ENVIRONMENTAL ASSESSMENT REGISTRATION DOCUMENT

Nova Sustainable Fuels Renewable Energy Park

Prepared for: Nova Sustainable Fuels

strum CONSULTING

October 2025

October 22, 2025

Mr. Jeremy Higgins
Nova Scotia Department of Environment & Climate Change
Environmental Assessment Branch
#2085 - 1903 Barrington Street
PO Box 442
Halifax, NS B3J 2P8

Dear Mr. Higgins,

Re: Environmental Assessment Registration Document
Nova Sustainable Fuels Renewable Energy Park

Please find enclosed the Environmental Assessment Registration Document for the Nova Sustainable Fuels Renewable Energy Park.

The undersigned approves and accepts the contents, as submitted to Nova Scotia Environment & Climate Change, Environmental Assessment Branch.

Sincerely,

Andrew Parsons
Project Director

EXECUTIVE SUMMARY

Nova Sustainable Fuels is proposing to construct the Nova Sustainable Fuels Renewable Energy Park near the communities of Goldboro and Drum Head, Guysborough County, Nova Scotia. The Project consists of a sustainable aviation fuel (SAF) production facility and supporting infrastructure that will produce SAF, green methanol, and other low carbon co-products from locally-sourced biomass (woodchips). The SAF produced by the Project will be used to support the transition from fossil fuels in the aviation sector and has the potential for substantial greenhouse gas reductions. Upon approval of the Environmental Assessment, construction activities are proposed to begin in 2028 and once constructed, the Project will be operational for a minimum of 50 years.

The Project is considered a Class I Undertaking under Schedule A of the Nova Scotia Environmental Assessment Regulations, N.S. Reg. 26/95, and therefore requires the registration of an Environmental Assessment Registration Document. The Environmental Assessment Registration Document has been completed according to methods and requirements outlined in A Proponent's Guide to Environmental Assessment.

Several Valued Components were identified and evaluated as part of this assessment. Based on provincial guidance, desktop analysis, and subsequent field studies, Valued Components determined for assessment were as follows:

- Atmospheric Environment
- Geophysical Environment
- Aquatic Environment
- Terrestrial Environment
- Socioeconomic Environment
- Archaeological Resources

The results of the assessment indicate that the Project, with the implementation of mitigation and monitoring measures, will not result in significant adverse residual effects. The Project will have a positive residual effect associated with the reduction of greenhouse gas emissions (i.e., production of low-carbon fuel) and economic prosperity within Nova Scotia.

Nova Sustainable Fuels will continue to engage and collaborate with local communities, the Mi'kmaq of Nova Scotia, and government representatives to ensure that any potential concerns identified in association with the Project are addressed and mitigated.

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µg/m^3	Micrograms per cubic metre
µm	Micrometers
AAQMS	Ambient air quality monitoring stations
AAS	Assessed archaeological significance
ABF	Advanced biofuels
ACCDC	Atlantic Canada Conservation Data Centre
AGRU	Acid gas removal unit
AMO	Abandoned mine opening
AQHI	Air quality health index
AQM	Air quality management
ARD	Acid rock drainage
ARIA	Archaeological Resource Impact Assessment
AUT	Automatic
B	Breeding
BF	Balsam fir
BMP	Best management practices
BS	Black spruce
BSM	Baseline sound monitoring
CAAQS	Canaidan Ambient Air Quality Standards
CB	Coastal boreal
CCME	Canadian Council of Ministers of the Environment
CEA	Cumulative Effects Assessment
CEO	Chief Executive Officer
CH_4	Methane

CLC	Community Liaison Committee
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
COS	Carbonyl sulphide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CRWN	Canadian Radar Weather Network
CSA	Canadian Standards Association
C-SAF	Canadian Council for Sustainable Aviation Fuels
CWS	Canadian Wildlife Service
dBA	A-weighted decibels
DBH	Diameter at breast height
DMA	Davis MacIntyre & Associates Limited
EA	Environmental assessment
EARD	Environmental assessment registration document
ECCC	Environment and Climate Change Canada
ECCC-MSC	Environment and Climate Change Canada – Meteorological Service of Canada
EMP	Environmental Management Plan
EQS	Environmental quality standards
ERP	Emergency Response Plan
ESA	*Endangered Species Act*
ESC	Erosion sedimentation control
ESD	Emergency shutdown
EU	European Union
FAC	Facultative
FACW	Facultative wetland
FEC	Forest Ecosystem Classification
FGDS	Fire and gas detection systems
FWI	Fire weather index
gCO_2e/MJ	Grams of CO_2e per megajoule
GHG	Greenhouse gas
GIS	Geographic information system
GPS	Global positioning system
GW	Gigawatt
H2	Hydrogen
H2S	Hydrogen sulfide
ha	Hectares
HSI	Habitat suitability index
HCN	Hydrogen cyanide
HPA	High potential area

IAAC	Impact Assessment Agency of Canada
IBA	Important Bird Area
ICSS	Integrated Control and Safety System
kg/h	Kilograms per hour
km/h	Kilometres per hour
KMKNO	Kwilmu'kw Maw-klusuaqn Negotiation Office
kt	Kilotonnes
kt/a	Kiltonnes per annum
LAA	Local assessment area
Late-successional	LT
LED	light emitting diode
LNG	Liquified natural gas
Long-lived intermediate-tolerant	LIT
Lpm	Litres per minute
M	Migrant
m^3	Cubic metres
m^3/h	Cubic metres per hour
masl	Metres above sea level
MBBA	Maritimes Breeding Bird Atlas
MBCA	*Migratory Bird Convention Act*
MBOF	Marine berth and offloading facility
MBS	Migratory Bird Sanctuary
MCPI	Major Projects Coordination Initiative
MEKS	Mi'kmaq Ecological Knowledge Study
MLA	Member of the Legislative Assembly
MMBtu/h	Million British thermal units per hour
MODG	Municipality of the District of Guysborough
MOU	Memorandum of Understanding
MPA	Moderate potential area
MTJ	Methanol-to-jet
mTPH	Modified Total Petroleum Hydrocarbons
MTRI	Mersey Tobeatic Research Institute
MW	Megawatt
MW	Mixedwood
N	Non-breeding
NE	Northeastern
NH_3	Ammonia
NLM	Natural Landscapes of Maine
Nm^3/h	Normal cubic metres per hour
NMOC	Nonmethane Organic Volatile Compounds

NO_x	Nitrogen oxides
NRCan	Natural Resources Canada
NS	Nova Scotia
NSAQR	Nova Scotia Aur Quality Regulations
NSCCTH	NS Communities, Culture, Tourism and Heritage
NSECC	Nova Scotia Environment and Climate Change
NSF	Nova Sustainable Fuels
NSPI	Nova Scotia Power Incorporated
NSPW	Nova Scotia Public Works
O_2	Oxygen
O_3	Ground level ozone
OBL	Obligate
OGPI	Old-Growth Potential Index
OLA	Nova Scotia Office of L'nu Affairs
PC	Point count
PCS	Process Control System
PCOCs	Potential contaminants of concern
PCS	Process control system
PEM	Polymer electrolyte membranes
PHC	Petroleum hydrocarbons
PID	Premises identification number
PLEM	Pipeline end manifold
PM	Particulate matter
PPE	Personal protective equipment
Pre-FEED	Preliminary front-end engineering design
RAA	Regional assessment area
RED	Renewable Energy Directive
REP	Renewable energy park
RFNBO	Renewable fuels of non-biological origin
ROW	Right-of-way
RPG	Renewable power generation
RWTS	Raw Water Treatment System
SAF	Sustainable aviation fuel
SAR	Species at risk
SGI	Sipekne'katik Governance Initiative
SH	Spruce hemlock
SIS	Safety Instrumented System
SM	Sound monitor
SO_2	Sulphur dioxide
SOCI	Species of conservation concern
SP	Spruce pine

SPK	Synthetic paraffinic kerosene
S-Rank	Subnational rank
t	Tonnes
tCO_2e	Tonnes CO_2 equivalent
TL	Tamarack
TNS	Tourism Nova Scotia
TSP	Total suspended solids
U.S. EPA	United Stated Environmental Protection Agency
VC	Valued component
VOC	Volatile organic compounds
WAM	Wet area mapping
WAR	Wildlife acoustic recorder
WB	Paper birch
WBA	Water balance assessment
WC	Wet coniferous
WESP-AC	Wetland Ecosystem Services Protocol - Atlantic Canada
WGS	Water gas shift
WHMIS	Workplace Hazardous Material Information System
WM	Wet mixedwood
WMA	Wskijnu'k Mtmo'taqnuow Agency Ltd.
WSS	Wetland of special significance
wt%	Weight percentage
WTS	Water treatment system

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1.0 PROPONENT DESCRIPTION

Nova Sustainable Fuels (NSF; the "Proponent") is proposing to develop and operate a vertically integrated Renewable Energy Park (REP, the "Project") at an onshore site in Goldboro, Nova Scotia (NS). The Project is the first phase of the larger, phase-deployed Canada Sustainable Aviation Fuel Project that will use available biomass resources and renewable electricity to produce sustainable, low-carbon alternatives to fossil fuels, with the potential for substantial reductions in associated greenhouse gas (GHG) emissions.

The Proponent retained Strum Consulting to support the development and submission of this Environmental Assessment (EA) Registration Document (EARD) under the *Environment Act*, S.N.S 1994-95, c.1. Strum is an independent, multi-disciplinary team of consultants with extensive experience undertaking EAs throughout Atlantic Canada. Contact information for the Proponent and their consultant is included in Table 1.1.

Table 1.1: Proponent and Consultant Contact Information

Proponent Information	
Project Name	Nova Sustainable Fuels Renewable Energy Park
Proponent Name	Nova Sustainable Fuels Ltd.
Chief Executive Officer(s) / Principal(s)	Andrew Parsons Project Director – Nova Sustainable Fuels
Mailing and Street Address	Nova Sustainable Fuels 1701 Hollis Street, Suite 800 Halifax, NS, B3J 3M8
Website	www.novasustainablefuels.com
Proponent Contact Information for the EA Registration	Michelle Gilders, Environmental & Regulatory Affairs Manager – Sustainable Fuels Phone: 902. 499.7196 Email: Michelle.Gilders@novasustainablefuels.com
Consultant Information	
Name of Consultant	Strum Consulting
Mailing and Street Address	Strum Consulting #210 – 211 Horseshoe Lake Drive Halifax, NS B3S 0B9
EA Contact	Heather Mosher, Senior Environmental Scientist Phone: 902.835.5560 Email: hmosher@strum.com

2.0 PROJECT INFORMATION

2.1 Project Introduction

The Proponent is proposing to develop, construct, and operate the Canada Sustainable Aviation Fuel Project at an existing industrial site on the Eastern Shore of Nova Scotia. The Project aims to produce sustainable aviation fuel (SAF), green methanol, and other sustainable

fuel co-products in response to a growing international demand for alternatives to fossil fuels. The development of sub-projects will occur over two phases:

- Phase 1 involves the construction and operation of a REP, which includes a sustainable aviation fuel production facility (the "Facility"), freshwater pipelines, and marine berth and offloading facility. In this phase, biomass and hydrogen (H_2) from local sources will be converted to SAF and other sustainable fuel co-products through the synthesis of green methanol.
- Phase 2 involves the construction of an onshore wind [820 megawatt (MW)] and solar (300 MW) project with associated high-voltage transmission line to generate renewable energy for SAF production.

This EARD is prepared in relation to land-based Phase 1 developments, with the submission of an EARD for Phase 2 anticipated in 2027. The construction and operation of Phase 1 will be powered by connection to the existing NS Power Incorporated (NSPI) electrical grid and by the renewable electricity produced and transmitted to Goldboro by Phase 2.

The development and construction of MBOF falls within federal jurisdiction and does not on its own require an EA per the *Environment Act,* S.N.S 1994-95, c.1. There are existing processes and regulatory pathways in place to manage potential impacts. As such, the marine component is not included in this EARD. Associated regulatory requirements related to the marine component are outlined in Section 2.3.

The Project will be located at the site of the former proposed Goldboro Liquified Natural Gas (LNG) Project in the Municipality of the District of Guysborough (MODG), in the community of Goldboro, NS (approximate project center: 45.175° N, 61.629° W; Drawing 2.1). The Goldboro LNG Project was initially proposed by Pieridae Energy (Canada) Limited ("Pieridae") in 2013 but was not commissioned. In 2024, Simply Blue Group, a renewable energy project developer, purchased the Goldboro LNG Project with plans to transition the site to a REP. Simply Blue Group sold the Project to NSF in May 2025. As it pertains to the EA, all permits and approvals issued to Pieridae were legally transferred with the sale to NSF.

Upon approval of the EARD, construction is proposed to begin in 2028. Once constructed, the Project is expected to be operational in 2031 for a minimum of 50 years.

2.2 Purpose and Need for the Undertaking

The goal of the Project is to produce SAF and other sustainable fuel co-products from biomass (i.e., woodchips from waste and residual sources). SAF, which include aviation biofuels, synthetic aviation fuels, and recycled carbon aviation fuels, are a drop-in alternative to aviation fuel derived from fossilized carbon. The SAF produced by the Project will have significantly lower GHG emissions compared to conventional aviation fuels (at least 65% to 70% reduction, depending on components). In practice, as the global production of SAF grows, it will be blended with fossil-based fuels at increasing proportions to reduce the net carbon emissions associated with energy-intensive sectors such as air transportation. The potential for

substantial reductions in life-cycle carbon emissions make SAF an attractive pathway to decarbonization and achieving climate goals.

The fuel produced by the Project will respond to a growing demand for SAF in European markets. The ReFuelEU Aviation regulation [Regulation (EU) 2023/2405] was passed by the European Parliament in 2023 to promote the aviation industry's transition to SAF. As it comes into effect, the regulation will require that the aviation fuel used in all airports in the European Union (EU) contain at least 20% SAF by 2035, increasing to 70% by 2050. The rapid ramp-up period and widespread transition to SAF across Europe ensures a degree of market certainty around future demand for the product. It is expected that the requirement for SAF within the aviation sector will eventually extend to North America. When that occurs, the Project will be well situated to meet demand.

The biomass used in the production process must meet regulated sustainability requirements for the produced aviation fuels to be usable in European markets. EU Renewable Energy Directive (RED) III [Directive (EU) 2023/2413] under the ReFuelEU Aviation regulation requires that the woodchip biomass feedstock used by the Project be limited to waste and residues from forestry and forest-based industries (e.g., bark, branches, pre-commercial thinnings, treetops). It is intended that the biomass required for the Project will be locally supplied by NS's well-developed biomass industry. Currently, biomass (which excludes lumber quality sawlogs) produced by the province's forestry sector is used for domestic electricity and heat generation, as well as the production of wood chips and pellets (including export to international markets). The use of forest biomass to produce SAF aligns with the province's desire to enhance and secure its bioeconomy and increase the use of existing (waste) biomass (NRCan, 2024). With its abundant wind resources and the availability of solar, NS is also equipped to supply renewable energy to generate the green hydrogen needed to produce SAF (Phase 2).

The Proponent is committed to sharing economic opportunities with the local community throughout the development and lifespan of the Project. This will be accomplished through employing local skills and labour where possible (including on the job training) while providing municipal tax revenue and a market for forestry biomass residues. Engagement with local groups has been ongoing throughout the planning and development phase of the Project to ensure community support.

2.3 Regulatory Framework

2.3.1 Federal

A federal impact assessment is not required for the Project as it is not located on federal lands or listed as a physical activity that constitutes a designated project in the Physical Activities Regulations, S.O.R./2019-285 under the *Impact Assessment Act* (Canada, 2019). Although marine terminals are listed as a physical activity, the proposed marine terminal will not be capable of accepting marine vessels larger than 25,000 deadweight tonnage, as listed in the regulations. A project description was submitted to the Impact Assessment Agency of Canada (IAAC) January 14, 2025, and this was confirmed. However, a variety of federal regulatory

requirements, including approvals, permits, notification, and compliance may apply to the Project (Table 2.1).

Table 2.1: Federal Regulatory Requirements for the Project

Requirement/Permit	Regulatory Body	Application/Permit and Comments
Migratory Birds Convention Act, 1994 (MBCA)	Environment and Climate Change Canada (ECCC)	Compliance legislation – there is no expectation that a MBCA permit will be required.
Species at Risk Act (SARA) Permit	ECCC, Fisheries and Oceans Canada (DFO)	No SARA permits are expected for the development of the Project. If deemed necessary at later stages of Project development, the Proponent will consult with ECCC-Canadian Wildlife Service (CWS).
Temporary Blaster's License or Blaster's Permit	Natural Resources Canada (NRCan)	The *Explosives Act* (Canada, 1985c) requires anyone working with explosives to have a license, certificate or permit issued by the Minister of Natural Resources. This permit will be acquired if explosives are required for the construction of the Facility.
Explosives Transportation Permit	NRCan	Pursuant to Section 28 of the Explosives Regulations, 2013 (SOR/2013-211, 2013), the Proponent must submit an application for authorization for the transport and use of an explosive under Part 3 of the Explosives Regulations, 2013. This permit will be acquired if explosives are to be transported for use in the construction of the Facility.
Approval of Emergency response assistance plan, *Transportation of Dangerous Goods Act, 1992*	Transport Canada	The application must be submitted in writing to the Minister of Transport and Internal Trade. The requirements for an emergency response assistance plan are identified under Section 7.3(2) of the Transportation of Dangerous Goods Regulations (SOR/2001-286, 2001)
Canadian Navigable Waters Act (Canada, 1985b)	Transport Canada	Approval required to construct “work” in navigable waters (marine berth and offloading facility marine berth and offloading facility)

Requirement/Permit	Regulatory Body	Application/Permit and Comments
Fisheries Act (Canada, 1985d) Authorization	DFO	Compliance legislation - Approval required for "Harmful Alteration, Disruption, or Destruction" of fish habitat. If, during the detail design phase, the Project is determined to have potential to impact fish or fish habitat, the Proponent will submit a Request for Project Review to DFO and/or submit a provincial watercourse alteration application which will be reviewed by DFO.

2.3.2 Provincial

The Project is subject to a Class I EA as defined in the Environmental Assessment Regulations, N.S. Reg. 26/1995 under the *Environment Act,* S.N.S 1994-95, c. 1. As such, this submission has been prepared in accordance with:

- A Proponent's Guide to Environmental Assessment (NSECC, 2025a)
- Activities Designation Regulations, N.S. Reg. 47/1995
- Environmental Assessments Regulations, N.S. Reg. 26/1995

Other regulatory requirements, including provincial approvals, permits, notifications, and compliance may apply to the Project (Table 2.2).

Table 2.2: Provincial Regulatory Requirements for the Project

Requirement/Permit	Regulatory Body	Application/Permit Status and Comments
Environmental Assessment Registration	Nova Scotia Environment and Climate Change (NSECC)	This approval application will be submitted to NSECC in accordance with Part IV of the *Environment Act,* S.N.S 1994-95, c. 1.
Industrial Plant / Facilities Approval	NSECC	This approval application will be submitted to NSECC in accordance with the Activities Designation Regulations, N.S. Reg 47/1995, following EA approval. Approval will be sought prior to Facility commissioning.
Watercourse Alteration Approval	NSECC	This approval application will be sought prior to watercourse alteration in accordance with the Activities Designation Regulations, N.S. Reg 47/1995.
Surface Water Withdrawal Approval	NSECC	This approval application will be sought following EA approval and following detailed hydrological assessments of Meadow and Ocean lakes, in accordance with the Activities Designation Regulations, ,N.S. Reg. 47/1995.

Requirement/Permit	Regulatory Body	Application/Permit Status and Comments
Wetland Alteration Permit	NSECC	Alteration applications will be submitted to NSECC in accordance with the Activities Designation Regulations, N.S. Reg. 47/1995, following EA approval.
Crown Land Easement	NSNR	Application to be filed for Project components occurring on Crown lands.
Beaches Act	NSNR	Compliance legislation - approval required for construction activities including trenching and infilling below the ordinary high-water mark.
Endangered Species Act, S.N.S. 1998, c. 11 (ESA)	Nova Scotia Natural Resources (NSNR)	Compliance legislation – there is no expectation that an ESA permit will be required.
Registry of Buyers - Primary Forest Products Development of a Wood Acquisition Plan	NSNR	Registration and plan to be completed following EA approval if primary wood products (e.g., logs) are to be purchased for use by the Project, in accordance with the Forest Sustainability Regulations, N.S. Reg. 284/2007.
Archaeology Field Research Permit	NS Communities, Culture, Tourism and Heritage (NSCCTH)	A permit was obtained to complete an archeology assessment. Discussed in further detail in Section 9.0.
Overweight/Special Move Permit Access Permit Work within Highway Right-of-way Use of Right-of-way for Pole Lines	NS Public Works (NSPW)	Permits to be acquired before mobilizing oversize vehicles on public roads or commencing work within a highway right-of-way
Nova Scotia Temporary Workplace Traffic Control Manual	NSPW	Compliance for the use of provincial roads during the construction, operation, and decommissioning phases of the Project.
Dangerous Goods Transportation Regulations	NSPW	Mandatory compliance with the provisions of the Dangerous Goods Transportation Regulations, N.S. Reg. 152/85, may be required.
Dangerous Goods Approval	NSECC	This approval will be sought prior to the storage of materials and product as set out in the Dangerous Goods Management Regulations, N.S. Reg. 56/95, Schedule A.
Filing of Approved Contingency Plan	NSECC	A contingency plan is to be filed with NSECC.

