. Removal and transport of material and equipment will follow the Waste Management Plan (Appendix N). Components will be recycled or refurbished for continued use wherever possible.
		X	2.3.5 (Decommissioning and Rehabilitation)	The Argentia Green Fuels Facility will be reclaimed with as little disturbance to shorelines and waterways as possible. Rehabilitation of any shoreline erosion and bank re-stabilization will be carried out if required. These facilities will be included in the Project decommissioning plan.
X			2.4.2.2 (Siting of Turbines and Linear Features)	The routing of surface access to the turbines will be determined by the nature of surface features: existing roads/trails, presence of wetlands, sensitive habitat (especially for Species at Risk) and natural gradients.

Type			Registration Section	Commitment
Mi	Mo	F		
		X	3.1.2.2 (Water Resources - Surface Water Resources)	Water will be used sustainably throughout the life of the Project. If it is determined that Project drawdown could cause a temporary water shortage, consumption of water affecting the PWS will be curtailed until this condition is no longer met.
		X	3.1.2.4 (Freshwater Fish and Fish Habitat)	Construction laydown areas will be sited to avoid adverse effects on the aquatic environment.
		X	3.1.2.4 (Freshwater Fish and Fish Habitat)	Waterbodies or watercourse crossings relative to the Project will be assessed prior to Project construction. Assessments will supplement those detailed in Appendix B1.
X		X	3.1.2.5 (Freshwater Fisheries)	Pre-construction surveys will be conducted should Project components cross paths with the main channel of a Scheduled Salmon River. Mitigations will be implemented to prevent adverse effects on the aquatic environment.
		X	3.1.2.14 (Marine Fish and Fish Habitat)	A drop-down camera survey will be completed to assess marine habitats associated with the marine effluent.
X		X	3.1.2.6 (Freshwater Sensitive Time Periods and Working Windows)	The following activities will be avoided during sensitive time periods: • Perturbation of trout, salmon, and eel migrations at stream crossings during spring and summer (May to September); and • Habitat alteration of salmon and trout streams, including near pond outlets and shorelines, during the spawning period (September 1 – November 30). Mitigation to create a safe fish passage plan for upstream migration shall be considered if alteration results in passage obstruction during the Salmonidae migration period.
X			3.1.3.1 (Vegetation)	The Project will adhere to provincial wetland regulations, avoiding and minimizing impacts to wetlands where practicable.
	X	X	3.1.3.3 (Fauna), 3.2.8 (Data Gaps), Appendix D4 (Mammals)	A muskrat survey will be conducted in fall 2024 as per discussions with NL WD regarding a suspected decline of this species in the region.
X			3.1.3.4 (Avifauna - Passeriformes and Piciformes (Perching Birds and Woodpeckers) and Others)	Songbird and woodpecker nests, when detected, will be buffered by a minimum of 30 m, or with larger buffers when prudent to do so.
X	X	X	3.1.3.4 (Avifauna - Accipitriformes and Strigiformes (Raptors and Owls))	Argentia Renewables will adhere to NL WD standards for owl and raptor nest setbacks.
X			3.1.3.5 (Species at Risk (SAR) and Species of	Avoidance and minimization measures will be implemented for all known SAR in the Project Area. In cases where interactions with SAR cannot be avoided, minimization measures will be

Type			Registration Section	Commitment
Mi	Mo	F		
			Conservation Concern (SCC))	incorporated, and a Permit to Engage in an Economic Activity Under Section 19 of the NL ESA, SNL 2001 C.E.-10-1 will be sought from the NL WD.
X		X	3.1.3.5 (Species at Risk (SAR) and Species of Conservation Concern (SCC))	Avoidance and minimization measures will be implemented to preclude interactions between the Project and Blue Felt Lichen. Yellow birch stands will be avoided during the planning of road routes and there will be no overlapping conflicts between yellow birch and the turbine pad locations.
X			3.1.3.5 (Species at Risk (SAR) and Species of Conservation Concern (SCC))	A setback distance of greater than 100 m will be established during all Project activities to avoid the area in which Boreal Felt Lichen was found.
X		X	3.1.3.5 (Species at Risk (SAR) and Species of Conservation Concern (SCC))	If SAR (other than those detected during baseline studies) are detected in the Project Area, mitigations for other passerine species outlined in Appendix S (EEMPs: Bat and Avian PCMP), Appendix R (EEMPs: SAR IMMP) will be implemented.
	X	X	3.1.3.5 (Species at Risk (SAR) and Species of Conservation Concern (SCC)) Appendix R (EEMPs: SAR IMMP)	Baseline surveys have confirmed the presence suitable habitat for Short-eared Owl in the Project Area. More detailed surveys will be conducted in 2024 to determine if/how this species uses the Project Area.
	X	X	3.1.3.5 (Species at Risk (SAR) and Species of Conservation Concern (SCC)), 3.2.8 (Data Gaps)	Bat detector surveys will continue in 2024 to capture the temporal window between mid-April and early November. Survey coverage includes suitable habitat and turbine sweep area. Turbine sweep area is surveyed by deploying detectors on meteorological towers.
	X	X	3.1.3.5 (Species at Risk (SAR) and Species of Conservation Concern (SCC)) 3.2.8 (Data Gaps), Appendix D7 (Insects), Appendix R (EEMPs: SAR IMMP)	The presence of yellow-banded bumble bee was confirmed in the Project Area in 2023. A yellow-banded bumble bee survey will be conducted in August 2024 to determine how this species uses the Project Area.
X			3.1.7 (Human Health and Quality of Life)	Argentia Renewables will microsite wind turbines to minimize visibility to nearby landowners to the extent practicable and reduce turbine heights (e.g., from 120 m to 99 m) where necessary.
		X	3.2.8 (Data Gaps)	Site-specific aquatic surveys for crossings P1-P6, as well as others, will be carried prior to construction.

Type			Registration Section	Commitment
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	X	X	3.2.8 (Data Gaps)	Rare plants and lichens surveys will continue in 2024. The rare plant survey was conducted before the definition of a corridor for the Project Interconnect Line.
X		X	4.2.1.5 and 4.2.3.5 (Mitigation Measures), Appendix R (EEMPs: SAR IMMP) Appendix S (EEMPs: Bat and Avian PCMP),	Wind turbines will be fitted with curtailment software.
X			4.2.2 (Aquatic Environment)	Stream crossing structures and additional drainage structures will be designed for 1:100-year climate change flow to avoid any waterlogging and drainage issues in the Project Area.
	X		4.2.2 (Aquatic Environment)	Develop a noise and vibration monitoring plan in consultation with FFA and local environmental non-governmental organizations.
X			4.3 (Accidents and Malfunctions)	All staff and personnel working on the Project will be trained and aware of the full suite of Project Environmental, and Occupational Health and Safety plans.
X			4.4 (Effects of the Environment on the Project)	Project infrastructure will be designed and operated to minimize risk of damage from wildfire (e.g., transmission rights-of-way will be maintained to ensure vegetation is maintained to decrease fuel load and maintain reliability, turbine pads will be maintained to avoid the accumulation of vegetation that represents fuel load in the event of wildfire).
X	X	X	4.6 (Plans and Environmental Management)	Principles of sustainable development, pollution prevention, environmental protection and enhancement, and due diligence will be followed throughout the life of the Project.
	X		4.6 (Plans and Environmental Management)	Argentia Renewables is accountable for sound environmental stewardship through continuous measurement that demonstrates performance improvement.
X	X	X	4.6.1 (Environmental Policy)	Argentia Renewables is committed to reducing its impact on the environment and incorporating sustainability into its core business operations by employing commercially reasonable measures to reduce the impact of its operations on the environment.
		X	4.6.2.1 (Roles and Responsibilities)	Employees will comply with all HSE rules and regulations, and promptly report any Health, Safety, and Environmental incidents. Employees will follow all Operational Controls. Argentia Renewables will implement and maintain the HSE Management System by providing the necessary human, material, and financial resources.
		X	4.6 (Plans and Environmental Management)	The following plans will be developed: • Business Plan / Development Plan • Project Execution Plan • Environmental Protection Plan • Emergency Response/Contingency Plan • Waste Management Plan • Hazardous Materials Response and Training Plan • Transportation Impact Study and Traffic Management Plan

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				• Public Participation Plan • Workforce and Employment Plan • Environmental effects follow-up and monitoring programs (EEMPs)
		X	4.6.2.2 (Planning)	Where there is an incident or performance failure (e.g., material spill), a review will be conducted to identify lessons learned and opportunities for improvement. This review will form the basis for implementing corrective action to reduce the likelihood of future system failures.