Requirement/Permit	Regulatory Body	Application/Permit Status and Comments
On-Site Sewage Disposal Approval	NSECC	This approval will be sought prior to the installation of any on-site sewage disposal systems as set out in the On-site Sewage Disposal Systems Regulations, N.S. Reg. 317/2015.
Municipal Approval Division III - Municipal Waste Part 1: Sewage/Storm Drainage/Septage	NSECC	Application will be submitted to NSECC prior to construction.
Elevator Lift License	NS Labour, Skills and Immigration	Application is to be filed before the Facility is commissioned.
Boilers and Pressure Vessels: Equipment License	NS Labour, Skills and Immigration	All boilers and pressure vessels will be installed and inspected at regular intervals as prescribed by the Chief Inspector per the Boiler and Pressure Equipment Regulations, N.S. Reg. 10/2011.
Electrical Wiring Permit Communications Cabling Permit	NS Labour, Skills and Immigration NSPI	Permits to be applied for before installing/ modifying electrical or communication installations.
Building Plan Approval	Office of the Fire Marshal	Prior to the start of construction, the Proponent will provide building plans for the construction of the Facility to the Fire Marshal.
Notification of Blasting	NSECC	Notification to be submitted prior to blasting activities, if required.

2.3.3 Municipal

Municipal Planning Strategies and Land Use By-laws in MODG require approval and/or permits for industrial projects (Table 2.3). The Project is in the Industrial Resource (I-3) zone and is permitted subject to Project plan approval (MODG, 2013, 2022). Project components may also be subject to provisions under the *Municipal Government Act*.

Table 2.3: Municipal Regulatory Requirements

Requirement	Regulatory Body	Application/Permit Status and Comments
Building and Development Permits	MODG	Application will proceed following receipt of EA approval and prior to construction.
Occupancy Permit	MODG	Application will proceed following construction.
Noise Control By-Law	MODG	Compliance with schedule restrictions for construction activities.

3.0 DESCRIPTION OF THE UNDERTAKING

3.1 Geographical Location

The Project is located in the community of Goldboro, MODG, in Guysborough County, NS (Drawing 2.1), in an industrial resource zone. Much of the Project Footprint (the area where direct disturbance is expected to occur in relation to the Project) consists of private lands that were previously disturbed by the early development of the Goldboro LNG Project (Drawing 2.2A- B).

The Proponent has secured land for the Project through purchasing land previously owned by Pieridae and is currently working with NSNR to obtain an easement for ancillary infrastructure to be constructed on Crown lands [see list of Property Identification (PID) numbers in Table 3.1). To date, approximately 313 hectares (ha) have been secured for development in Goldboro. The Project purchased 107.6 ha previously owned by Pieridae, and have secured an option agreement for 206 ha owned by MODG. The remaining lands are currently under discussion with landowners.

Table 3.1: Land Parcels within the Assessment Area

PID #	PID Ownership Information	REP Area
35094770	9290834 Canada Limited	Facility
35122068	9290834 Canada Limited	Facility, Red Head Peninsula/haul road
35206515	Maritimes & Northeast Pipeline Limited	Facility
35178029	J. D. Irving, Limited	Facility
35066158	MODG	Facility
35095884	MODG	Facility
35178045	MODG	Facility
35178409	MODG	Facility
35179464	MODG	Facility, freshwater pipelines
35066463	MODG	Red Head Peninsula/haul road
35168376	MODG	Red Head Peninsula
35168384	MODG	Red Head Peninsula
35168392	MODG	Red Head Peninsula
35168400	MODG	Red Head Peninsula
35168418	MODG	Red Head Peninsula
35094366	NSNR	Freshwater pipelines, Meadow and Ocean lakes (50 m buffer)
35067636	Silvics Forestry Limited	Freshwater pipelines
35206507	Ovintiv Canada Unlimited Liability Corporation	Freshwater pipelines
35125467	Maritimes & Northeast Pipeline Limited	Freshwater pipelines
35088418	Private	Ocean Lake (50 m buffer)

PID #	PID Ownership Information	REP Area
35069640	His Majesty the King in Right of the Province of Nova Scotia	Ocean Lake (island)
35094531	NSNR	Ocean Lake (island)
35094549	NSNR	Ocean Lake (island)

3.2 Project Boundaries

An Assessment Area for the Project (1,030 ha) was established to inform field and technical surveys and to facilitate preliminary Project design (Table 3.2). The Assessment Area encompasses the REP, including the Facility and supporting infrastructure (north of Highway 316), the lands that connect the Facility to the marine berth and offloading facility (south of Highway 316; Red Head Peninsula), as well as routes for freshwater pipelines to Meadow and Ocean lakes (two route options included for flexibility in design; Drawing 2.3). The Assessment Area boundaries are partially based on the extent of underlying land parcels (i.e., PIDs; Table 3.1), as well as a 15 m buffer (30 m total width) around the locations of freshwater pipelines, and a 50 m buffer around the two freshwater lakes.

Options for freshwater withdrawal from Meadow and Ocean lakes (to meet the Project's production requirements; described further in Section 3.3.2.2) are the subject of an on-going detailed hydrological assessment and will be evaluated in greater detail through a supporting regulatory pathway, a surface water withdrawal permitting process with NSECC. Two routes to the Facility from Meadow and Ocean lakes have been included, with the final selection dependent on further construction feasibility once detailed design is completed. The lakes and surrounding lands are included in the Assessment Area for information purposes and to establish a more complete picture of the Project's extent. Detailed field investigations for the Project were conducted within the Assessment Area (Table 3.2), with the exception of the 50 m buffer around Meadow and Ocean lakes, and a portion of one of the two proposed pipeline routes to the Facility (due to land access constraints), which were not surveyed. These areas will be assessed as part of permitting and approvals relating to freshwater withdrawal, and wetland and watercourse alteration.

Table 3.2: Areas of Study

Area of Study	Area (ha)
Assessment Area	1,030
Project Footprint*	247

*Area is a conservative estimate of the permanent footprint of the Project. The area will be further refined following the detail design.

Located within the Assessment Area, the Project Footprint includes the physical areas where direct disturbance can be expected to occur in relation to the Project (Table 3.2). The estimated size of disturbance associated with all temporary and permanent Project components, as well as a 5 m corridor around the freshwater pipeline (estimated average area to be disturbed), were combined to determine a conservative maximum expected extent of the Project Footprint. Descriptions of Project components are provided in Section 3.3.1.

3.2.1 Non-Participating Receptors

There are nine non-participating receptors within 500 m of the Assessment Area. Six of the receptors are located within the Assessment Area boundary along the shores of Ocean Lake (Drawing 3.1), and three are located along Highway 316 (between 450 and 50 m from the Assessment Area). The nearest receptor to the Project footprint is located at 12486 Marine Drive (Highway 316), Goldboro, approximately 50 m from the Project Footprint, and 250 m from the nearest piece of proposed Project Infrastructure.

3.3 Project Features

The production of SAF from biomass can be accomplished using several alternative technologies and approaches. The main production stages selected for the Project include:

- Biomass gasification: Sustainably sourced biomass (wood chips) is converted to syngas through means of gasification (reacting biomass at high temperatures).
- Methanol synthesis: Syngas is treated and combined with additional green hydrogen to produce green methanol.
- Methanol-to-jet (MTJ) process: Methanol is processed with additional hydrogen to produce a synthetic paraffinic kerosene (SPK) product, which is a type of SAF. SAF is the primary output of the Project; however, methanol and other co-products of SAF production such as renewable naphtha and renewable diesel may potentially be exported as final products depending on market demand.

Further description of the biomass to SAF process is provided in Section 3.3.3.

The REP's integrated nature means the Project must be developed alongside biomass supply chains and renewable energy generation (Table 3.3). Sequencing the integrated pieces and resources is key to the success of the Project, which is why the Proponent has opted for a phased development approach. As discussed, this EARD relates only to land-based Phase 1 developments.

Table 3.3: Description of Project Features

Feature	Description	Phase to be Completed
Access roads	Existing access roads within the REP will be upgraded where required, and new roads (including the haul road connecting the MBOF to the Facility) will be developed, as required.	Phase 1
Office blocks, workshops, warehouses, and amenities	Infrastructure (administrative building, workforce housing) to support day-to-day operations and provide comfort to facility personnel will be specified as the development progresses.	Phase 1

Feature	Description	Phase to be Completed
Biomass input	Biomass inputs will be sourced from sustainably sourced wood products. Approximately 375,000 dry tonnes per year of woodchips will be required for full operation of the Facility.	Phase 1
Biomass receiving and storage	Biomass delivered by truck will be received at the Facility, and biomass delivered by marine vessel will be transported from the MBOF marine berth and offloading facility (see "Marine offtake") to the Facility by truck and/or conveyor belt. Wet biomass (as received) will be stored and dried.	Phase 1
Biomass gasification facility	Dried biomass will be converted to syngas via gasification.	Phase 1
Hydrogen production facility	Hydrogen will be produced by electrolysis from polymer electrolyte membranes (PEM).	Phase 1
Methanol synthesis facility	Methanol will be synthesized from syngas and green hydrogen and distilled (to AA grade).	Phase 1
SAF production facility	SPK and low-carbon co-products will be produced from methanol and additional hydrogen.	Phase 1
Freshwater pipeline and water processing facility	Freshwater pipeline(s) and pumping station(s) will be installed to supply the Project with water drawn from nearby Meadow and/or Ocean lakes.	Phase 1
REP Electrical substation	The intake substation for the REP will incorporate power from the existing electrical grid, the power generation system, and the renewable power generation (RPG) facility (all transmission lines are part of Phase 2).	Phase 1
Marine offtake	Biomass offloaded from marine vessels will be received at the MBOF. Subject to technology analysis, output SAF will either be exported at the MBOF via marine vessels or using a subsea pipeline.	Phase 1 (marine component not included in this EA)
Renewable Power Generation	Approximately 1.1 gigawatt (GW) of combined solar and onshore wind capacity, RPG facility, collector system, export substations.	Phase 2

3.3.1 Project Components

A series of specific land-based components, determined through a preliminary front-end engineering design (Pre-FEED) study (Wood, 2025), will be developed as part of the Project's commissioning for Phase 1 (Table 3.4). These include components that are directly required for SAF production as well as supporting utilities and infrastructure.

Table 3.4: Description of Phase 1 Project Components Required for SAF Production

Project Component	Description
SAF Production	
Biomass receiving, storage, and drying systems	Intake, transfer, holding, and drying units to process incoming biomass.
Biomass gasifier	Unit to convert biomass to syngas by gasification.
Gas conditioning units	Water gas shift (WGS) and acid gas removal (AGRU) units to produce carbon dioxide (CO_2) and H_2 from syngas, and units to compress and pre-treat syngas and H_2.
CO_2 processing	System to capture, compress, store, and optionally vent biogenic CO_2 generated by the WGS and AGRU.
Methanol synthesis and distillation units	Units to synthesize methanol from compressed syngas and to increase methanol yield by using electrolytic H_2 to utilize excess carbon in the syngas. .
Hydrogen production and storage units	Units to produce and store H_2 produced through electrolysis.
MTJ unit	Production of SAF from methanol and H_2.
Product storage and load out zone	Containment, pumping, and storage facilities for methanol, SAF, and process by-products (diesel, naphtha).
Supporting Utilities and Infrastructure	
Raw freshwater pipeline and treatment system	Raw freshwater pipeline from Ocean and/or Meadow lakes, pumping station(s), and equipment to receive, treat, store, and distribute treated raw water to the facility.
Flare system	Elevated, top-flare system and associated drums and pumps for processing safety relief loads, preparing equipment for maintenance, and start-up/shutdown sequencing.
Natural gas metering/distribution	Natural gas intake from existing pipeline to fuel the auxiliary boiler and supply unit start-up requirements.
Fuel gas conditioning system	System to treat low heating value waste gases for re-use in facility.
Air separation unit	Unit to supply gaseous nitrogen and oxygen requirements of the facility (particularly MTJ process and gasifier).
Process water	Treated raw freshwater stored for use in filter backwash.
Treated potable water system	System to process treated raw water to meet potable water quality standards (water for personnel and safety use).
Demineralized water system	System to filter, demineralize, treat, and store water primarily used for H_2 production and steam generation.
Cooling water system	Cooling tower, basin, and circulation pumps for process cooling water, heat exchangers.
Firewater system	Storage tanks, duty and jockey pumps, and underground fire main (hydrants, monitors, deluge systems, dry risers, and sprinkler systems, as required).

Project Component	Description
Water retention ponds	Permanent ponds with embankment to manage and treat storm water runoff, and possibly facility effluent.
Instrument and plant air system	System for dispersing and treating air for instrumentation and control systems, and plant operations as required.
Deaerator/auxiliary steam boiler	Secondary boiler to meet steam requirements of production process.
Catalyst/chemicals handling and storage	Handling and storage units for chemicals and catalysts required for processing stages.
Water treatment system	Waste and storm water treatment to standards required for use in cooling water system.
Power generation system	Superheated steam from the gasifier will be used to generate power for the REP (connected to the REP electrical substation).

3.3.2 Production Inputs

The following sections describe the main inputs required for SAF production: biomass and fresh water.

3.3.2.1 Biomass

Biomass is a crucial component of the production pathway, as it is the carbon and hydrogen contained in biomass that is ultimately transformed into SAF and other co-products. Biomass is used early in the production process to generate syngas for methanol synthesis. To ensure a reliable supply of biomass to the Project, the Proponent has signed a Memorandum of Understanding (MOU) with Wagner Forest NS Ltd. to supply approximately 750 kilotonnes (kt) of wet biomass (375 kt of dry biomass) annually. The biomass used for the Project will be limited to waste and residues from forestry and forest-based industries to ensure compliance with EU RED III (as described in Section 2.2). Wet woodchips will be transported to belt dryers to reduce their moisture content to 10-17%. Dried chips will then be transferred to gasifiers for further processing.

3.3.2.2 Freshwater

Treated freshwater is required at several stages of the SAF production process, including steam generation and hydrogen production via electrolysis. A desktop hydrological assessment is ongoing to determine allowable water withdrawals from freshwater sources close to the REP. Based on preliminary assessments, two lakes have been identified as having the greatest potential as freshwater sources: Meadow and Ocean lakes. In-situ monitoring is currently in progress to validate the findings of the hydrological assessment and inform additional hydrological modelling.

The EA includes the land required to construct pipelines to Meadow and Ocean lakes in anticipation that the detailed hydrologic assessments will confirm their suitability. The lakes' perimeters and a 50 m area from the shoreline are also considered (i.e., included in the Assessment Area). Water withdrawal and assessment of associated environmental effects will

be addressed through subsequent permitting and approvals pathways. It is possible, based on the results of the hydrologic assessment and after optimising the Project water usage, that withdrawal from one lake will be sufficient for the Project, but routes from both lakes are included in the EA to allow for flexibility at later stages.

3.3.3 Production Pathway

The MTJ process was selected for converting biomass to SAF due to its efficiency and flexibility compared to other processes (e.g., Fisher-Tropsch). The main steps in the conversion process include biomass gasification, hydrogen generation, methanol distillation and synthesis, and conversion of methanol to SAF (Figure 3.1).

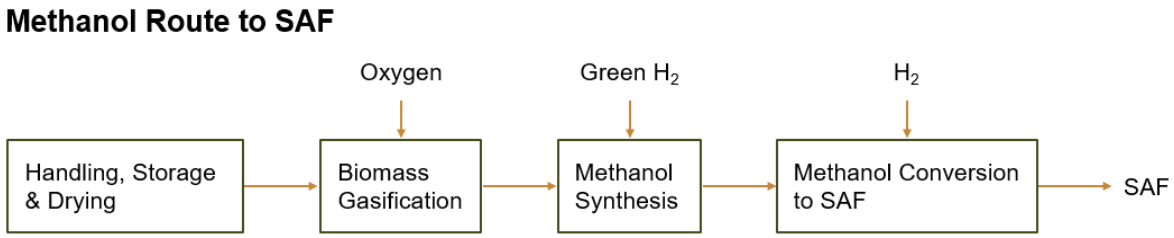

Figure 3.1: Major Steps in the Production of SAF from Biomass

3.3.3.1 Biomass Gasification

To be compliant with EU RED III, the SAF produced by the Project will contain only advanced biofuels (ABF) and renewable fuels of non-biological origin (RFNBO). ABF is derived from biomass gasification and must have a minimum of 65% GHG reduction compared to conventional fossil fuel. RFNBO is a synthetic aviation fuel produced from green hydrogen and, in the case of the Project, surplus biogenic carbon from the production of syngas. It must have at least 70% less GHG intensity than conventional fossil fuels.

Biomass gasification is a process whereby organic material (e.g., dried wood chips) is heated in a controlled oxygen/steam environment (500°C to 700°C) to produce a syngas mixture mainly composed of hydrogen (H_2), carbon monoxide (CO), and carbon dioxide (CO_2). Two gasifiers may be used to produce syngas, and unconverted solids (ash and tars) will be removed from the reactor for disposal at an approved disposal facility.

A portion of the produced syngas will be treated and conditioned before entering the methanol synthesis loop. Impurities will be removed using carbonyl sulfide (COS) / hydrogen cyanide (HCN) hydrolysis reactors, a sulfur guard bed, and activated carbon gas filtration system. The remaining syngas will be diverted to the WGS and AGRU. The proportion of diverted syngas varies depending on the availability of renewable energy (i.e., greater diversion during low/no renewably powered green hydrogen production). The WGS converts CO and water to CO_2 and ABF H_2 (Equation 1):

$$CO + H_2O \rightarrow CO_2 + H_2 + Heat\,(1) \quad \text{(Eq. 1)}$$

The CO_2 produced from the WGS will be sent to storage, recycled to the gasifier, and occasionally vented during periods of facility instability and/or low renewable energy. Every effort will be made to minimize biogenic CO_2 venting; however, analysis shows that an annual average of approximately 10 weight percentage (wt%) of the biogenic CO_2 produced may be required to be vented. The AGRU removes impurities, and the hydrogen is used to produce methanol.

3.3.3.2 Hydrogen Generation (Electrolysis)

A hydrogen and oxygen production unit will be constructed to produce hydrogen and oxygen from water through electrolysis. Water sourced from freshwater sources will enter the water treatment system where it will be demineralized before undergoing PEM electrolysis. The hydrogen produced will be used in methanol synthesis and MTJ processes (described in Section 3.2.3). Note that grid power may be used to produce electrolysis hydrogen for the MTJ process during periods of low or no renewable energy production, whereas methanol synthesis will only use green hydrogen (i.e., electrolysis hydrogen produced using renewable energy or ABF hydrogen produced by the WGS and AGRU; described in Section 3.2.3.1). Green hydrogen in excess of what is required for production will be stored for periods of low or no renewable energy.

3.3.3.3 Methanol Synthesis and Distillation

A catalytic conversion process will be used to produce methanol from the combined syngas (H_2, CO_2, and CO) and hydrogen streams. The resulting crude methanol will be processed by a crude methanol stripper and then distilled (water removal). Methanol will then be temporarily stored in tanks to ensure a consistent flow of methanol is available for the MTJ process.

3.3.3.4 Methanol-to-Jet

The stored methanol product will be fed to the MTJ unit for further processing to create SAF. Within the MTJ unit, methanol will be vaporized and superheated before entering a methanol to olefins reactor. Olefins (a chemical class that includes ethylene, propylene, and 1,3-butadiene) will then be oligomerized (a chemical process that converts monomers to macromolecular complexes through a finite degree of polymerization) and hydrogenated (the addition of pairs of hydrogen atoms to a molecule) to produce SPK (i.e., SAF). A small amount of electrolysis hydrogen will be added during the MTJ process, and naphtha and diesel blend stock bottoms will also be produced as byproducts and sold (see Section 3.3.6 for details regarding product offtake).