		X	4.6.2.3 (Management Plans)	Argentia Renewables will conduct: • Routine senior reviews of the HSE Management System and individual plans to ensure continued suitability, adequacy, and effectiveness; • Internal audits to determine the degree of success in implementation of the HSE Management System, and to verify the level of performance within individual management plans; and • Annual reviews to assess corporate environmental, health and safety performance and to reconfirm their commitment to the Sustainable Development Policy.
X	X	X	5.0 (Residual Effects)	Mitigation measures and associated monitoring efforts, as required, will be implemented employed to confirm predictions and support a continuous improvement approach to environmental management. This requirement and commitment are especially applicable to interactions with Species at Risk.
		X	9.0 (Environmental Protection Plan)	Each individual EPP (Construction Phase, Operation and Maintenance Phase, Decommissioning and Rehabilitation Phase) will be tailored to reflect the relevant site activities and their associated protection procedures
		X	Appendix C1 (Source Water Hydrology)	Water level monitoring and adaptive water management strategies will be implemented for the Placentia PWS ponds, to ensure the protection of Placentia's PPWSA and support the Project long-term
X	X	X	Appendix D2 (Bats Baseline Study)	A robust SAR IMMP (Appendix R) will be implemented, pending NL WD approval.
	X	X	Appendix D5 (Rare Lichens Baseline Study)	Lichen SAR surveys will be conducted in areas that may interact with Project infrastructure or activity to ensure mitigation measures are implemented. Surveys will be conducted in consultation with NL WD.
		X	Appendix M (Emergency Response/Contingency Plan)	Mutual Aid Agreements will be established with local and provincial groups as the project development progresses.
			Appendix M (Emergency Response/Contingency Plan)	Incidents shall be reported immediately, without delay, by phone to the local Ministry of Labour Office and later in writing.
X		X	Appendix M (Emergency Response/Contingency Plan)	Special attention will be given to scheduling ammonia loading on days when the ferry is not in Argentia (Tues-Wed-Sun).

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			Appendix M – Argentia Renewables Emergency Response Plan	Argentia Renewables will inform Marine Atlantic of a Level III incident (i.e., one where potential public or environmental exposure is significant) and assist Marine Atlantic with making a decision to redirect the ferry to its alternative port or evacuate passengers at the ferry terminal.
X			Appendix M (Emergency Response/Contingency Plan)	Argentia Renewables will identify critical areas that require fire protection and an assessment of potential fire size and duration. Argentia Renewables will determine the required fire water demand based on the risk assessment and applicable codes.
X			Appendix M (Emergency Response/Contingency Plan)	Argentia Renewables will construct a fire water storage tank based on fire water demands and will consider factors such as available space, environmental conditions, and future expansion needs.
X		X	Appendix M (Emergency Response/Contingency Plan)	The project will follow established good engineering practices throughout its development, with a focus on identifying and addressing risks and hazards at each stage of design, construction, and operation.
X		X	Appendix M (Emergency Response/Contingency Plan)	Argentia Renewables will train employees and emergency responders for each facility and shift, following legislative requirements, and industry best practices.
X		X	Appendix M (Emergency Response/Contingency Plan)	Argentia Renewables will maintain in good condition spill response caches that are accessible within fifteen (15) minutes travel of all work faces and within the immediate vicinity of fuel/hazardous materials storage areas.
X		X	Appendix M (Emergency Response/Contingency Plan)	Work will be carried out according to applicable provisions and/or requirements of the Fire Prevention Act, National Fire Code, and Section 443 of the NL OHS regulations.
		X	Appendix M (Emergency Response/Contingency Plan)	Evacuation areas will be designed specifically to account for wind dispersion of any potential ammonia vapor release. These points will be clearly defined by blue three-sided signs with white lettering.
X	X	X	Appendix M (Emergency Response/Contingency Plan)	Ultraviolet (UV) or infrared (IR) flame detectors will be installed in areas where hydrogen is produced and stored.
X		X	Appendix M (Emergency Response/Contingency Plan)	Argentia Renewables will establish emergency shut-down procedures for a hydrogen gas fire in the processing plant to ensure the safety of personnel, equipment, and the surrounding environment.
		X	Appendix M (Emergency Response/Contingency Plan)	Argentia Renewables will establish and clearly document the emergency shutdown procedures for hydrogen-related processes including specific steps to shut down equipment, valves, and processes associated with hydrogen.