3.4 Siting Considerations

The selection of the Project Footprint was based on a detailed constraints analysis, primarily consisting of a Geographic Information System (GIS) exercise that considered land ownership, previous studies completed in the Assessment Area, and data reports from the Atlantic Canada Conservation Data Centre (ACCDC) (2024a, 2024b). Specific siting considerations included:

- Availability of large parcels of industrial land.
- Environmental suitability, including proximity to deep water.
- Maximizing use of existing disturbed areas to the greatest extent practical.
- Avoidance of known protected areas, significant habitats, and wildlife sites, provincial parks, and reserves, and field identified archaeological, cultural, and heritage resources
- The Project must also comply with a series of regulated setbacks and separation distances (Table 3.5).

Table 3.5: Summary of Minimum Setbacks and Separation Distances for Project Components

Setback Category	Distance	Relevant Regulators / Stakeholders
Watercourses	Recommended 30 m [from disturbance (i.e., laydown area)]	NSECC
Wetlands	Recommended 30 m	NSECC, NSNR
Wetlands of Special Significance (WSS)	Recommended 30 m (to be determined in consultation with NSECC)	NSECC, NSNR
Old-growth forest stands	100 m (applicable on Crown land)	NSNR
Rare plants	Species-specific	NSNR
Rare lichens	100 m to 500 m (species-specific, applicable on Crown land, recommended on private land)	NSNR
Protected areas/public resources	To be determined during consultation.	NSECC, NSNR, MODG

In addition, the results of field assessments (described in Sections 7.2 to 7.4) were used to iteratively update the Project Footprint to avoid or minimize interactions with known occurrences of rare species and sensitive habitats.

An Environmental Design Basis Report was developed by Strum in 2025 to review existing land use data, analyze environmental constraints, and assess regulatory and permitting requirements (Strum Consulting, 2025). Some potential additional constraints identified in the report include:

- Existing mineral rights in the areas proposed for the raw freshwater pipelines.
- Constructability limitations regarding ground stability due to Abandoned Mine Openings (AMOs) and associated historical tailings areas.
- Timeline and development limitations associated with regulatory approvals for Project impacts on waterbodies and wetlands.
- Presence of potential receptors within the REP and raw freshwater pipeline corridor.
- Presence of known archaeological resources within the REP.

The detailed mitigation measures stipulated in the Environmental Design Basis Report provide avenues for minimizing potential effects on surrounding land uses, residents, and environmental features.

3.4.1 Historical Operations within and near the Assessment Area

The Assessment Area and surroundings have long been of interest to industrial developers in the oil and gas, and mining sectors. In 2006, Keltic Petrochemicals Inc. proposed to construct and operate a petrochemical complex supported by an LNG importation and vapourization facility and electrical co-generation plant in the area being proposed for the Facility and MBOF. The project was approved in 2007 (federal and provincial EA processes) but never built. In 2013, Pieridae proposed to construct a natural gas liquefaction plant and marine terminal in approximately the same area, which received provincial approval in 2014 (no federal assessment was required). The Project site was cleared in preparation for construction, but the plant and terminal were not constructed.

In addition to these proposed projects, several developments are present in the vicinity of the Project. A decommissioned natural gas plant (Sable Gas Plant) is located northeast of the proposed Facility. The Maritimes and Northeast Pipeline network, which was connected to the Sable Gas Plant, is operational and delivers natural gas from the United States to NS and New Brunswick (CER, 2024). Two other decommissioned gas pipelines associated with abandoned offshore gas developments exist near the Project Footprint (CER, 2023). These pipelines, owned by Exxonmobil Canada Limited and Ovintiv Canada Unlimited Liability Corporation, have been flushed, nitrogen inerted, and disconnected. Additionally, portions of the Assessment Area and vicinity have in the past been active sites for gold mining.

Siting the Project within the footprint of earlier industrial projects offers an opportunity to minimize new land disturbance during construction and operation, although legacies associated with past projects require consideration when planning Project activities.

3.4.1.1 Abandoned Mine Openings

The Goldboro area is a historic gold mining district, and the area contains numerous abandoned mine works and associated waste materials, including tailings, waste rock, exploration trenches, building foundations, and AMOs. The provincial AMO Database (NSNR, 2024a) and a survey completed by Golder Associates [for the Goldboro LNG Facility (Golder Associates, 2014a)] indicate that many AMOs are present in the vicinity of the Project, posing a potential safety risk to the Project.

To confirm the presence of AMOs in the Assessment Area and quantify their level of risk, a dedicated field assessment was completed by Strum in July and August 2024.The field assessment involved a search for previously documented (provincial database and Golder Associates survey) as well as undocumented AMOs within the Assessment Area (excluding the freshwater pipelines, Meadow and Ocean lakes, and Red Head Peninsula). Encountered AMOs were georeferenced, and their safety risk level was assessed. A total of 108 field-identified AMOs were confirmed within the Assessment Area by Strum comprising of documented AMOs and new, undocumented AMOs. Most of which (76 of 108) were

considered to pose a low risk to safety (AMO visible, shallow, and/or not containing hazardous material), with the remainder high-risk (29 of 105; AMO concealed, deep, and/or containing hazardous material) (Drawing 3.2). Many of the AMOs were found to be collapsed, filled with water, or in various states of revegetation.

Not all previously documented AMOs were identified during field surveys due to vegetative overgrowth, topographical hazards, and the inherent safety risk of exploring potential locations further. However, combined with records from the provincial AMO Database (NSNR, 2024a; 52 AMOs) and earlier survey (Golder Associates, 2014a; 134 AMOs), it is possible that as many as 291 AMOs are present within the Assessment Area, including pits, shafts, and trenches (but likely much fewer; due to the lack of identifying features and variations in the precision of location data it is not possible to distinguish duplicate observations between the three sources of AMO data). The majority of the AMOs were identified within the main portion of the Assessment Area where the Facility will be located, with others in the vicinity of the freshwater pipeline near Seal Harbour Lake (Drawing 3.2).

The presence of AMO's may pose constraints to the Project, including potential constructability limitations regarding ground stability and associated historical tailings areas. The mitigation measures to manage the risks for AMOs are described in Section 7.2.5 and 7.4.3.

3.4.1.2 Historical Contamination

In addition to AMOs, historic gold mining has also left tailings and mine waste within the Assessment Area. The following reports were developed for Pieridae's Goldboro LNG Project, which consists of the same area considered for the Project:

- Phase I Environmental Site Assessment completed in 2018 by Wood Environment & Infrastructure Solutions.
- Phase II Environmental Site Assessment completed in 2018 by Wood Environment & Infrastructure Solutions.
- Assimilative Capacity Study Part 1 – Baseline Sampling Plan completed in 2016 by AMEC.
- Assimilative Capacity Study Part 2 – Baseline Data and Bioaccumulation Assessment completed in 2020 by AMEC.
- Risk Management Plan completed in 2021 by Wood Environment & Infrastructure Solutions.

The Phase I Environmental Site Assessment consisted of interviews, a review of historical information/reports, and a site visit to assess potential contamination. The conclusions of the Phase I Environmental Site Assessment indicated there is potential for significant environmental concern within the Project Footprint based on the historical use and/or the environmental condition of the property, including:

- Presence of abandoned mine workings (tailings, pits, open shafts).
- Presence of tailing disposal areas.

- Remnants of Giffin's Mill (i.e., rock walls).
- Identification of contaminants of concern from historic gold mining activities in soil, sediment, groundwater, and surface water. Primary contaminants of concern included arsenic, mercury, cyanide, and petroleum hydrocarbons (PHCs).

A Phase II Environmental Site Assessment was recommended and subsequently completed based on the results of the Phase I Environmental Site Assessment. The Phase II Environmental Site Assessment involved site investigations to confirm the presence and extent of contamination and to assess whether contaminants pose a significant risk to human and environmental health. Surface water, groundwater, sediment, and sub-surface soils were sampled, and analytical results were compared to Tier I Environmental Quality Standards (EQS). The Phase II Environmental Site Assessment concluded the following:

- Surface water exceeded Tier I EQS criteria for arsenic and mercury.
- Groundwater exceeded Tier I EQS for arsenic.
- Sediment exceeded Tier I EQS criteria for arsenic, mercury, and PHC.
- Soil exceeded Tier I EQS criteria for arsenic.

Results of the Phase I and II Environmental Site Assessments (Wood, 2018a, 2018b) along with Part I and II of the Assimilative Capacity Study (AMEC, 2016, 2020) were used to develop a Risk Management Plan (Wood, 2021) to manage contamination and associated risks to human and environmental health. This plan was specifically developed for the Goldboro LNG Project and its associated design, layout, and construction/operational activities. The Proponent is currently in the process of having an updated Risk Management Plan developed that will be specific to the REP.

A second Phase I Environmental Site Assessment was completed by WSP in 2024 when the Project was under ownership of Simply Blue Group. The report was conducted for due diligence purposes; providing an updated record of current and former practices within the site that may pose actual or potential environmental concerns. WSP's 2024 Phase I Environmental Site Assessment concluded that the Areas of Potential Environmental Concern (APECs) identified by Wood (Wood, 2018a, 2018b) remain APECs and areas of environmental concern.

3.4.1.3 Mitigation

A series of mitigation measures to address the contaminants on site will be implemented and adjusted as required during the construction phase of the Project to limit remobilization. Specific measures are described in Sections 7.1, 7.2, and 7.3 in consideration of the potential effects of the Project on the atmospheric, geophysical, and freshwater environments, respectively.

3.5 Project Phases

The Project will include three phases:

- Site preparation and construction
- Operations and maintenance
- Decommissioning

Activities and requirements associated with each phase are discussed in the following sections.

3.5.1 Site Preparation and Construction

Construction will not commence until the necessary Approvals, Permits, and permissions are received (including the grant of an EA Approval and associated permitting requirements). Although the majority of construction activities are expected to take place between the hours of 0700 and 2100, construction activities may occur outside of these hours.

3.5.1.1 REP

The Project Footprint is approximately 247 ha, including plant development, freshwater pipelines, construction laydown areas, temporary concrete batch plant, and supporting infrastructure, as indicated in Drawing 2.2A-B.

Site preparation for the REP will include geotechnical surveys, clearing, grubbing, and grading. A geotechnical survey will be conducted to determine soil competency, as well as the potential for acid rock exposure and subsequent generation of acid rock drainage (ARD) in the area. If ARD material is encountered and exceeds regulatory limits, a management plan will be developed and submitted to NSECC for approval [included as a component of the Project's Environmental Management Plan (EMP). The geotechnical investigation will ensure the area is able to support the various facilities and roads to be developed within the Assessment Area. Following the geotechnical surveys, the Project Footprint will be cleared of vegetation (i.e., trees and shrubs) using tree clearing and harvesting equipment. During this phase, overburden (i.e., stumps, roots, downed timber, humus, and topsoil) will be removed (i.e., grubbed) to expose the compacted soil layer (i.e., hardpan) and/or underlying bedrock. Grubbed material will be transported to a disposal site or handled on site if contaminated, as determined in Project's EMP. Any material which may be used in successive phases will be retained on-site for re-use in landscaping and grading.

Grading in the Project Footprint will require cut and fill activities, as well as ground compaction. In the case of exposed bedrock, blasting may be required to accommodate the REP structural designs. A management plan (incorporated in the EMP) will be developed and implemented to minimize the potential for blasting to impact surrounding infrastructure or the environment. Explosives will be transported to the required location on the day of the scheduled blast and will not be stored on the site. Blast monitoring will be carried out, as required.

Prior to commencing construction, temporary fencing will be installed to secure the site, and site drainage will be managed through grading and a system of temporary retention ponds.

During the construction of the Facility and its associated works, construction laydowns and storage areas will be established for temporary placement of equipment and construction materials. Following the formation of laydown and storage areas, the assembly of the substation and associated infrastructure will be prioritized, as electricity will be required during the early phases of construction. The remaining Facility components will be constructed as equipment and building materials are delivered, following the sequence determined during the Project's development and design phase. Various contractors will be responsible for installing footings and foundations, erecting (framing) building walls, roofs, storage tanks, and enclosures. Specialist contractors will support the various component installs. Areas of the Project Footprint associated with the Facility will be paved.

The development of the Facility will require the use of the following equipment:

- Backhoes
- Bulldozers
- Compactors
- Compressors
- Cranes
- Dump Trucks
- Excavators
- Forklifts
- Generators
- Graders
- Ground Heaters
- Heavy Haulers
- Loaders
- Manlifts
- Mixer Trucks
- Pickup Trucks
- Pile Boring Machines
- Pile Driving Machines
- Tractors/Trailers
- Tree Clearing and Harvesting Equipment
- Trenchers
- Vacuum Trucks
- Welding Machines

General construction activities within the REP include:

- Erosion and sediment control and temporary sediment basins
- Installation of access road infrastructure (upgrading existing and new construction)
- Laydown area and Facility construction
- Infrastructure development
- Transportation of Facility components, equipment, and materials
- Site traffic control measures
- Piping and electrical work
- Foundation excavation and construction, including blasting, if required
- Materials preparation and storage (e.g., crusher and storage areas)
- Facility infrastructure assembly
- Site waste and dust management
- Construction of the substation
- Construction of the freshwater pipeline

- Removal of temporary works and site restoration
- Commissioning

A review of environmental considerations, mitigations, and best management practices to be followed during Facility construction activities, can be found under Section 11.0, Environmental Effects Assessment.

3.5.1.2 Access Roads

Primary access to the Facility will be via the existing perimeter roads (Sable Road and Highway 316). New, paved roads will be constructed within the REP to facilitate access to the various Facility components and streamline on-site transportation. On-site roads will be two-lane roads with a total roadway width of 6 m and a 1 m wide shoulder on either side. Access to the facility will require one watercourse crossing (Section 7.3.1). Additional watercourse crossings may be required once detailed design of on-site roads is complete. A new haul road will be constructed between the MBOF and the Facility (Drawing 2.2A). The haul road (approximately 800 m) will be a minimum of 9 m wide with asphaltic pavement. All roads will be sloped to direct surface water off the road surface and equipped with culverts (as needed) and drainage ditches.

During the construction phase, Project gravel roads will be maintained with additional gravel or periodic grading. Aggregate material for road construction will be transported from on-site or off-site quarries and stored temporarily until used. Any material removed for road construction will be stored or disposed of in accordance with regulations for road construction. Material stored on the site will be managed with appropriate erosion and sedimentation control measures or re-used.

The following equipment is typically used during road upgrading and construction:

- Excavators
- Feller buncher
- Dump trucks
- Bull dozers
- Rollers
- Graders
- Crusher
- Light trucks

3.5.1.3 Laydown Areas, Concrete Batch Plant, and Ancillary Infrastructure

General activities during the creation of the laydown area (one general construction laydown area, approximately 7 ha), concrete batch plant, and ancillary infrastructure may include:

- Delineation of work areas and installation of erosion and sedimentation control measures.
- Removal of vegetation and site grading.

- Removal of overburden and soils.
- Blasting/breaking of bedrock (to be determined, based on geotechnical conditions and foundation design).
- Pouring and curing of concrete foundations (complete with reinforcing steel).
- Placement of competent soils to bring area to grade.
- Compaction of fill or soils.
- Trenching and installation of above ground electrical collector systems and fibre optic communication systems.

A temporary concrete batch plant will be used for the Project to minimize the transport of concrete during construction. The specific type of the plant will be determined during the detailed design phase. Preliminary locations are provided on Drawing 2.2A, but exact locations may change following detailed design.

3.5.1.4 Workforce Housing

Temporary workers accommodations will be built to support construction activities. The accommodations will include facilities for sleeping and dining to support 500 to 1000 people. Wastewater from the facilities will be treated by an on-site septic field, and water will be provided by a drilled well. The facilities will have 24-hour security, meet all building codes and standards, and be provisioned with a sprinkler system for fire suppression.

3.5.1.5 Surface Water Management

Drainage of stormwater, which may contain contaminants, will be managed across the REP using retention ponds and ditches (Drawing 2A). Water collected in gutters and open ditches will be directed to a series of retentions ponds sized to the Project Footprint and a 1 in 100 year, 24-hour storm event. Pond designs include sediment/retention basins sloped to a primary outlet, with stormwater pumping stations as needed to account for elevations. Water from the ponds will be routed to the remaining retention pond where a wastewater treatment facility is proposed to remediate stormwater of on-site contaminants (size and location to be determined in a later design stage). Water will be released to either WC2 or WC11 pending the results of a Water Balance Assessment (WBA) and the Stormwater Management Plan.

3.5.1.6 Freshwater Pipeline

The freshwater pipelines to Meadow and/or Ocean lakes will be 44.5 cm in diameter with a maximum length of 15 km. A proposed route has been included in the EA, with an optional route provided depending on an assessment of constructability once detailed design and geotechnical surveys are completed. Pumping stations and associated access points will also be constructed, but permanent roads will not be required along the pipeline route. The location of the pumphouses is dependent upon the completion of the multi-year hydrological assessments; for the purposes of the EA, a conservative sized footprint (10 m x 10 m) has been assumed on the banks of each lake and included in the Project Footprint calculation.

During construction, vegetation will be cleared along the pipeline route to the minimum width required (e.g., for construction and to maintain access for maintenance/inspection during the operation phase). Where subsurface conditions allow, the pipeline will be trenched below the

ground surface or mounded overtop using surficial material (to be determined during detailed engineering stage). Directional drilling may be used where the pipelines intersect water crossings so that the pipeline passes below watercourses. If detailed design suggests this is not feasible, then pipelines will span watercourses. For the purposes of the EA, a conservative estimate of pipeline width inclusive of clearing has been set at 5 m. The water pipeline will have co-located communication and electrical cables running alongside of it.

3.5.1.7 Substation

A substation will be constructed in the Project Footprint near the closest available grid connection location (the transmission line and grid connection itself is part of Phase 2). The construction of a substation can take between eight and ten months, depending on weather, soil conditions, and construction vehicle access.

The following equipment is expected to be used during construction of the substation:

- Excavator
- Backhoe
- Bucket trucks
- Light cranes
- Light trucks
- Hydrovac
- Directional Driller
- Telehandler
- Rollers

3.5.1.8 Removal of Temporary Works and Site Restoration

Once construction has been completed at each of the components, temporary works will be removed, and the site will be appropriately graded. The following equipment is expected to be used in this process:

- Excavator and/or backhoe
- Grader
- Dump trucks
- Hydroseeder
- Light trucks

3.5.2 Commissioning

The Facility and all ancillary infrastructure will undergo a series of tests for mechanical, electrical, and control functions prior to initializing the unit start-up sequence. Once the start-up sequence has been initiated, another series of performance checks for safety systems will be completed. Commissioning will begin after the Facility has cleared all tests.

Product offloading will occur at any time of the day and is subject to environmental and logistical conditions for marine offloading.

3.5.3 Operating Alternatives

Two operating alternatives have been established to reflect the sequencing of Project phases (e.g., the Facility will become operational prior to RPG) and the inherent variability of renewable energy, which causes the actual operating capacities of many industrial process units to fall short of their design sizing basis (the nameplate capacity). The operational scenarios described in the following sections include one for optimal conditions when renewable energy supply is stable, and another for period of low or no renewable energy availability. These scenarios ensure flexibility and efficiency in the system's performance across varying renewable energy outputs.

3.5.3.1 Operating Scenario 1: High Renewable Energy Input

In this case, maximum green H_2 (and subsequently RFNBO) is produced. Renewable electricity input to the facility is high and the use of grid power is minimized:

- Renewable electricity input to the process is at its maximum.
- The gasifiers operate at capacity to produce syngas for maximum methanol production.
- The WGS and AGRU are maximally bypassed.
- Green H_2 produced above the nameplate requirements of the methanol unit is stored for future turndown scenarios.
- MTJ unit uses green H_2 to operate at its maximum.

3.5.3.2 Operating Scenario 2: Zero Renewable Energy Input

In this case, no green H_2 is produced. Stored green H_2 and biogenic H_2 produced from ABF syngas are used to maintain minimum operation of the methanol synthesis and distillation unit. The renewable electricity input to the facility is at zero (0):

- Gasifiers operate in a turndown mode.
- The WGS and AGRU operate at a capacity to produce the H_2 required for methanol synthesis turndown operation.
- The methanol synthesis and distillation unit is turned down and optimized.
- The MTJ unit uses methanol from the storage tanks and H_2 produced from grid sourced electricity to maintain steady state operation.