			Appendix M (Emergency Response/Contingency Plan)	Each year Argentia Renewables will provide the local fire departments with the scale map of the facility, location of suitable staging areas, drainage patterns and sewer or tile inlet location, nurse tank parking areas, ammonia storage tank and line shut off valves, other hazards, location of utility emergency shut offs, telephone numbers of facility operators, location(s) of material safety data sheets (SDS) for ALL hazardous chemicals stored, and on site location of facility emergency response plan(s).
		X	Appendix M (Emergency Response/Contingency Plan)	If a significant ammonia leak happens and analysis indicates that an ammonia cloud could potentially reach nearby businesses or communities, all potentially affected parties will be notified about the prevailing situation and advised on necessary actions to be taken.

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X		X	Appendix M (Emergency Response/Contingency Plan)	If a spill of fuels, oils, lubricants, or other harmful substances occurs during the construction / operation of the project, spill response procedures will be implemented to ensure that the spill is contained as close as possible from the component system to eliminate hazardous materials entering the environment.
X		X	Appendix M (Emergency Response/Contingency Plan)	All tank capacities will meet NFPA 22 Standard for Water Tanks for Private Fire Protection requirements and address the need to deal with an ammonia release.
			Appendix M (Emergency Response/Contingency Plan)	In the event that there is a loss of water supply, the plant will have to be shut down, isolated, and purged. The cause of the loss of water will have to be identified and the plant will remain shut-down until the cause of the failure is identified and corrected.
X		X	Appendix M (Emergency Response/Contingency Plan)	Argentia Renewables will supply any specialized equipment or training required by the Placentia Fire Department for Ammonia site operations. Regular site visits will be arranged for members of the Placentia Fire Department to familiarize themselves with the site layout and emergency protocols.
X		X	Appendix M (Emergency Response/Contingency Plan)	Argentia Renewables will establish a Liaison Committee that will involve local stakeholders (communities, businesses, emergency services, schools, health care facilities etc.). The purpose of this committee will be to streamline communication strategies for ensuring the safety and well-being of area residents and businesses during emergencies.
X		X	Appendix M (Emergency Response/Contingency Plan)	Argentia Renewables will conduct regular public awareness campaigns to educate the community about emergency procedures, communication channels, and the importance of staying informed. Argentia Renewables will also establish a feedback mechanism to gather input from the community and industry stakeholders.
		X	Appendix M (Emergency Response/Contingency Plan), Appendix N (Waste Management Plan)	Hazardous wastes, including those from accidental spills, will be stored in designated areas or storage facilities that are appropriately designed for the materials stored. A designated Project site hazardous waste storage area will have secondary containment and be collected in appropriate leakproof containers until they are removed from site to a licensed offsite facility for regular disposal. This area will be marked with appropriate signage and fencing to control access
X		X	Appendix M (Emergency Response/Contingency Plan), Appendix O (Hazardous Materials Response and Training Plan)	A proficient emergency response team (i.e., 3 firefighters, at minimum, and one fire officer per shift) will be on standby round the clock to address site emergencies including medical incidents, fires, and emergency releases. All members of the ERT will be trained in the following areas: • Argentia Renewables Hazardous Materials Training Plan • Fire Training • Spill Response Training • Ammonia / Hydrogen emergencies • Wind turbine emergencies
		X	Appendix N (Waste Management Plan)	Argentia Renewables seeks to achieve and maintain a high degree of control over the collection, storage, transportation, and disposal of waste to minimize adverse environmental effects while ensuring compliance with all applicable acts, regulations and standards.

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X		X	Appendix N (Waste Management Plan)	Argentia Renewables is dedicated to engaging with key stakeholders and the public on the WMP to ensure that expectations and regulations are being met.
X			Appendix N (Waste Management Plan)	Argentia Renewables is committed to hiring local contractors and companies to assist with the transportation of materials to appropriate facilities for disposal.
X		X	Appendix N (Waste Management Plan)	The Project will involve the transport of recyclable materials to a larger recycling facility. Non-hazardous waste streams will be temporarily stored in designated laydown areas on the Project site and will be progressively removed to the local landfill or recycling facility for final disposal.
X		X	Appendix N (Waste Management Plan)	All food waste will be collected and disposed of in an odour-proof, enclosed, secure, and covered collection bin to minimize the attraction of wildlife. Gathering and transporting these wastes will be the responsibility of Argentia Renewables or its representative. Littering around the site will be strictly prohibited and enforced.