Table 3.6: Overall Process Design Rates

Unit Operation	Nameplate Capacity	Scenario 1	Scenario 2	Nameplate Source	Comments
Biomass Receiving	894 kilotonnes per annum (kt/a)	843 kt/a	331 kt/a	Calculated	At 50% moisture content
Grid Power to Facility	60 MW	0 MW	54 MW	Calculated	Nameplate is maximum available from current grid (19 MW to electrolyzers, 35 MW for remainder of plant)

Unit Operation	Nameplate Capacity	Scenario 1	Scenario 2	Nameplate Source	Comments
Raw Water Processing	645 cubic metres per hour (m^3/h)	586 m^3/h	To be confirmed	Calculated	Design growth margin included in nameplate. Options to optimize and reduce raw water consumption are currently being explored.
Methanol Synthesis Green H_2 Supply	8,095 kilograms per hour (kg/h)	8,095 kg/h	3,632* kg/h	Vendor	*When available from storage
Gasifier Syngas Production	105,900 kg/h	80,810 kg/h	31,730 kg/h	Vendor	Based on selected methanol unit
ABF/ RFNBO Methanol Production	62,500 kg/h	62,500 kg/h	18,784 kg/h	Vendor / Calculated	-
ABF/ RFNBO SPK Production	165 kt/a	165 kt/a	165 kt/a	Calculated	-
MTJ H_2 demand	346 kg/h	346 kg/h	346 kg/h	Vendor	-

3.5.4 General Facility Operations

3.5.4.1 Operating Hours and Staffing

The lifespan of the Project is estimated to be a minimum of 50 years. The Facility will be operational 24 hours/day, 365 days of the year. The facility will employ 60 to 80 employees, operating on rotating shifts. Site access will be via Highway 316 and Sable Road.

3.5.4.2 Thermal Management

Air cooling is expected to be used for the majority of REP cooling needs. When the air cooling temperature is not adequate, an evaporative cooling water system (including cooling tower, basin, circulation pumps, and chemical injection packages) will be used [designed for a maximum circulation rate of 12,169 tonnes per hour (t/h)]. Sources of cooling water will include treated wastewater from the Facility, treated stormwater runoff, and treated make-up water. The possibility of using seawater as cooling water (i.e., to replace evaporator towers) is currently being assessed to reduce freshwater demand.

3.5.4.3 Air System

An air separation unit will supply the gaseous nitrogen and oxygen requirements of the Facility. An air compressor and dryer will supply the instrument and utility air for the REP.

3.5.4.4 Biomass Delivery

Biomass may be transported to the REP by trucks and/or marine vessels from locations across NS (the use of out of province biomass may be considered to supplement local sources). Deliveries by ship will be offloaded at the marine berth and offloading facility; during early

stages of the Project, biomass may be transported by truck from the marine berth and offloading facility to the REP via a haul road, and later by a conveyor system. Land-based wood chip deliveries will be trucked directly to the REP (estimated 60 truckloads per day), screened, and transported to the stacker-reclaimer using a conveyor system. Biomass delivery may occur 24 hours a day, although it is expected that the majority of truck activity will occur during the day.

3.5.4.5 Freshwater Supply and Treatment

A pumping station and freshwater pipeline will be constructed to transport raw freshwater to the REP. At the REP, a raw water treatment system will receive, treat, store, and distribute treated water to the Facility. The treatment system will be designed for a maximum utility consumption of 586 t/h of raw water. The water used for cooling and firewater systems will require filtration of suspended matter to ensure the water does not contain debris. The water used for electrolysis will require further treatment in a demineralized water system.

The total length of the proposed freshwater pipeline route is approximately 15 km, with a pipe diameter of 44.5 cm. A 15 m buffer (30 m corridor) was chosen for the Assessment Area around the pipeline, but the actual amount of land cleared for the route will be smaller (estimated 5 m corridor; minimized to the extent required for access during construction and maintenance).

Wastewater from the facility will be recycled into the process as much as practical to reduce freshwater demand.

3.5.4.6 Effluent Treatment

An anaerobic reactor will be used for wastewater treatment and will convert (via biological activity) waste organics to methane, biomass, and CO_2. The solid waste biomass produced by the anaerobic reactor will be periodically removed as sludge and disposed of as non-hazardous solid waste (trucked to municipal treatment system or sold for beneficial reuse). Effluent from the anaerobic reactor will flow to an aerobic reactor (membrane bioreactor). Treated effluent will be separated from biomass such that the resulting effluent may be used as cooling tower makeup and process water.

Process water effluent from the demineralization system and cooling tower blowdown will contain a high concentration of total dissolved solids. These are not suitable for treatment in the biological system and water will instead be pretreated prior to entering a reverse osmosis system. This process will allow up to 75% of the water to be reused in the Facility, with the remaining concentrate discharged to retention ponds for treatment prior to release. Process water effluent will either be released to the freshwater environment or the marine environment after any necessary treatment, with the specific location evaluated during detailed design pending the results of the Water Balance Assessment. Discharge criteria will meet Canadian Council of Ministers of the Environment (CCME) guidelines.

3.5.4.7 Surface Water Management

Surface water will be directed through ditches and culverts as necessary into retention ponds. The number and location of retention ponds are subject to change pending detailed design and the results of a water balance assessment. However, it is expected that surface water from the retention ponds will be released to the freshwater environment ending in WC2 (Betty's Brook) or WC10 and WC11 (Drawing 2.2A). All discharge from retention ponds will meet CCME guidelines.

3.5.4.8 Fuel Gas Conditioning System

Waste gases emitted at various stages of the process will be recycled to the Facility where feasible to the fired heaters in the process and/or for additional power generation.

3.5.4.9 Controlled Emissions and Flare System

CO_2 produced by the AGRU will be occasionally vented from the facility, primarily during periods of facility instability and/or low renewable energy. Efforts will be made to limit CO_2 venting; however, analysis shows that an annual average of approximately 10 wt% of the biogenic CO_2 produced may be required to be vented.

An elevated, top flare system will be used to process safety relief loads, preparation of equipment for maintenance, start-up/shutdown and small, low pressure gas streams. The flare pilot (fuelled by natural gas) will remain lit with flaring on start-up and shutdown.

3.5.4.10 Alternative Energy Sources

Process fuel requirements will be met using off-gases produced during normal operation and supplemented with natural gas. Natural gas will be used to meet start-up supply requirements, pilot fuel and to run the auxiliary boiler. Natural gas will be supplied from the existing Maritimes & Northeast Pipeline, which terminates in the area adjacent to the Project.

3.5.4.11 Auxiliary Administrative Buildings

Administrative buildings will provide a location for the daily administrative operations of the Facility, including offices, washrooms and staff spaces. Drinking water will be sourced from a drilled well, and wastewater will be treated through an onsite septic system. Parking will be provided with a lot adjacent to the administrative buildings with ad hoc parking throughout the Facility.

Access roads and the Facility will be maintained by staff and maintenance personnel. The conditions of access roads will be maintained with additional gravel and graded, as required. During the winter months, all roads will be plowed, sanded, and/or salted, as required for driving safety and to ensure access to all site locations in the event of an emergency.

3.5.4.12 Site Security and Firefighting

The Facility and marine berth and offloading facility will be surrounded by chain-link fencing. A security guard will be present on site at all times. The pipeline route will not be fenced, and the pumphouses will be enclosed within a facility.

Firefighting systems (including firewater system) will be installed throughout the site and designed with up-to-date codes and standards. It is expected that firefighting systems will be a combination of risers located throughout the site, with sprinkler systems in buildings.

3.5.4.13 Vegetation Maintenance

Vegetation management will be completed around the Facility and along the pipeline route and will include removal and pruning. Timing of vegetation management will depend on site-specific conditions. A 5 m corridor along the pipeline route will be allowed to naturally regenerate as herbaceous and low-level shrubs

3.5.4.14 Facility Maintenance

Facility maintenance activities will conform to manufacturer's equipment specifications, industry best management practices (BMPs), and standard operating procedures. Maintenance work will be carried out on a proactive, periodic, and as-needed basis. Maintenance activities may require the use of machines and spare parts for the replacement of equipment components. The most common vehicle used during maintenance work will be light/medium pickup trucks. It is possible that SAF production may require periods of scheduled shutdown for maintenance activities. During this time, the Facility will remain open to facilitate maintenance activities.

3.5.5 Product Storage and Offtake

3.5.5.1 Storage

Various products will be temporarily stored on site in quantities required to meet production demands (Table 3.7).

Table 3.7: Storage Specifications for Feedstock, Intermediaries, and End Products

Product	Product Format	Storage Vessel	Capacity
Feedstock			
Wet biomass	Woodchips, as received	Stacker reclaimer	40 kt; volume required for 10 days of production
Dry biomass	Dry woodchips, 10 to 17 wt% water	Concrete walls, steel grates	200 tonnes (t)
Intermediate Products			
Methanol	Liquid	Two internal floating roof tanks with Nitrogen blanketing and additional tank for off-spec methanol	25,000 cubic metres (m^3)rundown, certification, and export tanks (2); 5,000 m^3 off-spec storage
Hydrogen	Gas	Pressure vessels	20 x 1 t Vessels
Oxygen	Gas	Pressure vessels	Between 10 and 20 t
Carbon dioxide	Liquid	Four tanks	5,000 t
Demineralized water	Liquid	Temporary storage tanks	Interim storage

Product	Product Format	Storage Vessel	Capacity
End Products			
SPK	Liquid	Four internal floating roof tanks and additional re-run tank for off-spec SPK	5,000 m^3 rundown and certification tanks (2); 21,000 m^3 export tanks (2); 2,000 m^3 off-spec storage
Naphtha	Liquid	One internal floating roof tank	1,000 m^3 (storage for 7 days production equivalent)
Diesel	Liquid	Fixed roof tank	40 m^3 (storage for 7 days production equivalent)

Other materials that will be stored on-site include compressed air, nitrogen, oxygen, production chemicals and catalysts, potable water, firewater, and off-spec products.

3.5.5.2 Shipping and Offtake

Offtake of SAF (and, optionally, methanol) will be by marine vessel. Subject to technology analysis, this may occur via a floating mooring buoy connected to a pipeline end manifold (PLEM) situated approximately 800 m from the shore, serviced by a subsea pipeline (Drawing 2.2). Marine offtake may also occur via the marine berth and offloading facility. Product offtake will occur at any time of the day and is subject to environmental and logistical conditions for marine offloading.

Offtake of naphtha and diesel co-products will be completed by truck.

3.5.6 Decommissioning or Refurbishment

As noted above, the operational life of the Project is estimated to be a minimum of 50 years with the possibility of extension. Decommissioning plans will be provided to NSECC for review prior to Project decommissioning.

Generally, the decommissioning phase will follow the same steps as the construction phase (in the reverse order) but will also include:

- Removal, recycling (where possible), and disposal of facility infrastructure and equipment, as required.
- Reinstatement and stabilization of land, where necessary.
- Removal of access roads or remain in place, per landowner lease agreements.
- The pipeline will be decommissioned and left in place and capped as necessary.

3.6 Project Schedule

The Project schedule from EA registration to Project decommissioning is outlined in Table 3.8.

Table 3.8: Project Schedule

Project Activity	Timeline[1]
EA Registration	October 2025
Post-EA Conditions of Approval	2026 - 2028
Geotechnical Assessment	2027 - 2028
Detailed Engineering Design	2027 - 2028
Construction (including clearing, site preparation, and road work, component installations)	2028
Commissioning	2031
Operation	2031 – 2081 (based on lifespan of 50 years)
Decommissioning	2081 or later

[1] The Project schedule is based on professional estimates current at the time of the EA and may be subject to change as each activity progresses. The Proponent will keep NSECC informed on any revisions to the schedule in advance.

4.0 ENVIRONMENTAL ASSESSMENT METHODOLOGY

This Project is being registered as a Class I undertaking as per Schedule A of the Environmental Assessment Regulations, N.S. Reg. 93/2025 (a facility producing greater than 1000 m^3 or 1000 litres per day of alternative fuels or syngas) under Section 49 of the *Environment Act,* S.N.S 1994-95, c.1.

As a Class I EA, this Registration Document and supporting studies have been developed to meet all requirements under Section 9(1A) of the Environmental Assessment Regulations. As such, this submission has been prepared in accordance with:

- A Proponent's Guide to Environmental Assessment (NSECC, 2025a)
- Nova Scotia Class I Environmental Assessment Checklist (NSECC, 2025b)
- Activities Designation Regulations, N.S. Reg. 47/1995
- Environmental Assessment Regulations, N.S. Reg. 26/1995

Throughout the EA process, including a federal-provincial one-window meeting, Project team members have engaged with the following regulatory bodies to provide input and advice into the EA scope and planning.

- ECCC
- Transport Canada
- NSECC
- Impact Assessment Agency of Canada
- DFO
- NSCCTH
- NSNR
- Nova Scotia Office of L'nu Affairs (OLA)

4.1 Assessment Scope and Approach

EA is a planning tool used to predict the environmental effects of a proposed project, identify measures to mitigate adverse environmental effects, and predict the significance of any residual effects after the application of mitigation measures.

The EA focuses on Valued Components (VCs). VCs are specific components of the biophysical and socioeconomic environments that, if altered by the Project, may be of concern to regulators, the Mi'kmaq of Nova Scotia, stakeholders, and/or the public. The scope of the EA for this Project is to:

- Identify VCs that the Project may interact with (by activity and phase) within established spatial and temporal boundaries.
- Establish the existing conditions of VCs.
- Identify potential interactions between the Project and the VCs.
- Assess the potential effects that could occur from the interactions.
- Identify mitigation measures to reduce or eliminate those effects.
- Evaluate the significance of the residual environmental effects using VC-specific criteria.
- Identify monitoring or follow-up programs to verify predictions and/or evaluate the need to implement adaptive management.

4.2 Identification of Valued Components

The following VCs were identified based on the experience of the Project team and through engagement with regulators, the Mi'kmaq of Nova Scotia, and the public.

- Biophysical environment
    - Weather, climate, air quality, and climate change
    - Geology, hydrogeology, and groundwater
    - Surface water, fish, and fish habitat
    - Wetlands
    - Vegetation communities and flora
    - Fauna
    - Bats
    - Avifauna

- Socioeconomic environment
    - Economy, land use, recreation and tourism
    - Cultural and heritage resources

4.3 Spatial and Temporal Boundaries

4.3.1 Spatial Boundaries

Spatial boundaries are considered separately for each VC and are typically based on natural system boundaries or administrative/political boundaries, as appropriate. The following spatial boundaries have been established for the effects assessment:

- Local Assessment Area (LAA): The area which represents the maximum extent of predicted or measurable direct and/or indirect effects of the Project. The LAA is VC-specific and is defined in the individual VC chapters
- Regional Assessment Area (RAA): This area is larger than direct and indirect effects and will be used to support the assessment of accidents and malfunctions, and if needed within each VC chapter for diffuse regional impacts.

Additional boundaries were also identified for the purpose of field data collection and to describe the area containing Project Infrastructure. The Project Footprint represents the maximum area where direct physical disturbance is expected to occur (clearing, grading, etc.). This area has been used to calculate the maximum expected direct footprint impact from the Project to allow for minor adjustments in infrastructure placement during detailed design. A larger Assessment Area was established within which most field assessments were completed to support evaluation of effects (described further in Section 3.2; Drawing 2.3).

4.3.2 Temporal Boundaries

The temporal boundaries in Table 4.1 apply to all VCs unless otherwise stated in the individual chapters.

Table 4.1: Temporal Boundaries

Project Phase	Temporal Boundary
Site Preparation and Construction	3 ½ years
Operation and Maintenance	Minimum of 50 years
Decommissioning	50+ years

4.4 Potential Project-Valued Component Interactions

The potential interactions between the Project and the VCs, by phase, are presented in the individual VC chapters (Sections 7 to 10), following a description of existing conditions. Where an adverse effect on a VC is identified, strategies for avoidance, mitigation, or compensation are proposed. Where possible, mitigation measures are incorporated into the Project design to eliminate or reduce potential adverse effects.

4.5 Residual Effects Assessment Criteria

For each VC, the residual effects of the Project (after mitigations are applied) are rated using a series of defined criteria. Most criteria are the same for all VCs (Table 4.2); however, the magnitude criteria are VC-specific and are provided in the individual chapters.

Table 4.2: Effects Assessment Criteria

Rating Criteria	Rating
Magnitude The amount of change in measurable parameters or the VC relative to existing conditions	**VC-specific as outlined in individual chapters**
Geographic Extent* The geographic area in which an effect occurs	**LAA –** the area where direct and/or indirect Project-related effects can be predicted or measured for assessment unless impacts are widespread

Rating Criteria	Rating
	RAA – the area where widespread Project-related effects can be predicted or measured for assessment (if/where applicable)
Frequency Identifies how often the residual effect occurs and how often in a specific phase	**Single event –** occurs once **Intermittent –** occurs occasionally or intermittently during one or more phase of the Project **Continuous –** occurs continuously
Duration The time required until the measurable parameter or VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	**Short term –** residual effect restricted to no more than the duration of the construction phase **Medium term –** residual effect extends through the operation and maintenance phase **Long term –** residual effect extends beyond the decommissioning phase
Reversibility Describes whether a measurable parameter or the VC can return to its existing condition after the activity ceases	**Reversible –** the residual effect is likely to be reversed after the activity is completed **Irreversible –** the residual effect is unlikely to be reversed **Partially Reversible –** the residual effect is likely to be partially reversible after the activity is completed.

* Criteria used for describing context of the effect; however, this criteria does not factor directly into the significance definition.

The combination of criteria and ratings identified for residual effects are then used to determine their significance. Certain combinations of criteria and ratings will result in a determination of a significant adverse effect, whereas other combinations will not. For example, a VC that is anticipated to experience a high magnitude, long-term, continuous, and irreversible impact will experience a significant adverse effect.

Table 4.3: Definition of the Significance of Residual Environmental Effects

Magnitude	Duration	Frequency	Reversibility	Significance
Negligible	All	All	All	Not significant
Low	All	All	All	Not significant
Moderate	Short term Medium term	Single event Intermittent	Reversible Partially reversible	Not Significant
	Long Term	**Continuous**	**Irreversible**	**Significant**
High	Short term Medium term	Single event Intermittent	Reversible Partially Reversible	Not significant
	Medium term **Long term**	**All**	**Irreversible**	**Significant**

In addition to considering the potential direct and indirect environmental effects of the Project, cumulative effects are considered in Section 13.

4.6 Monitoring and Follow-up

Follow-up programs and monitoring, in some cases developed in conjunction with regulators, may be recommended to verify predictions and/or assess the effectiveness of mitigation measures and the need to implement adaptive management. Follow-up programs and monitoring are presented, as necessary, in individual VC chapters.

4.7 Approach to Biophysical Assessments

The assessment for wild species (e.g. birds, mammals, fish, plants, etc.) was conducted in accordance with the Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009). Special consideration of species at risk (SAR), listed under SARA and/or ESA, along with species of conservation interest (SOCI), which, for the EA Registration Document, includes species that are:

- Assessed as “Endangered”, “Threatened”, or “Special Concern” by the Committee on the Status of Endangered Wildlife in Canda (COSEWIC) that are not already listed under SARA.
- Have a subnational rank (S-Rank) of “S3”, “S2”, or “S1”, of combinations thereof, from the ACCDC.

Table 4.4 outlines status rank definitions for SARA, ESA, COSEWIC and S-Rank.

Table 4.4: Status Ranks Definitions

Protection	Status	Definition
COSEWIC	Extinct	A wildlife species that no longer exists.
COSEWIC	Extirpated	A wildlife species that no longer exists in the wild in Canada but exists elsewhere.
COSEWIC	Endangered	A wildlife species facing imminent extirpation or extinction.
COSEWIC	Threatened	A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
COSEWIC	Special Concern	A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.
COSEWIC	Data Deficient	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.
COSEWIC	Not at Risk	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
SARA	Extirpated	Species which no longer exist in the wild in Canada but exist elsewhere in the wild.
SARA	Endangered	Species facing imminent extirpation of extinction.
SARA	Threatened	Species which are likely to become endangered if nothing is done to reverse the factors leading to their extirpation or extinction.

Protection	Status	Definition
SARA	Special Concern	Species which may become threatened or endangered because of a combination of biological characteristics and identified threats.
ESA	Endangered	A species facing imminent extirpation or extinction.
ESA	Threatened	A species likely to become endangered if limiting factors are not reversed.
ESA	Vulnerable	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
ESA	Extirpated	A species that no longer exists in the wild in NS but exists in the wild outside of the province.
ESA	Extinct	A species that no longer exists.
ACCDC	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.
ACCDC	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 state/province.
ACCDC	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 nation or state/province.
ACCDC	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.
ACCDC	S4	Apparently Secure - Uncommon but not rare; some cause for long term concern due to declines or other factors.
ACCDC	S5	Secure - Common, widespread, and abundant in the province.
ACCDC	SNR	Unranked - Nation or state/province conservation status not yet assessed.
ACCDC	SU	Unrankable - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
ACCDC	SNA	Not Applicable - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
ACCDC	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).
ACCDC	Not Provided	Species is not known to occur in the NS.
Breeding Status Qualifiers		
ACCDC	**Qualifier**	**Definition**
ACCDC	B	Breeding - Conservation status refers to the breeding population of the species in the province.
ACCDC	N	Nonbreeding - Conservation status refers to the non-breeding population of the species in the province.

Protection	Status	Definition
ACCDC	M	Migrant - Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient population of the species in the province.

For SAR, said species and their dwellings are provided protection under SARA, ESA, and the *Biodiversity Act,* 2021, c. 3, s. 1. Priority species were developed based on the SAR and SOCI identified through desktop review or field assessments that have the potential to interact with the Project through their presence, or the potential for presence, in the Assessment Area.

The habitats assessed in the EA include landscape features and vegetation communities within the Assessment Area that have been identified as having important functional and/or biophysical attributes (e.g., areas that serve as wildlife habitat for SAR and/or SOCI, landscape features connected to processes such as carbon and water cycling, uncommon vegetation communities), or that are determined to have high sensitivity to disturbance.

4.7.1 Timing of Biophysical Assessments

The biophysical field components of the EA were initiated in April 2024 and continued until fall 2025. The field components, survey timing, and surveyors that completed the field studies are outlined in Table 4.5.

Table 4.5: Biophysical Assessment Components, Timing, and Surveyors

Survey		Date	Surveyor(s)
Baseline sound monitoring		May 12 to 26, 2025	Strum Field Staff
Characterization of vegetation communities	Forest ecosystem classification	During botany surveys	Strum Botanists
	Old growth forest Assessments	November 12 to 15, 2024	Strum Biologists
Flora surveys	Early botany	July 17 to 19, 2024	Strum Botanists
	Late botany	August 26 to 30, 2024 September 26, 2024 October 15 to 16, 2024	Strum Botanists
	Lichens	August 27 and 27, 2024 September 3, 2024 November 13, 14, and 25, 2024	Strum Lichenologist
Wildlife surveys	Bat hibernacula assessments	July 2024 August 28 to 30, 2024	Strum Biologists
	Winter tracking	February 2 to 5, 2025	Strum Biologists
	Pellet group inventory	April 1 to 2, 2024	Strum Biologists
	Trail cameras	April 1, 2024, to February 11, 2025	NA

Survey		Date	Surveyor(s)
	Incidental observations	All biophysical surveys	All surveyors
Avian surveys	Spring migration (3)	April 15 and 16, 2024 May 17, 2024	Strum Biologists
	Nocturnal owl	April 15, 2024	
	Breeding bird (2)	June 13 and 14, 2024 July 4, 2024	
	Nightjar (2)	June 12, 2024 July 15, 2024	
	Fall migration (2)	August 16, 2024 September 24, 2024	
Wetland and watercourse evaluations		July 22 to December 20, 2024 August 5 to 8, 14 and 15, 2025 September 26, 2025	Strum Biologists
Fish and fish habitat assessment	Electrofishing	August 29, 2024	Strum Biologists
	Trapping	September 11 to 12, 2024	Strum Biologists
AMO evaluations		July 24 to 26, 2025 August 28 and 30, 2024	Strum Field Staff Strum Biologists
Sound monitoring		May 12 to 26, 2025	Strum Field Staff
Species at risk	Incidental	All biophysical surveys	All surveyors

4.7.2 Limitations of Biophysical Assessments

Limitations incurred at the time of the assessment include:

- There are a potentially infinite number of methods in which human activity can influence wildlife behaviours and populations and merely demonstrating that one factor is not operative does not negate the influence of the remainder of possible factors.
- A limitation with field surveys is that if no migration patterns are observed, it does not mean they do not exist in the area.
- All reasonable assessment programs will involve an inherent risk that some conditions will not be detected and all reports summarizing such investigations will be based on assumptions of what characteristics may exist between the sample points.
- Species detectability depends on (i) species biology and behaviour (abundance, activity, species body size and conspicuousness, and ecological traits), (ii) individual characteristics within the species (sex and age), (iii) environmental factors (habitat, weather, phase of season, and time of day), and iv) methodology of counts and skills of observers.
- An essential assumption of distance sampling methods is that distances to individuals are accurately estimated, a task not easy to accomplish under normal field conditions and is based on the perspective of the observer.

4.8 Approach to Socioeconomic Assessments

The baseline conditions of the human/socioeconomic environment were assessed using desktop resources (e.g., informational and geospatial databases) and field observations (e.g., noise monitoring, project setting, confirmation of local receptors, archaeological assessment) to meet the guidelines of the Nova Scotia Class I Environmental Assessment Checklist (NSECC, 2025b).

5.0 MI'KMAQ OF NOVA SCOTIA

The Project is located within Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People – the founding peoples of Nova Scotia. Mi'kmaq communities are located throughout the province, with 13 recognized First Nations who continue to uphold their inherent rights, culture, and connection to the land.

5.1 Engagement Strategy

NSF recognizes the rights and vital role of Mi'kmaq communities in the planning and development of this Project. From the outset, NSF prioritized early engagement with Mi'kmaq communities to:

- Ensure communities were well-informed about the Project from its earliest stages.
- Understand community interest in building long-term, respectful relationships.
- Provide adequate time and space for meaningful, two-way engagement and information exchange.

Information shared during these early conversations addressed both the short- and long-term potential impacts of the Project, including potential effects on traditional land use and practice, and Aboriginal and Treaty rights.

There are 13 Mi'kmaq communities in Nova Scotia, of which 11 are represented by the Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO), which operates on behalf of and reports to the Assembly of Nova Scotia Mi'kmaw Chiefs. KMKNO plays a key role in coordinating consultation processes between the Mi'kmaq of Nova Scotia and the Crown and facilitates engagement with Project proponents.

Two communities (Millbrook First Nation and Sipekne'katik First Nation) conduct their own consultations through their respective Chiefs and Councils.

NSF engaged early with KMKNO (March 2024) and the 13 individual Mi'kmaq communities (early July 2024). NSF also presented a project overview to Wskijnu'k Mtmo'taqnuow Agency Ltd. (WMA) in May 2024, the economic development organization that represents all 13 Mi'kmaw communities in the province.

5.1.1 Guiding Principles

NSF's approach to Mi'kmaq engagement is grounded in the following guiding principles:

- Mutual respect: Recognition of all voices, perspectives and cultural values.
- Early and proactive engagement: Initiating conversations at the earliest stages.
- Responsiveness and accountability: Open lines of communication and keeping communities informed about how concerns and input are reflected in Project decisions.
- Appropriate timelines: Establishing realistic timelines, allowing for sufficient time for communities to review and respond to Project materials.

NSF engaged with the Office of L'Nu Affairs early in the process to ensure alignment with their expectations and to foster a collaborative approach.

5.1.2 Memorandum of Understanding – KMKNO

In October 2024, Simply Blue Group and the Assembly of Nova Scotia Mi'kmaw Chiefs signed an MOU to support the responsible and collaborative development of the Project. This MOU was transferred to NSF and reflects a shared commitment to:

- Incorporating Mi'kmaw knowledge, culture, and values into project planning.
- Ensuring environmental responsibility and stewardship.
- Advancing mutual economic, environmental, and community benefits.

This partnership represents a foundational step in building a respectful, long-term relationship.

NSF is currently working with KMKNO and is committed to the development of a benefits agreement with the Assembly of Nova Scotia Mi'kmaw Chiefs.

5.2 Engagement Summary

There have been over 100 individual touchpoints between the Mi'kmaq of Nova Scotia and NSF. KMKNO has been kept informed throughout the development of the EA and in preparation of filing. Table 5.1 summarizes engagement with the 13 Mi'kmaq communities since Project commencement in 2024.

Table 5.1 Engagement by community

First Nation	Contact Details
Acadia First Nation	NSF first engaged Acadia First Nation in July 2024, providing a project overview and an invitation to meet and discuss the Project further. NSF provided additional information in August 2024, including a project overview document to help inform economic development. NSF followed up in September 2024, October 2024, and July 2025 to provide project updates and invitations to events.

First Nation	Contact Details
Annapolis Valley First Nation	NSF first engaged with Annapolis Valley First Nation in July 2024 providing a project overview and invitation to meet. NSF reached out in August 2024, September 2024, October 2024, and July 2025 to provide project updates and invitations to events.
Eskasoni First Nation	NSF first engaged directly Eskasoni First Nation in July 2024, providing a project overview and invitation to meet. A follow-up email was sent later that month. Eskasoni is on the WMA Board and was present at a May 2024 presentation. Communication via email and telephone has been ongoing, including in August 2024, September 2024, October 2024, and July 2025 to provide project updates and invitations to events.
Glooscap First Nation	NSF first engaged directly with Glooscap First Nation in July 2024, providing a project overview and invitation to meet. A follow-up email was sent later that month. Glooscap Ventures is on the WMA Board and was present at a May 2024 presentation. In mid-August 2024, an ongoing email and telephone exchange occurred to schedule a meeting to discuss the Project in more detail. NSF reached out again September 2024, October 2024 and July 2025 to provide project updates, send invitations to events and encourage feedback.
L'sitkuk (Bear River) First Nation	NSF first engaged with L'sitkuk (Bear River) First Nation in July 2024, providing a project overview and invitation to meet. NSF followed up later that month. In August 2024, September 2024, October 2024, and July 2025 NSF provided project updates and invitations to events.
Membertou First Nation	NSF first engaged with Membertou First Nation in July 2024, providing a project overview and invitation to meet. NSF followed up later that month as well. In August 2024, September 2024, October 2024, and July 2025, NSF provided project updates and invitations to events.

First Nation	Contact Details
Millbrook First Nation	NSF first engaged Millbrook First Nation in July 2024, providing a project overview and invitation to meet. NSF followed up later that month. In July and August 2024, an ongoing email and telephone exchange started to schedule a meeting to discuss the Project in more detail. In August 2024, September 2024, October 2024, and July 2025 NSF provided Project updates, and invitations to events.
Paq'tnkek First Nation	NSF first engaged with Paq'tnkek First Nation in July 2024, providing a project overview and invitation to meet. NSF followed up later that month. In August 2024, September 2024, and October 2024 NSF provided project updates and invitations to events. NSF met in person with Paq'tnkek in late February 2025 to discuss the Project, provide updates and opportunities for collaboration. NSF provided a project update and information on the open house event in July 2025.
Pictou Landing First Nation	NSF first engaged Pictou Landing First Nation in July 2024, providing a project overview and invitation to meet. NSF followed up later that month. An email and telephone exchange has been ongoing. In August 2024, September 2024, October 2024, and July 2025 NSF provided project updates and invitations to events.
Potlotek First Nation	NSF first engaged Potlotek First Nation in July 2024, providing a project overview and invitation to meet. NSF met with Potlotek in late August 2024 to discuss the Project and opportunities for collaboration. Potlotek attended the September 2024 project launch stakeholder luncheon. Potlotek identified that the community may be interested in investing in the Project and was to follow up with NSF. Unfortunately, the Potlotek contact then left his position and these discussions ended.

First Nation	Contact Details
	NSF provided a project update and information on the open house event in July 2025.
Sipekne'katik First Nation	NSF first engaged Sipekne'katik First Nation in July 2024, providing a project overview and invitation to meet. NSF followed up later that month. In September 2024 NSF met with Sipekne'katik in person to discuss the project in greater detail. It was a successful introductory meeting with lots of excellent information sharing between parties. Sipekne'katik asked NSF to start the Sipekne'katik Governance Initiative (SGI) Protocol to continue engagement. The protocol affirms the inherent authority of Sipekne'katik First Nation to manage their lands, waters and resources by regulating the industrial activities of the Crown and other proponents on traditional territories. In October 2024 NSF provided additional project details with Sipekne'katik (as per their request from the September 2024 meeting). NSF submitted Step 1 of the SGI application in October 2024. In January 2025, Step 2 of the SGI process commenced. The process is ongoing with recent communication in July, September, and October2025. NSF plans to submit Phase II of the SGI application in late October 2025. A meeting is booked in late October 2025 to discuss the EA conclusions.
Wagmatcook First Nation	NSF first engaged with Wagmatcook First Nation in July 2024, providing a project overview and invitation to meet. NSF followed up later that month as well. In August 2024, September 2024, October 2024, and July 2025, NSF provided project updates and invitations to events.
We'koqma'q First Nation	NSF first engaged with We'koqma'q First Nation in July 2024, providing a project overview and invitation to meet. NSF followed up later that month as well.

First Nation	Contact Details
	In August 2024, September 2024, October 2024, and July 2025, NSF provided project updates and invitations to events.

In addition to engagement with the Mi'kmaq communities, ongoing engagement has occurred with Mi'kmaq organizations, some of which is summarized in Table 5.2

Table 5.2: Summary of Meetings with Mi'kmaq Organizations

First Nation / Organization	Meeting Type	When	Summary
Kwilmu'kw Maw-klusaqn Negotiation Office	Virtual meeting	April 4, 2024	Successful introductory meeting (updated to inform that offshore wind is potentially down the road, but not the focus currently)
Wskijinu'k Mtmo'taqnuow Agency	Virtual meeting	May 23, 2024	Successful introductory meeting to the Board; WMA is glad to be involved so early (so that there is time to identify any interests); review potential collaboration with Mi'kmaq forestry Initiative (MFI)
Kwilmu'kw Maw-klusaqn Negotiation Office	Virtual meeting	June 13, 2024	Successful meeting to discuss MOU/mutual benefits agreement process and financial requirements; draft MOU to be reviewed
Kwilmu'kw Maw-klusaqn Negotiation Office	Virtual meeting	August 13, 2024	Successful meeting to discuss MOU and next steps; EA timing discussions; MOU to be presented at the September 26th Assembly
Potlotek First Nations	Virtual meeting	August 14, 2024	Successful introductory meeting; lots of excellent information sharing between parties and a true impression of wanting to work together
Potlotek First Nations	In-person meeting	September 14, 2024	Potential investor identified in Potlotek First Nation
Sipekne'katik First Nation	In-person meeting	September 23,2024	Successful introductory meeting; lots of excellent information sharing between parties; Sipekne'katik to send NSF consultation application and information; NSF to send Sipekne'katik a map showing the renewable generation area; NSF to send Sipekne'katik any completed environmental studies
Kwilmu'kw Maw-klusaqn Negotiation Office	Virtual meeting	January 13, 2025	Successful update meeting; NSF to continue to provide updates to KMKNO to share with the Assembly

First Nation / Organization	Meeting Type	When	Summary
Paq'tnkek First Nation	Virtual Meeting	February 25, 2024	Successful introductory meeting; lots of excellent information sharing between parties and a true impression of wanting to work together
Kwilmu'kw Maw-klusaqn Negotiation Office	Virtual meeting	July 15, 2025	Successful update meeting; open house discussions; benefits agreement discussions moving forward

5.3 Feedback Received

Communities and organizations were glad to be involved early in the Project, thus allowing time for meaningful feedback and collaboration. Concerns raised to date are to ensure Mi'kmaq training/jobs are available as the Project progresses and that there should be Mi'kmaq input into archaeological studies. It has also been suggested by multiple individuals that there is an opportunity for NSF to potentially work with the MFI on sourcing biomass – this continues to be explored. No specific feedback on the EA has been received to date; however, meetings are booked to review EA conclusions in Q4 2025.

5.4 Future Engagement

Engagement with the Mi'kmaq will continue throughout the Project. Regular updates will be provided and feedback will be continuously sought and incorporated into the project design. Potential partnerships continue to be explored with certain communities. NSF commits to the following:

- Engagement with individual Mi'kmaq communities as interest in the Project is expressed.
- Ongoing engagement throughout the detailed design phase and all required permitting processes, including the Industrial Approval and *Fisheries Act* (Canada, 1985d) Authorization.
- Regular engagement with KMKNO.
- Regular and consistent engagement efforts with Millbrook First Nation.
- Continued collaboration with Sipekne'katik through the SGI process.

NSF remains committed to the development of a benefits agreement with the Assembly of Nova Scotia Mi'kmaw Chiefs.

5.5 MEKS

A Mi'kmaq Ecological Knowledge Study (MEKS) presents a thorough and accurate understanding of the Mi'kmaq's use of the land and resources within an area. It is a report of gathered, identified, and documented ecological knowledge which is held by individual Mi'kmaq people. In addition, the MEKS report provides information on proposed Project activities that may impact the traditional land and resources of the Mi'kmaq. The MEKS for this Project is

being developed by Membertou Geomatics Solutions and was geographically scoped to include an evaluation of the Project Area along with a 5 km buffer surrounding the Assessment Area (referred to as the "Study Area" in the MEKS report). Once available, a copy of the MEKS will be provided directly to the required reviewers under separate cover.

MEKS considers the land and water areas in which the proposed Project is located to identify what Mi'kmaq traditional use activities have occurred or are currently occurring within the "Study Area"; and what Mi'kmaq ecological knowledge presently exists with respect to the area. This process is done in accordance with the Mi'kmaq Ecological Knowledge Protocol, 2nd Edition, which was established by the Assembly of Nova Scotia Mi'kmaq Chiefs and speaks to the process, procedures, and results that are expected of a MEKS.
The MEKS consists of two major components:

- Mi'kmaq Traditional Land and Resource Use Activities
  - Considers both past and present use of the area.
  - Uses interviews as the key source of information regarding Mi'kmaq use.
- A Mi'kmaq Significance Species Analysis
  - Identifies species in the area and considers resources that are important to Mi'kmaq use (food/sustenance resources, medicinal/ceremonial plant resources, and art/tools resources).
  - Considers resource availability/abundance in the area (along with adjacent areas or in other areas outside), their use, and their importance, with regards to the Mi'kmaq.

Interviews are undertaken by the MEKS team with Mi'kmaq knowledge holders. Interviewees are shown topographical maps of the Project Area and its 5 km buffer and asked to identify where they undertake their activities as well as to identify where and what activities are undertaken by other Mi'kmaq, if known. These interviews allow the MEKS team to develop a collection of data that reflected the most recent Mi'kmaq traditional use in this area, as well as historic accounts. The data gathered was also considered regarding its significance to the Mi'kmaq people. Once the analysis is complete, the MEKS report and any recommendations will be reviewed by the Project team to determine if any mitigation measures are required to support the continued traditional use of the Study Area by the Mi'kmaq of Nova Scotia.

6.0 PUBLIC ENGAGEMENT

NSF believes that building strong relationships is crucial to successful and sustainable projects. The NSF team has engaged with hundreds of people across the province to gather feedback and answer questions, building excellent relationships with regulators, stakeholders, and the local public.

Originally initiated by Simply Blue Group, the engagement program transitioned to NSF in May 2025. The core engagement team remained consistent throughout. For clarity and ease of reference within the EARD, engagement activities – no matter the timing – are attributed to NSF.

NSF deeply values local and Indigenous knowledge and are committed to becoming active, responsible members of the communities where they operate. NSF has met or exceeded the engagement requirements outlined in the NSECC's A Proponent's Guide to Environmental Assessment (2025a) and the Office of L'nu Affairs' Proponent's Guide (2012).

Communication materials are included in Appendix A.

6.1 Engagement Goals

NSF's engagement efforts are guided by the following principles:

- Transparency and accountability: A commitment to open and honest communication throughout every stage of the Project.
- Awareness and understanding: Ensuring that stakeholders are informed about the Project's purpose, scope, and potential impacts.
- Responsiveness and adaptability: Proactively listening to concerns and, where feasible, incorporating feedback into project planning and design.

Initial outreach began in 2022 during Simply Blue Group's early presence in Nova Scotia. These early conversations were introductory in nature, aimed at presenting the company and its vision. Engagement in 2022 and 2023 included a broad and diverse range of organizations, including:

- Atlantic Groundfish Council
- Atlantic Policy Congress of First Nations Chiefs Secretariat
- Atlantic Towing
- Canada-Newfoundland and Labrador Offshore Energy Board
- Canada-Nova Scotia Offshore Energy Board
- Cape Breton Partnership
- C-Core
- Clearwater Seafoods
- COVE
- Dalhousie University
- econext
- Energy NL
- Government of Canada
- Halifax Partnership
- Impact Assessment Agency of Canada
- International Ocean Institute
- Irving Oil
- Lorneville
- Marine Renewables Canada
- Maritime Aboriginal People Council
- Maritime Launch Services
- Melford International Terminal
- Municipality of the District of Guysborough
- Municipality of Richmond
- Natural Resources Canada
- Net Zero Atlantic
- Nova Scotia Business Inc
- Nova Scotia Community College
- Nova Scotia Innovation Hub
- Nova Scotia Power
- Novaporte
- NS Natural Resources and Renewables
- Port of Halifax
- Port of Sheet Harbour
- Procurement Assistance Canada
- Province of Newfoundland and Labrador
- Province of Nova Scotia
- Seaforth Engineering

6.2 Engagement Activities

Since mid-2024, NSF has implemented a comprehensive engagement program to support the EA process. This program is designed to keep stakeholders informed, provide opportunities for meaningful participation, and ensure local voices are reflected in project planning.