X		X	Appendix N (Waste Management Plan)	Waste metal will be stockpiled on-site and then transported to the appropriate waste facility.
X		X	Appendix N (Waste Management Plan)	Larger pieces of lumber will be stored in a laydown area for potential reuse. Site personnel will be informed to reuse this lumber material as much as possible or wherever feasible.
		X	Appendix N (Waste Management Plan)	A province-wide Certificate of Approval for the Transportation of waste Dangerous Goods/Hazardous Waste will be obtained for hazardous waste transportation if necessary.
		X	Appendix N (Waste Management Plan)	Petroleum wastes will be segregated as necessary to render individual waste streams easier to reuse for other purposes, recycle, or permit recovery of any by-products. Special precautions will be exercised when petroleum wastes to avoid improper release or disposal.
		X	Appendix N (Waste Management Plan)	Personnel handling wastes will be required to have specific training and utilize PPE to ensure safe handling and disposal.
X		X	Appendix N (Waste Management Plan)	Any hazardous materials stored in drums will have proper labelling (Safety Data Sheets available where applicable). All drums will be clearly labelled indicating their contents.
		X	Appendix O (Hazardous Materials Response and Training Plan)	The Hazardous Materials Response Team will adhere to guidelines in the Hazardous Material Training Plan.
X		X	Appendix O (Hazardous Materials Response and Training Plan)	Before starting work on any Argentia Renewable site, all employees, subcontractors and visitors must receive a safety orientation, including environmental aspects, using the Pattern OMS 300 Site Orientation guideline.
		X	Appendix P (Public Participation Plan)	Argentia Renewables is committed to engaging the public in a culturally sensitive manner, recognizing the distinctness and diversity of different communities. Implementing the above engagement strategy will involve: • Applying customized engagement and communication tools that are effective for each audience. • Encouraging stakeholders to participate actively in the Project approval process.

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				• Establishing a brand for the Project that generates pride for local stakeholders in having their community host the Project. • Delivering community benefits that meet at least one of the following objectives: ○ Produce local and regional economic benefits; ○ Advance community initiatives; ○ Enhance ecological preservation, restoration, and education; ○ Foster health and wellness; ○ Promote the needs of youth; and ○ Support cultural awareness.
		X	Appendix R (EEMPs: SAR IMMP)	A data query to the Atlantic Canada Conservation Data Centre (ACCDC) produced one record of Harlequin Duck from 1947, and it is likely this species occasionally uses Placentia Bay in the winter, but it would be unlikely to interact with the Project. If new information dictates otherwise, Harlequin Duck will be reconsidered for inclusion into this SAR IMMP
		X	Appendix R (EEMPs: SAR IMMP)	While baseline surveys did not confirm the presence of Rusty Blackbird in the Project Area, suitable habitat was observed. As such, Rusty Blackbird will continue to be sought during surveys as part of the avifauna monitoring program.
X			Appendix R (EEMPs: SAR IMMP)	The Project layout will undergo micro-siting adjustments before construction to avoid and minimize effects on wetlands in the Project Area.
	X	X	Appendix R (EEMPs: SAR IMMP)	SAR monitoring surveys will be conducted during Project Construction. Surveys will supplement previously completed baseline surveys and help address remaining data gaps and/or maintain data continuity prior to Project Operation. Survey details follow. • Avifauna spring and fall migratory, breeding, and winter surveys will continue throughout the pre-construction period. During spring construction activities, nest surveys will be conducted within 24 hours of site clearing to prevent incidental mortality of nesting birds. • Acoustic monitoring of bat SAR will continue to assess the presence, establish numbers, and habitat use, inform the development of additional mitigation measures and adaptive management plans.
	X	X	Appendix R (EEMPs: SAR IMMP) Appendix S (EEMPs: Bat and Avian PCMP)	The following post-construction activities will be completed: • Avifauna Surveys; • Bat Acoustic and/or Thermal Camera Surveys; • Standardized Fatality Searches; • Searcher Efficiency Trials; and • Carcass Persistence Trials.
X			Appendix R (EEMPs: SAR IMMP)	The Project will avoid and/or minimize direct and indirect impacts to wildlife, including SAR, which may occur during Project construction or operation.