NSF employed a diverse set of engagement methods to reach community members and promote project awareness and understanding:

- Government relations: Project updates and briefings delivered to government staff and elected officials.
- Direct community outreach: Door-to-door outreach and direct mail.
- Community events: Project launch and open house provided in-person opportunities for information sharing and feedback.
- Stakeholder communications: Ongoing engagement with key stakeholders through meetings (in-person and virtual), phone calls and regular email updates.
- Communication materials: Brochures, infographics, videos, and other visual aids developed to clearly explain project details.
- Digital presence: Project website, LinkedIn updates, and blog posts provide accessible and up-to-date information.
- Community investment: Support for local organizations through sponsorships and donations demonstrating commitments to being a good neighbour.
- Media outreach: Press releases and media coverage across radio, print, and digital platforms keep the public informed.
- Targeted advertising: Advertisements published via local newspapers, Facebook, and community radio stations.
- Community Liaison Committee (CLC): Dedicated group of local stakeholders that will meet regularly to discuss the Project and provide community insights

6.2.1 Engagement with Government Departments, Agencies, and Regulators

NSF has undertaken a proactive and coordinated approach to government relations, engaging municipal, provincial, and federal stakeholders through transparent and accurate communication. These efforts ensure that public officials are well-informed and equipped to respond to constituent inquiries with confidence.

From the outset, NSF has maintained open lines of communication with relevant government departments, agencies, and regulatory bodies. These early and frequent conversations have not only ensured compliance with all applicable legislation and regulatory requirements but have also provided valuable insight into evolving policies and expectations.

Local government support has been encouraging. Both the MODG and the Municipality of the District of St. Mary's have expressed support for the Project to date. NSF has held regular in-person and virtual meetings with municipal staff and elected officials since early 2024, providing timely updates and addressing any emerging questions or concerns. Both municipalities will be participating in the Project's CLC and information was included on the

CLC in MODG's bimonthly newsletter, inviting participants to join. Initial Community Benefits Agreement discussions are underway with both municipalities.

NSF has maintained engagement with local Members of Parliament (MPs) and the Member of the Legislative Assembly (MLAs) to ensure alignment at all levels of government. Government engagement will continue throughout the life of the Project, reinforcing NSF's commitment to collaboration, accountability and regulatory excellence.

Table 6.1 provides an overview of selected meetings conducted to date with government stakeholders. The list is not exhaustive.

Table 6.1 Summary of Government Meetings

Stakeholder	Meeting Type	When	Summary
Major Projects Coordination Initiative, NS Department of Energy, NSECC, NSNR	Virtual Meeting	January 9, 2024	Introductory meeting to discuss meeting formats, frequency, and goals for regularly scheduled meetings
NSECC	Virtual Meeting	February 13, 2024	Meeting on EA process and modernization. Discussion about role of federal permitting post-EA.
IAAC	Virtual Meeting	March 6, 2024	Meeting to introduce the Project and discuss potential triggers for the proposed Project under the *Impact Assessment Act* (Canada, 2019). Proponent agreed to submit a project description to IAAC to allow the Agency to determine if a federal assessment is required.
NSNR	Virtual meeting	June 26, 2024	Successful project update meeting
Transport Canada	Virtual meeting	August 2, 2024	Successful introductory meeting; lots of excellent information sharing between parties
Transport Canada	Virtual meeting	August 9, 2024	Successful update meeting/relationship building
Municipality of the District of Saint Mary's	Virtual meeting	August 15, 2024	Successful update meeting/relationship building
Transport Canada	Virtual meeting	August 20, 2024	Successful update meeting/relationship building
SAF+ Consortium; Government of Quebec; Invest Quebec	Virtual meeting	August 23, 2024	Successful introductory meeting; lots of excellent information sharing between parties
Municipality of the District of Saint Mary's	Virtual meeting	September 27, 2024	Successful update meeting to provide the District of Saint Mary's an overview of NSF's met tower campaign for the renewable generation area

Stakeholder	Meeting Type	When	Summary
Transport Canada	Virtual meeting	October 4, 2024	Unexpected introductory/policy meeting with high-level Transport Canada leaders
Member of Parliament Sean Fraser	Virtual meeting	October 15, 2024	Successful introductory meeting; Minister supportive
Municipality of the District of Saint Mary's	In-person meeting	October 16, 2024	Successful introductory meeting to Council (Committee of the Whole Meeting)
NSECC Major Projects Coordination Initiative (MCPI)	Virtual meeting	October 22, 2024	Overview of the MPCI and the One-Window process including current stage, future steps and MPCI tools
MODG	In-person meeting	November 6, 2024	Successful introductory presentation to Council (special meeting)
NSECC	Virtual Meeting	December 11, 2024	Discussion around Project Description for Provincial evaluation of EA requirements
Federal and Provincial Regulators	Virtual meeting	December 16, 2024	One Window Meeting - Project overview presentation followed by question and answer period
Major Projects Coordination Initiative, NSECC	Virtual Meeting	January 15, 2025	Update on Project and Project components and timelines
NSNR	Virtual Meeting	January 21, 2025	Meeting to discuss process for submitting applications for use of Crown Lands, including Submerged Crown Lands
NSECC	Virtual Meeting	January 31, 2025	Discussion around EA modernization by the province
NSECC	Virtual Meeting	May 14, 2025	Participated in information discussion on recently approved updates to the EA process
Municipality of the District of Saint Mary's	Virtual meeting	July 14, 2025	Successful update meeting, open house discussions
MODG	Virtual meeting	July 16, 2025	Successful update meeting, open house discussions
NS Department of Energy	Virtual meeting	August 14, 2025	Province updated NSF on Project plans for the fall
Major Projects Coordination Initiative, NSECC, NS Department of Energy, NSNR	Virtual meeting	August 20, 2025	Project update provided re new Project ownership. Information provided on post-EA steps and NSECC department restructuring, including new Large Industrial File Team.
Transport Canada	Virtual meeting	September 9, 2025	Successful update meeting (new ownership, etc.)
MODG	Virtual meeting	September 16, 2025	Successful introductory presentation to Council (special meeting)

6.2.2 Direct Community Outreach

In early September 2024, staff walked door-to-door to approximately 75 homes around the REP and renewable generation areas. Many positive interactions took place with community members and all were informed of the Project and invited to the upcoming project launch event (either in person or information was left at the door). Initial questions fielded were related to visual impacts from renewable generation and how this project is different than/fits in with the many other proposed projects. Concerns regarding potential impacts to Highway 316 were also raised during door-to-door interactions with neighbouring residents.

Prior to the September 2024 project launch and July 2025 open house, 5,000 postcards were distributed through Canada Post to homes and businesses within the area surrounding the Project (2,500 each time), ensuring broad awareness and encouraging attendance. The postcards included information on the events and contact information for any outstanding questions. The map below shows the coverage area where postcards were delivered (in light purple).

Figure 6.1 Postcard mailout coverage in September 2024 and July 2025

6.2.3 Community Events

NSF hosted two well-attended community events – one in September 2024 and a second in July 2025 – providing valuable opportunities for residents to learn about the Project, ask questions and share their feedback directly with the Project team.

6.2.3.1 Launch Event

The community project launch marked the beginning of the public stakeholder engagement process. The launch was hosted at the Goldboro Interpretive Centre (12881 Highway 316, Goldboro) on Saturday, September 14, 2024, from 11 a.m. to 2 p.m. (ADT) consisting of two main components:

- Indoor poster boards/project information (project brochure, feedback forms, etc.).
- Outdoor "carnival" for family fun (bouncy castles, games, prizes, cotton candy, popcorn, balloons, live music, etc.). Local vendors were used as much as possible. A hot lunch was served throughout the event, provided by a Drumhead caterer, located just down the road from the Project.

Figure 6.2: Community Project Launch Event, September 14, 2024

Attendance

The open house was well attended, with just over 130 people dropping by the Goldboro Interpretive Centre. People began to arrive prior to the event's official start time and continued throughout the duration of the event, with attendance highest during the first hour of the event.

Attendees primarily came from Isaacs Harbour (18%), Goldboro (15%) and Guysborough (13%); however, there were also attendees from Antigonish, New Harbour, Country Harbour, Seal Harbour, and Drumhead (Figure 6.3). The majority of stakeholders (36%) who completed feedback forms came from over 5 km away from the Project (Figure 6.4). The next largest group of respondents (26%) came from within 5 km of the Project. "Neighbours" and stakeholders who live within 1 km of the Project accounted for 38% of respondents.

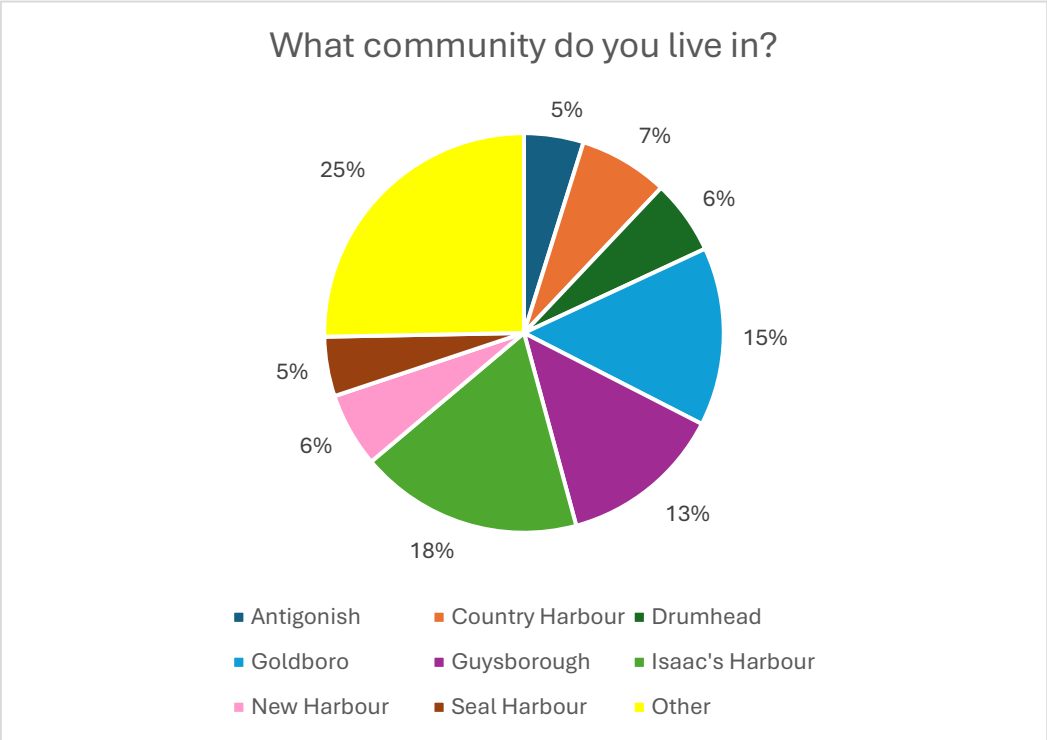

Figure 6.3: Community Launch Feedback: Attendee Communities

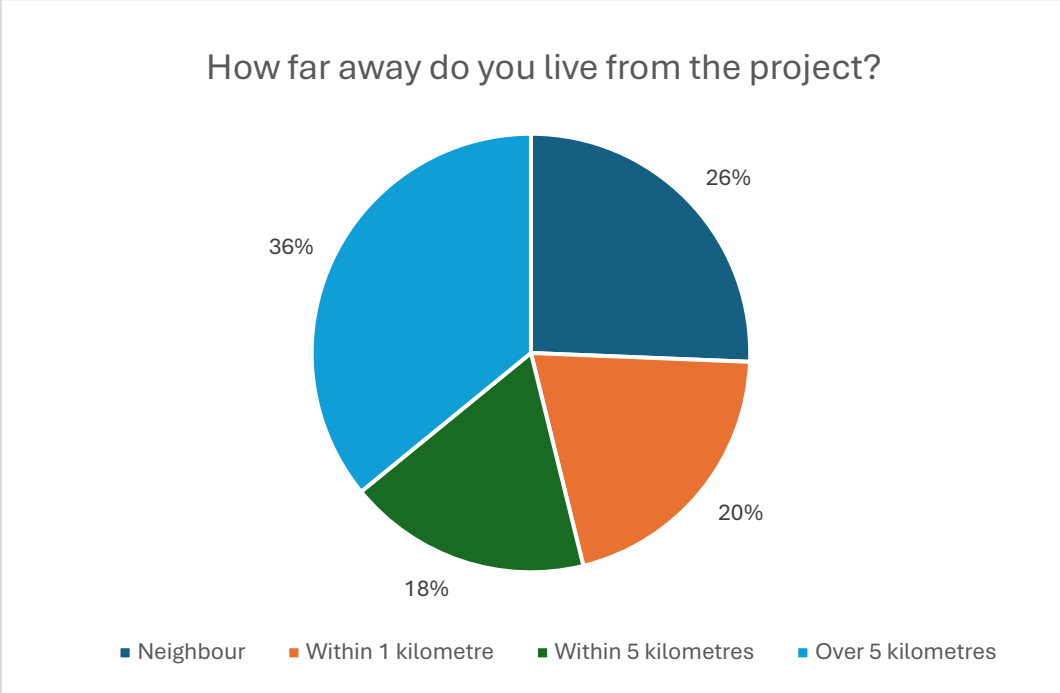

Figure 6.4: Community Launch Feedback: Residential Proximity of Attendees

Some senior members from the MODG attended the event (both staff and politicians), as well as representatives from Invest Nova Scotia and the Government of Nova Scotia (NSNR). MODG Councillor for the area Hudson MacLeod and Warden Vernon Pitts attended, as well as MODG's Chief Administrative Officer and Director of Economic and Community Development.

One reporter from the Guysborough Journal attended the event.

Feedback

Feedback forms were offered to all adult open house attendees upon entry and could be returned in person at the launch event or submitted via post, email, and fax following the events. A total of 40 feedback forms were collected at the event. One additional feedback form was received via email following the event.

Just over 30% of open house attendees completed forms.

Why Stakeholders Attended

Respondents were asked to indicate their reason for attending the launch event. The majority of stakeholders (32 responses) stated that their reason for attending was to gather information/learn more about the Project. Others came because they are interested in energy/sustainability (2 responses) or live nearby (2 responses). Others came looking to provide feedback or explore employment opportunities.

When asked what information they were hoping to gather at the launch event, most stakeholders (16 responses) said that they came to gain a better understanding of the Project. Many people came to learn specific locations for project infrastructure (turbines, transmission line routing, etc.) (10 responses). As this information was not available at the time of the launch, it will be presented to stakeholders as the Project advances through its design phase. As expected, many came hoping to gather information on employment opportunities (6 responses). Others came hoping to understand the impact of the Project on the community (4 responses) or to gain a better understanding of potential environmental impacts (3 responses). One person flagged that she came hoping to learn about the impact of the Project on local roads. The potential impacts to Highway 316 (biomass trucking) came up multiple times in the feedback forms.

Feedback on the Project

One of the main goals of the community event was to introduce the Project to impacted stakeholders/NS and to provide clarity on project components. Most stakeholders left the launch event with an improved understanding of the Project (87%) (Figure 6.5).

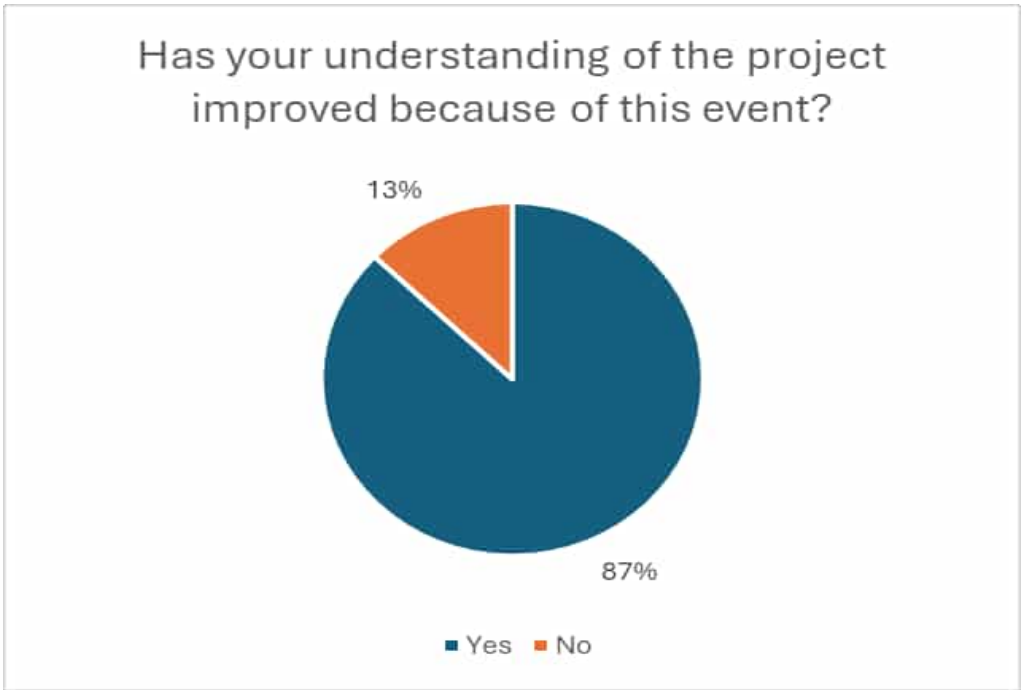

Figure 6.5: Launch Event Feedback: Project Understanding

Open house attendees were asked if there is anything they think should be known from an ecological, cultural, or economic perspective related to the Project. Multiple people flagged that the roads are in poor condition. Attendees stressed the significance of potential employment from the Project (specifically for keeping/attracting young people). Others noted the importance of consulting adequately with locals (fishermen were specifically noted) and hiring locally. The significance of continued stakeholder engagement in the area was also made clear. Examples of comments received:

- *"Roads are in very poor condition (overgrown ditches, poor visibility, etc.)."*
- *"As a local, I have lived here all my life. I feel from your presentation that you are doing all the necessary studies."*
- *"It's a very small community and slow to change. Keep up social engagement."*

The New Project in the Community

Stakeholder fatigue is a major concern in the area. Residents are jaded from broken promises of hope from previous projects proposed in the area and are overwhelmed by the number of new projects being proposed by proponents. Comments such as "*don't build it and then leave…*" and "*it wouldn't take much to provide growth; so many projects came and went…*" were frequently heard both in feedback and conversations. The following emailed comment from a community member does an excellent job at summarizing the attitude of many stakeholders:

> *"I would say I am cautiously optimistic about the Project at this stage. If executed well and in accordance with the language and attitude I saw, I think it would be a good thing. Having seen too many projects and corporations come into Nova Scotia with dishonesty and the goal to plunder in the past though, I am wary of words and intents and will be watching for red flags in the details. The main benefits would be economic, which are really important of course. Having a good employer with high-skilled jobs locally would be a social boon for the communities overall too."*

That being said, community members were generally very welcoming and excited about the Project. 85% of stakeholders think the Project will have a positive impact on the community (Figure 6.6).

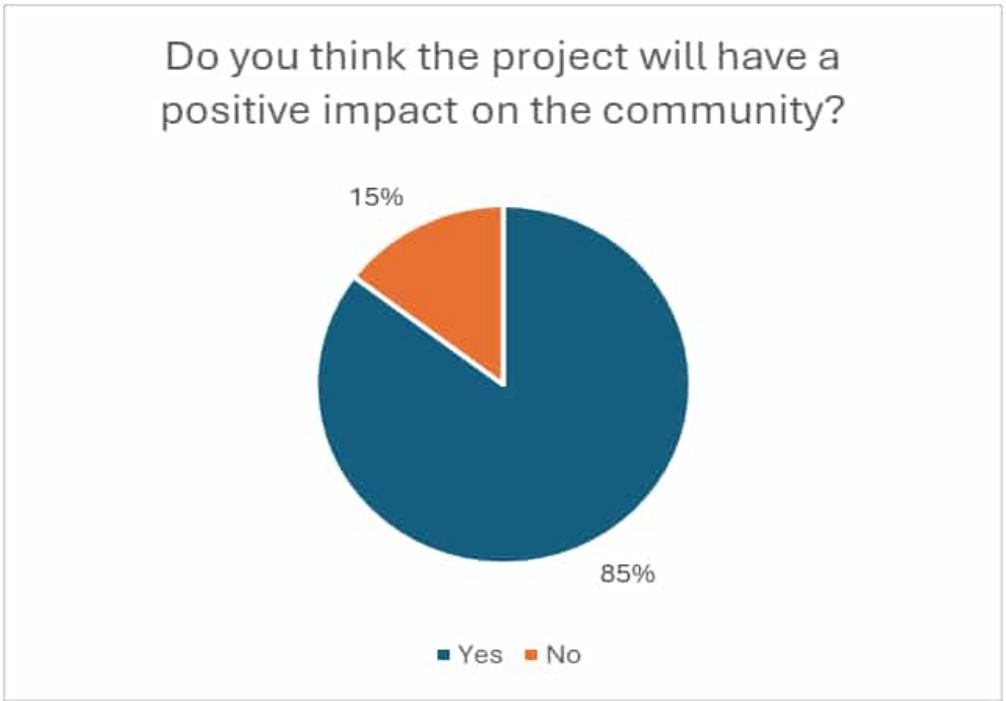

Figure 6.6: Launch Event Feedback: Community Impact

Five respondents presented negative feedback on the Project: one said "*been here, done this, negative impact...*" while others flagged potential negative long-term impacts to the environment, roads and harbour (3 responses). One person opposed the Project's planned used of biomass. Another had concerns that energy generated will be used "for export" and not for the benefit of local Nova Scotians. Trucking on Highway 316 continues to be a concern (2 responses).

The majority of respondents said that community benefits from the Project, such as jobs, tax revenue and the revitalizing need for more local supplies/people (22 responses) would have the largest positive impacts. It should be noted that of the 22 people who cited community benefits, 17 directly commented on the significance of jobs for the area and that those jobs

should be filled with locals. One person identified a hope that the Project would in fact have a positive environmental impact overall.

Comments of note from stakeholders:

- *"This area needs jobs and commercial projects to bring younger people in."*
- *"Employment opportunities for locals. Bring new people to our area."*
- *"Create jobs, bring more people to the area, make people who are not locals aware of where Goldboro is, create more customers for the small locally owned businesses that are already here."*
- *"Only if the local community is granted the educational resources to become the actual workforce of the Project."*
- *"You want to produce a product that the world needs using available resources in Nova Scotia."*
- *"I think this Project would be wonderful for us. We welcome you."*

Community Launch Event Evaluation

Overall, attendee response to the community launch event was positive and allowed for meaningful discussions with the community about the Project. Many feedback forms and conversations at the event included thanks for hosting such a nice event that brought the community together (fun for all ages).

An improvement for future events highlighted in the feedback included requests for more interactive, educational materials at future events (videos, demonstrations, etc.) saying: "*panels are fine, but 'playing' with the information is more effective and fun*".

When asked what they want to see in the future, community members said the most important thing is to be kept consistently informed as the Project moves forward (9 responses) and provide information on employment opportunities and training as soon as it becomes available (5 responses). Others wanted to be kept informed on long-term impacts and planned offsetting (3 responses), specific locations for project infrastructure, and more information on planned road usage/traffic management.

Almost all respondents either *agreed* or *strongly agreed* that the information presented helped them gain a better understanding of the Project, with 41 % *strongly agreeing* (Figure 6.7).

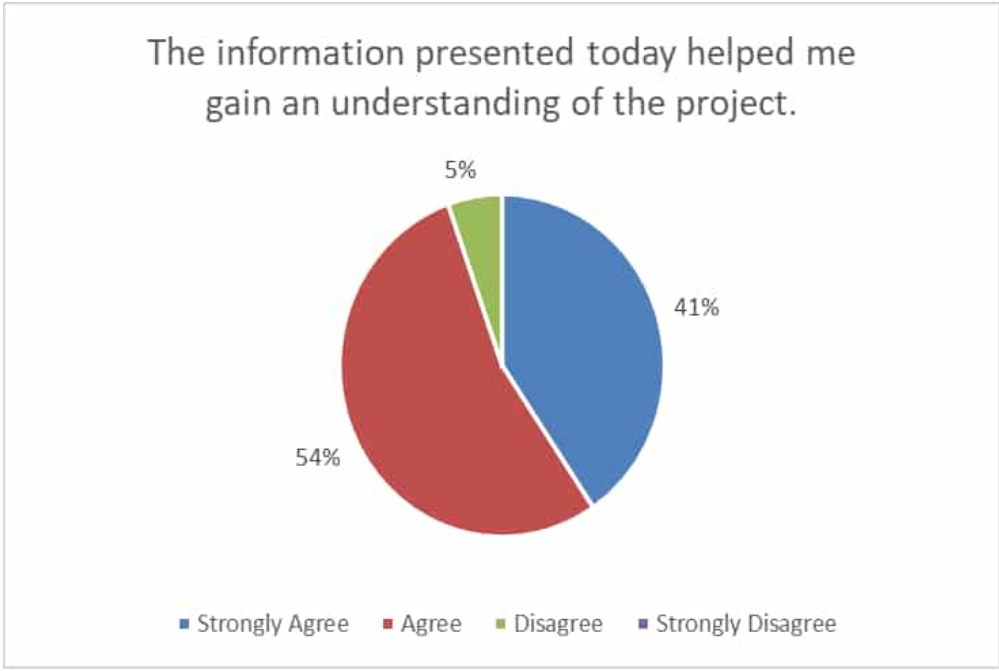

Figure 6.7: Launch Event Feedback: Information Value

Once again, almost all respondents either *agreed* or *strongly agreed* that the information was presented in a format that was easy to understand (Figure 6.8).

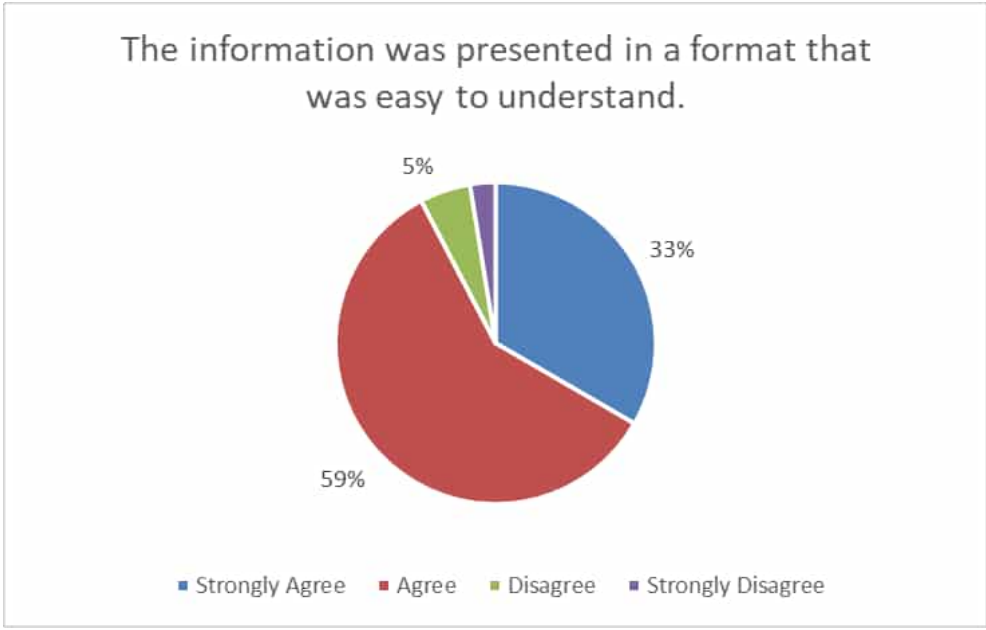

Figure 6.8: Project Launch Feedback: Information Comprehensibility

Attendees were very impressed with the team, with 92 per cent of respondents either *agreeing* or *strongly agreeing* that staff were able to answer their questions (Figure 6.9).

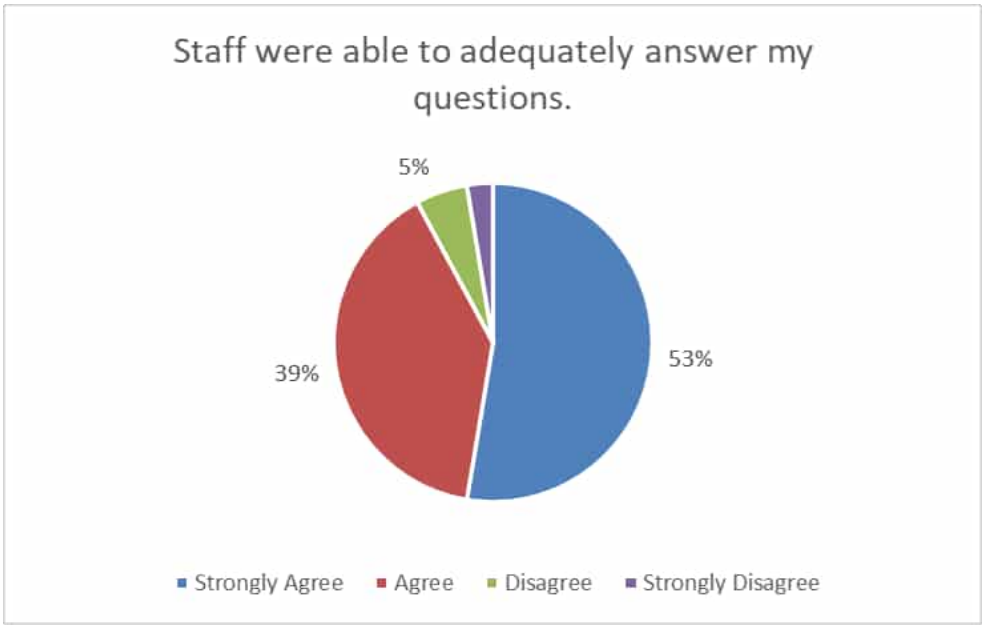

Figure 6.9: Project Launch Feedback: Staff Responsiveness

Most stakeholders heard about the open house through the direct mail postcard (49%) and through word of mouth (34%) – in true Nova Scotian style (Figure 6.10). The majority of respondents who heard about the community launch through other means did so through Facebook (9 responses) – this demonstrates the effectiveness of Facebook outreach and indicates that “Facebook” should be a response option in future events. Others heard about the event through direct engagement (door-to-door visits to nearby homes).

Many indicated their interest in being kept up-to-date about the Project by providing their email address and joining the project distribution list at the launch.

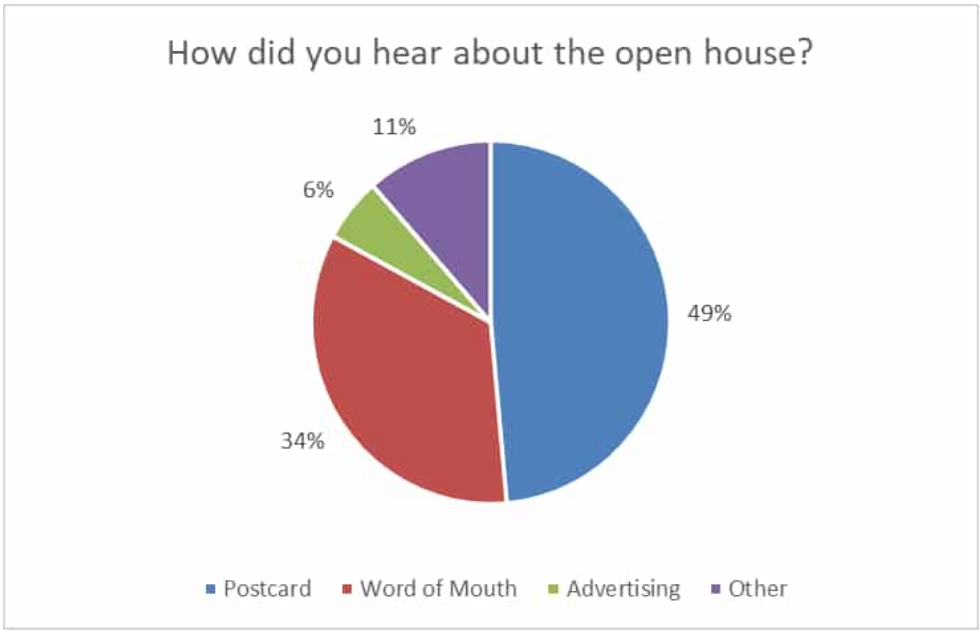

Figure 6.10: Project launch feedback: Event Awareness

6.2.3.2 July 2025 Open House

NSF hosted a second community information session (open house) at the Goldboro Interpretive Centre (12881 Highway 316, Goldboro) on Wednesday, July 23, 2025, from 4-6 p.m. (ADT).

NSF presented findings from nearly two years of environmental fieldwork and unveiled renderings of the proposed facility. The event presented the opportunity for one-on-one interactions with stakeholders, allowing the project team to share information and gather feedback.

The open house consisted of the typical elements (poster boards, handouts, etc.); however, special effort was made to include multimedia following requests for such at the Project's launch event held in September 2024. Two videos were made for the event to clearly communicate complex topics related to the Project to stakeholders.

The goal of the event was to seek direct public feedback on how locals use the Project area. It also presented an opportunity to collect contact information from community members interested in participating on the Project's CLC (first meeting planned for November 2025). A total of 10 potential committee members from the community volunteered.

Figure 6.11: Open House September 2024

Attendance

The open house was well attended, with just over 65 people dropping by the Goldboro Interpretive Centre. Although people arrived throughout the duration of the event, the first hour had the highest number of attendance and people started arriving as early as 15 minutes before the event's official start time (forming a line up out the door).

Attendees primarily came from Guysborough (15%), Drumhead (11%), and Antigonish (11%); however, there were also many attendees from New Harbour, Halifax, Country Harbour, Goldboro, Isaacs Harbour, and Sherbrooke (Figure 6.12). The majority of stakeholders (53%) who completed feedback forms came from over 5 km away from the Project (Figure 6.13). The next largest group of respondents (21%) live within 1 km of the Project, followed by "neighbours" at 16%. Stakeholders who live within 5 km of the Project accounted for 10% of respondents.

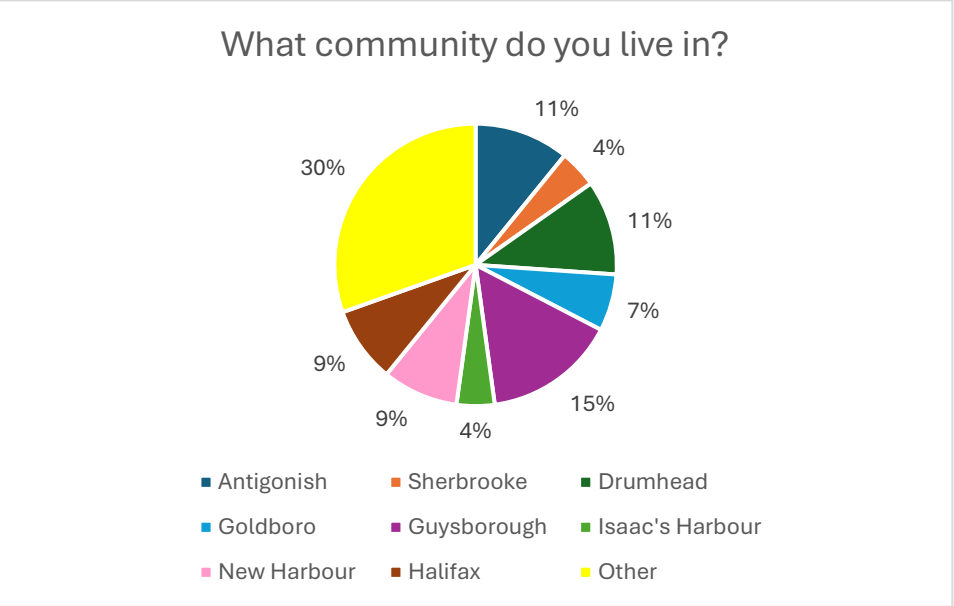

Figure 6.12: 2025 Open house feedback: Attendee communities

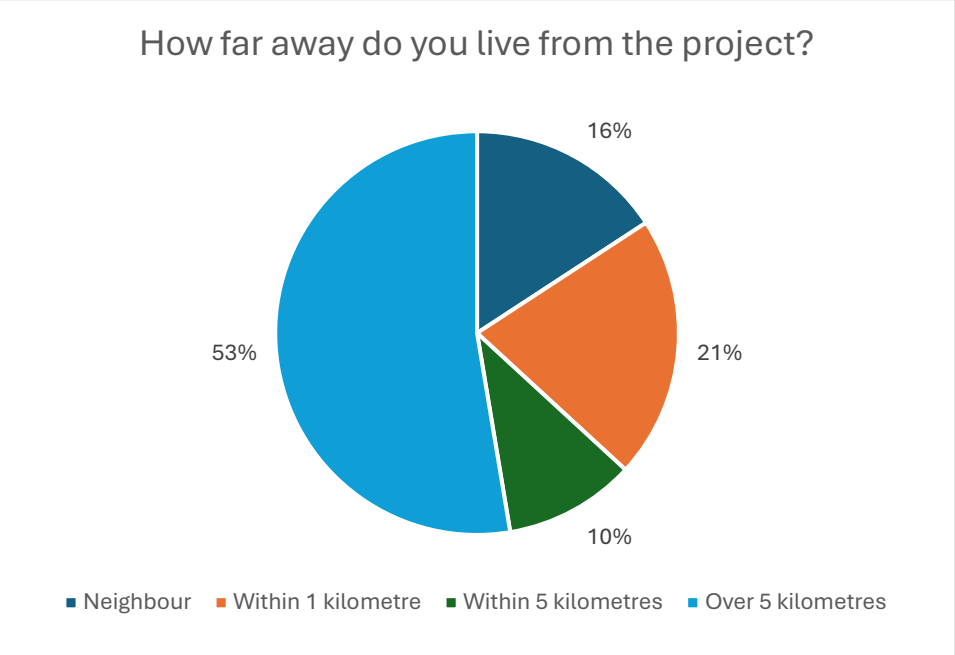

Figure 6.13: 2025 Open house feedback: Residential proximity of attendees

Some senior members from the MODG attended the event (both staff and politicians), as well as the Municipality of the District of St. Mary's. Representatives from Invest Nova Scotia, the Government of Nova Scotia, Forest Nova Scotia, Wagner Forest NS Ltd., and the Community Business Development Corporation were also in attendance. MODG Warden Vernon Pitts attended, as well as MODG's Director of Economic and Community Development.

One reporter (Jennifer Henderson) from the Halifax Examiner attended the event. There was significant local media attention on the Project and open house in the weeks surrounding the event due to a press release issued by NSF in early July and direct emails and calls to media contacts, resulting in positive media coverage from the following outlets: allNovaScotia, 989XFM, Guysborough Journal, Penticton Herald, CBC News, Port Hawkesbury Reporter and Halifax Examiner.

Feedback

Feedback forms were offered to all adult open house attendees upon entry and a total of 19 feedback forms were collected at the event. Additional feedback was received via email following the event.

Almost 30% of open house attendees completed forms.

Feedback was also collected throughout the event through one-on-one conversations with the Project team and representatives from Strum Consulting. Stakeholders were offered to place sticky notes on a map of the area to identify where they participate in different activities (photo on the right in Figure 6.14).

Figure 6.14: Open house, July 2025

Why Stakeholders Attended

Respondents were asked to indicate their reason for attending the open house. The majority of stakeholders (14 responses) stated that their reason for attending was to gather information/learn more about the proposed project in the community. Others came looking to provide feedback or explore supply/employment opportunities. Another came because she lives nearby and has concerns regarding potential impacts. Learning more about the potential impacts on lobster fishing was also a reason given.

Feedback on the Project

Open house attendees were asked if there is anything NSF should know from an ecological, cultural or economic perspective around the Project site (popular camping spots, hiking trails, swimming ponds, fishing/hunting spots, etc.). Most responses highlighted hunting and fishing use of the area (trout, salmon, and lobster). Stakeholders placed sticky notes identifying trout fishing at Crane Lake. Other feedback included:

- ATV use on trails in the area.
- Concerns on water withdrawals from Meadow Lake (identified by stakeholder as a rebounding Atlantic salmon fishery).
- Suggested creation of a park on the property with a sand beach at the end of the harbour on Dung Cove.
- Significance of local community benefits was highlighted (rather than municipal/provincial).
- More supply/employment opportunities are needed in the area.

Most respondents identified that they do **not** use Bettys Cove and/or Dung Cove for marine activities. It is important to note that many of the open house attendees were not from the immediate vicinity and thus these results are likely somewhat skewed for that reason. There is likely more local use by community members in Goldboro and Drumhead.