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X			Appendix R (EEMPs: SAR IMMP)	Bird flight diverters will be installed in areas of relatively high risk of collision prior to and/or during construction of the Project.
X			Appendix R (EEMPs: SAR IMMP)	A wildlife-friendly Project lighting plan will be implemented. Key lighting commitments include: • Minimize pilot warning and obstruction lighting on all tall structures as feasible; • Utilize flashing warning lights that turn off completely between flashes; • Install the fewest number of site-illuminating lights feasible in the Project Area; and • Use only flashing lights at night at the lowest intensity and fewest number of flashes per minute as required by Transport Canada.
X	X		Appendix R (EEMPs: SAR IMMP)	Prior to clearing areas with habitat suitable for rare lichen species, surveys will be conducted to identify any thalli existing within the habitats connected to the proposed infrastructure. Consultations with NL WD will determine the course of action.
X	X		Appendix R (EEMPs: SAR IMMP)	Buffer areas will be created where possible around any environmentally sensitive areas, such as areas identified by the baseline survey (i.e., yellow birch stands for blue felt lichen) Water pygmyweed locations will be buffered by a radius determined by consultations with NL WD.
X			Appendix R (EEMPs: SAR IMMP)	The Project Area will be kept clean and free from leftover foods that attract birds and other wildlife.
X			Appendix R (EEMPs: SAR IMMP)	Argentia Renewables will refrain from using herbicides on the regrowth of the understory along the transmission lines or any other cleared area.
X			Appendix R (EEMPs: SAR IMMP)	Scheduling disturbance-causing activities, such as vegetation clearing, will be minimized during the regional avian nesting period of approximately April through August, to the extent practicable. Avian nest surveys will be conducted if vegetation clearing occurs during the regional avian nesting period to avoid and/or minimize incidental take of birds, nests, and eggs. An active nest is defined by the presence of eggs or nest-dependent eggs (Government of Canada 2019). If an active nest is discovered, the following steps will be taken immediately: • Halt all disruptive activities in the nesting area; • Move construction equipment and personnel away as quickly and quietly as possible and avoid disturbing the surrounding vegetation or making a trail to and from the nest; • Protect the nest with a vegetated buffer zone; • Establish a setback distance for activities; and • Maintain mitigation measures and avoid the immediate area until the young have naturally left the vicinity of the nest.
X			Appendix R (EEMPs: SAR IMMP)	Turbine blades will be curtailed below a cut-in speed of 3.5 m/s during the autumnal bat migration period.
X			Appendix R (EEMPs: SAR IMMP)	Turbines will be curtailed during Year One at wind speeds below 6 m/s from dusk to dawn, when ambient air temperatures are above 6ºC, between July 1 and September 30.

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X			Appendix R (EEMPs: SAR IMMP)	Preventative mitigative measures will be implemented to ensure bats do not occupy buildings.
X			Appendix R (EEMPs: SAR IMMP)	Disturbances, habitat degradation, fires, and many other factors can affect SAR of the area. The following measures will be implemented during routine maintenance throughout Project Operation: • Areas of undisturbed habitats will be avoided during maintenance; and • The turbine site will be revegetated with native plants, where practicable.
	X		Appendix R (EEMPs: SAR IMMP)	An annual IMMP report will be generated for each year IMMP activities are conducted in the Project Area. Annual reports will be submitted to NL WD and made available to the Qalipu First Nation and Miawpukek First Nation, as needed.
	X		Appendix R (EEMPs: SAR IMMP)	Should SAR carcasses be discovered during IMMP activities or incidentally in the Project Area, NL WD and other government agencies, as appropriate, will be notified within 48 hours of discovery and confirmation.
	X		Appendix S (EEMPs: Bat and Avian PCMP)	The following will be communicated to the NL WD: • Annual fatality counts and adjusted fatality estimates; • Proposed adaptive management; and • Draft PCMP updates for consultation and approval.
	X	X	Appendix S (EEMPs: Bat and Avian PCMP)	Project personnel will be required to complete wildlife awareness training. Where applicable, personnel will have a full understanding of the PCMP and how to respond and implement the PCMP as it pertains to their activities in the Project Area.
	X	X	Appendix S (EEMPs: Bat and Avian PCMP)	Post-construction monitoring (PCM) activities will be completed for at least the first year of Project operation (i.e., Year One). Following the completion of Year One PCM activities and consultation with NL WD, additional PCM activities may be requested.