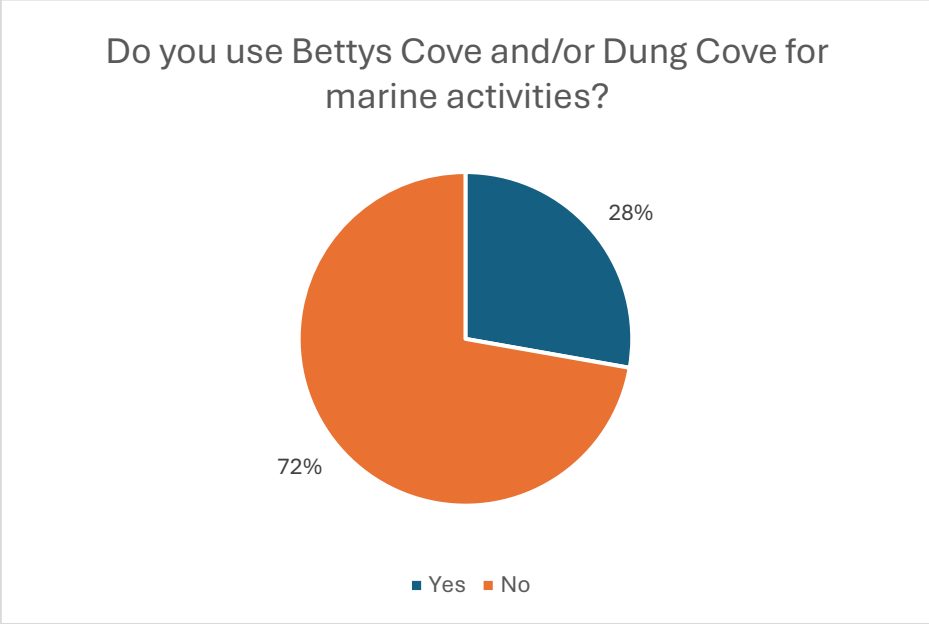

Figure 6.15: 2025 Open House Feedback: Marine Acitivites in Bettys Cove and/or Dung Cove

The main use of the coves identified by stakeholders is fishing [lobster (spring window identified), scallop, etc.)]. Other uses include swimming and walking along the beach. Stakeholders placed sticky notes identifying paddle boarding and shoreline exploration as other marine activities in the area.

One respondent encouraged NSF to consider another cove for marine operations due to the presence of a spring in one of the coves (specific cove not identified).

When asked how often they would like to hear about the Project, stakeholders were relatively split between at all major milestones (45%) and regularly, regardless of Project status (55%), clearly indicating a strong desire for open lines of communication throughout the duration of the Project.

Open House Evaluation

Open house attendees were pleased with the event, evaluating it positively overall.

All respondents indicated that they would be interested in attending future events about the Project. An improvement for future events was highlighted in the feedback: "*a brief discussion/presentation before a breakout session would help attendees tailor their questions*". This will be addressed by a world café style engagement event that is already being planned by the NSF team.

At future events, stakeholders would like to see tangible examples of how the Project will benefit the local community. Community members said the most important thing is to be kept consistently informed as the Project moves forward and provide information on supply/employment opportunities and training as soon as it becomes available. Others wanted to be kept informed on long-term environmental impacts and potential lobster fishing impacts.

Almost all respondents either *agreed* or *strongly agreed* that the information presented helped them gain a better understanding of the Project.

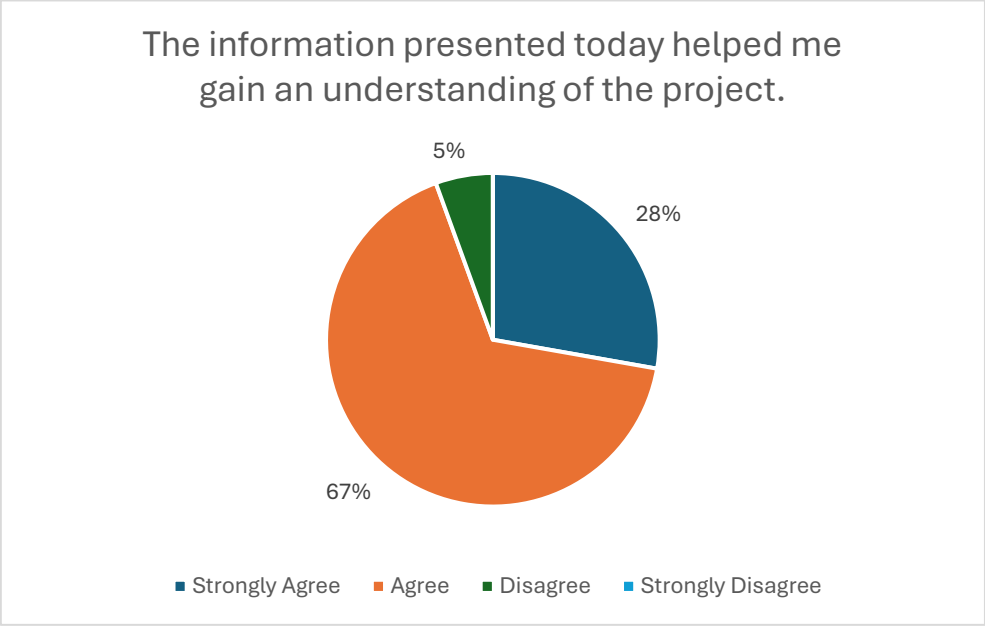

Figure 6.16: 2025 Open House: Information Value

Once again, almost all respondents either *agreed* or *strongly agreed* that the information was presented in a format that was easy to understand.

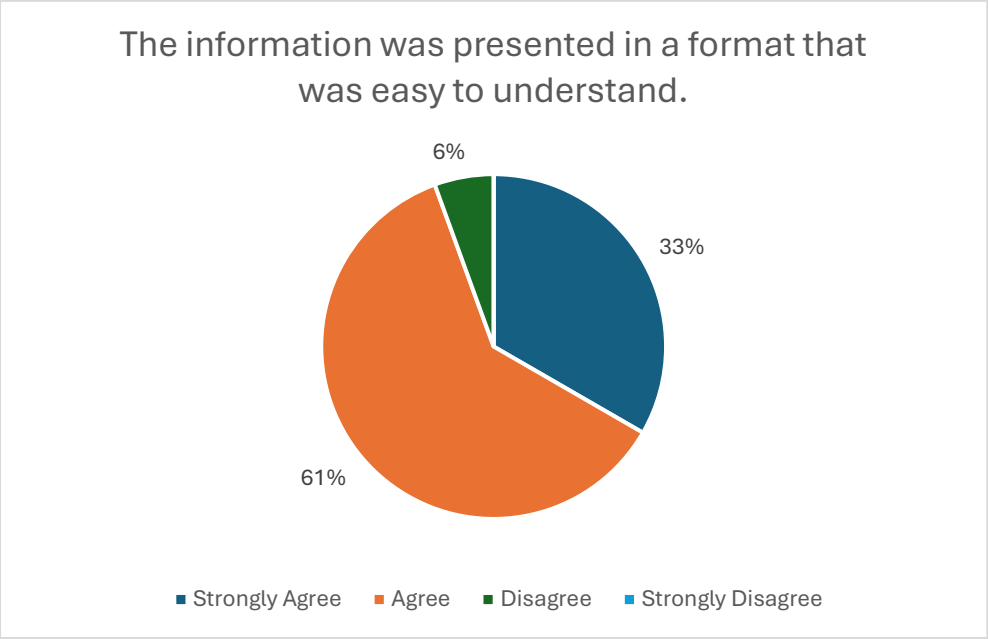

Figure 6.17: 2025 Open House: Information Comprehensibility

Attendees were impressed with NSF's team, with all respondents either *agreeing* or *strongly agreeing* that staff were able to answer their questions.

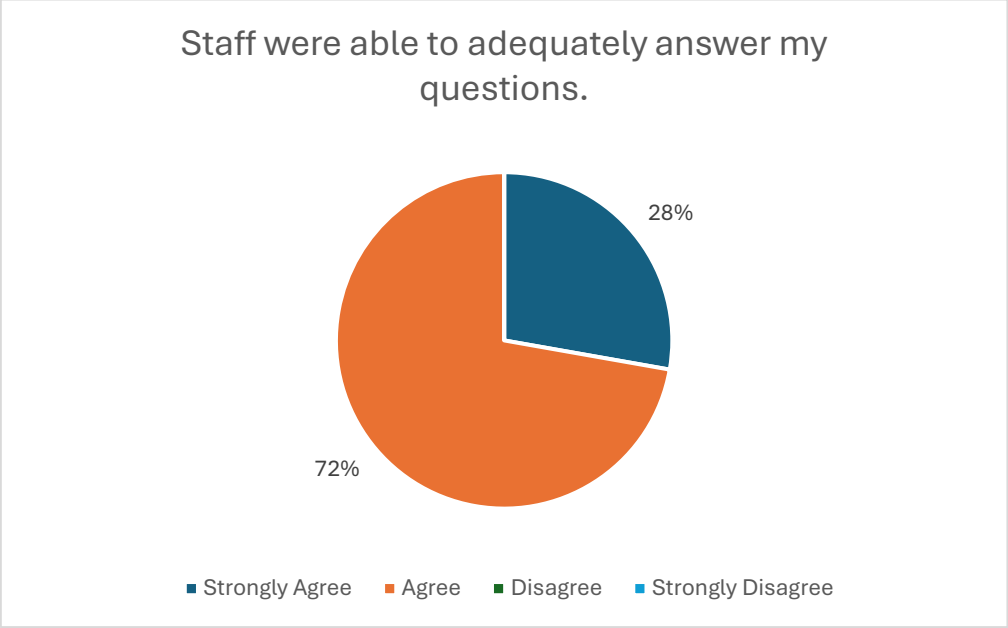

Figure 6.18: 2025 Open House: Staff Responsiveness

Most stakeholders heard about the open house through the direct mail postcard (35%), on the radio (25%) and through word of mouth (20%). Respondents who heard about the open house through other means did so through Facebook, direct email outreach conducted by NSF prior to the event and NSF's early July press release.

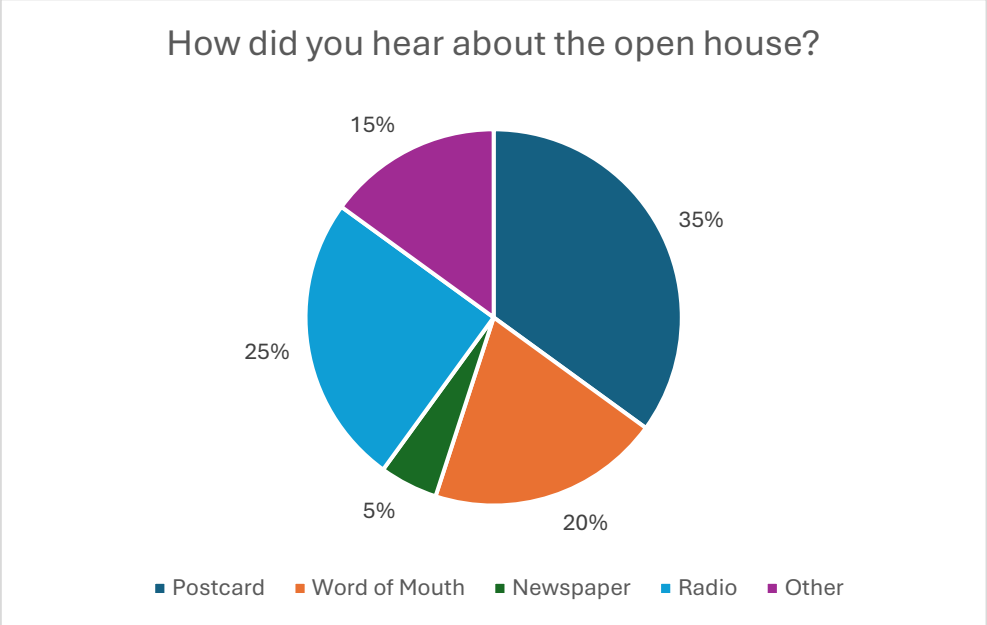

Figure 6.19: 2025 Open House Feedback: Event Awareness

Many indicated their interest in being kept up-to-date about the Project by providing their email address and joining our project distribution list at the event. New email addresses will be added to the distribution list created in fall 2024.

6.2.4 Communications with Stakeholder Groups and Industry Stakeholder

NSF is committed to meaningful and ongoing engagement with key stakeholders through meetings (in-person and virtual), phone calls and regular email updates. Stakeholders were engaged early so that meaningful action could be taken to build mitigation measures into Project design.

Key stakeholders were contacted directly via email and/or phone to invite them to NSF events (September 2024 project launch and July 2025 open house) and update them on major project milestones (new ownership, etc.).

Table 6.2 provides an overview of selected meetings conducted to date with a range of stakeholders. The list is not exhaustive (for example, additional meetings held with Eastern Canada Response Corporation, Forest Nova Scotia, local chambers, etc.).

Table 6.2: Summary of Stakeholder Meetings

Stakeholder	Meeting Type	Date	Summary
Canadian Council for Sustainable Aviation Fuels (C-SAF)	Virtual meeting	June 20-2024	Successful introductory meeting to identify any possible future synergies between NSF and C-SAF
Halifax International Airport Authority	Virtual meeting	June 25, 2024	Successful project update meeting
Wagner Forest NS Ltd.	Virtual meeting	June 26, 2024	Successful project update meeting
C-SAF	Virtual meeting	July 2, 2024	Successful introductory meeting between NSF and C-SAF
Clean Foundation	In-person meeting	July 4, 2024	Successful introductory meeting to identify any possible future synergies between NSF and Clean
Air Canada	Virtual meeting	July 31, 2024	Successful introductory meeting; lots of excellent information sharing between parties
Laurentic	Virtual meeting	July 31, 2024	Introductory meeting
Canadian Propane Association	Virtual meeting	July 31, 2024	Introductory meeting
Halifax International Airport Authority	Virtual meeting	August 6, 2024	Successful update meeting/relationship building
Perfect Link Consultants	Virtual meeting	August 7, 2024	Introductory meeting
Advanced Biofuels Canada	Virtual meeting	August 14, 2024	Successful introductory meeting; lots of excellent information sharing between parties
Halifax International Airport Authority	Virtual meeting	September 3, 2024	Successful update meeting/relationship building
Port of Halifax	Virtual meeting	September 6, 2024	Successful introductory meeting; lots of excellent information sharing between parties
West Jet	Virtual meeting	September 23, 2024	Introductory meeting
Halifax International Airport Authority	Virtual meeting	October 1, 2024	Successful monthly update meeting
SystemIQ	Virtual meeting	October 2,2024	Meeting to be rebooked - European focus
Graybar Canada	Virtual meeting	October 2, 2024	Quick chat to discuss if Graybar can help NSF as the project progresses
St. Mary's River Association	In-person meeting	October 3, 2024	Successful introductory meeting; very engaged questions
Halifax International Airport Authority	Virtual meeting	October 10, 2024	Successful meeting; excellent information sharing

Stakeholder	Meeting Type	Date	Summary
Rural Communities Foundation of Nova Scotia	In-person meeting	November 4, 2024	Successful introductory meeting
Nova Scotia Community College	Virtual meeting	November 12, 2024	Successful update meeting
Yurisel - Goldboro resident	Virtual meeting	November 15, 2024	Successful introductory meeting
Halifax International Airport Authority	Virtual meeting	September 15, -2025	Successful update meeting (new ownership, etc.)
Marine Renewables Canada	In-person meeting	September 22, 2025	Successful update meeting (new ownership, etc.)

Project updates with requests to meet were also sent to: Protect Guysborough, Birds Canada and the Ecology Action Centre.

6.2.4.1 Stakeholder Luncheon

A stakeholder luncheon was hosted to bring together leaders from across industries and government for an update on the Project and to further develop key relationships. It was held in the True Colours Art Gallery at the Muir Hotel (1709 Lower Water Street, Halifax) on Friday, September 13, 2024, from noon to 1 p.m. (local time in Halifax).

Figure 6.20: Stakeholder Luncheon, September 13, 2024

The luncheon was well attended, with just over 35 key stakeholders dropping by for lunch. Organizations represented included the Atlantic Canada Opportunities Agency, Bearhead Energy, Export Development Canada, Forest Economic Task Force, Forest Nova Scotia, Government of Nova Scotia (NSNR), the MLA of Guysborough-Tracadie, Halifax Port Authority, Halifax International Airport Authority, Invest in Canada, Invest in Nova Scotia, Irving

Oil, McInnes Cooper, MODG, NSPI, NS Innovation Hub, Ocean Super Cluster, Potlotek First Nation, Strum Consulting, Wagner Forest NS Ltd. and WMA.

6.2.5 Communication Materials

To effectively communicate project details to a diverse group of stakeholders, NSF developed a suite of tailored communication materials, including:

- A high-level project overview brochure available to stakeholders at meetings, open houses and other engagement interactions.
- Two informational project videos available on the website, and also shown at the 2025 Open House.
- Visually engaging infographics.
- Targeted presentations.

All materials were customized to suit the needs of specific audiences and prioritized the use of clear, non-technical language to ensure accessibility and understanding.

6.2.6 Digital Presence

NSF maintains an active, user-friendly website (novasustainablefuels.com) that provides stakeholders with 24/7 access to up-to-date information and resources. In addition, NSF leverages LinkedIn for broader outreach and collaborates on blog posts with organizations such as Invest in Canada to enhance visibility and engagement.

6.2.7 Community Investment

NSF is deeply committed to supporting the communities in which it operates. As part of ongoing efforts to give back, NSF has provided funding to several local initiatives, including the Municipality of the District of Saint Mary's, Miles MacDonald Performance Centre, St. Mary's Food Bank, Beanie's Bistro, Sherbrooke Village and the Goldboro Interpretive Centre. NSF has also sponsored key provincial events such as the Smart Energy Halifax conference, Strait of Canso Superport Days, and Forest Nova Scotia's Annual General Meeting.

Looking ahead, NSF remains dedicated to strengthening its community presence through continued sponsorships and donations. Plans are also underway to establish a formal Community Benefit Fund to further support local priorities in a meaningful and sustained way.

6.2.8 Media Outreach

6.2.8.1 Project Launch Coverage

As a part of the project launch, a formal press conference was held for local media with speeches/photos and a Q&A session.

The press conference was held in the True Colours Art Gallery at the Muir Hotel (1709 Lower Water Street, Halifax) on Friday, September 13, 2024, from 9 a.m. to 10 a.m. (local time in Halifax). Press packs were provided so media could access the press release, site photos, presentation and FAQs conveniently.

Speakers included Hugh Kelly [Simply Blue Group Chief Executive Officer (CEO) and Co-Founder), Michael Galvin (Simply Blue Group Chief Operating Officer - Hydrogen and Sustainable Fuels), Minister Tory Rushton (NSNR), and Laurel Broten (CEO, Invest in Canada).

The press release and conference generated more than 1 billion “opportunities to see” from approximately 60 pieces of coverage (trade press’ coverage was excellent).

6.2.8.2 Ownership Change/EA Open House Coverage

There was significant local media attention on the Project and open house in the weeks surrounding the event due to a press release issued by NSF in early July and direct media outreach, resulting in media coverage from the following outlets: allNovaScotia, 989XFM, Guysborough Journal, Penticton Herald, CBC News, Port Hawkesbury Reporter and Halifax Examiner.

6.2.8.3 Open House Coverage

Reporters have also attended both community open houses: one reporter (Alec Bruce) from the Guysborough Journal attended the community launch event in September 2024 and one reporter (Jennifer Henderson) from the Halifax Examiner attended the July 2025 event. Both reporters covered the events.

6.2.9 Targeted Advertising

Prior to public events, advertisements informed stakeholders of the Project and invited them to attend. Advertisements ran:

- In print in the Guysborough Journal (on September 4, 2024, and July 16, 2025 – see Appendix A).
- On the radio on 98.9 XFM (30 second ads ran regularly for the two weeks leading up to each event).
- On community Facebook pages (posted directly where possible; in some cases asked community groups to post).

6.2.10 Community Liaison Committee

The CLC will meet on a regular, quarterly basis to share information in the communities potentially impacted by the Project. Individual community members are subject-matter experts on their own communities – the goal of the CLC is for participants who understand the inner workings of their own communities to help NSF better understand the priorities and concerns of those living there. CLC members have been identified through a variety of engagement activities (open houses, door-to-door outreach, outreach in municipality newsletters, etc.). NSF has built a CLC of 15 stakeholders who represent varying perspectives/demographics in their communities – most of these stakeholders have already been approached and accepted their role on the CLC.

The first CLC meeting is planned for November 12, 2025, with quarterly meetings following (the frequency of meetings may change throughout Project phases).

6.2.11 Summary of Concerns

Table 6.3 summarizes concerns brought forward during engagement activities.

Table 6.3: Summary of Concerns

Concern	EA Section
How much additional traffic will this bring to Highway 316?	Section 3.5.5.3
Will there be restrictions to hunting and fishing? What about ATV activity?	Sections 8.2 and 8.3
Will there be long-term impacts to the environment?	Sections 7.1, 7.2, 7.3, 7.4, 8.1, 8.2, 8.3, 9.0
What are the benefits to the community?	Section 8.0
Will this create local jobs for our community?	Section 8.1
Where will the biomass be sourced from and how much is required?	Sections 2.2 and 3.3.2.1
How much water is required and where will it be sourced from?	Sections 3.3.2.2 and 7.3.1.10; Table 3.5
What permits does this Project require?	Section 2.3

7.0 BIOPHYSICAL ENVIRONMENT

7.1 Atmospheric Environment

7.1.1 Atmosphere and Air Quality

7.1.1.1 Overview

The assessment of the atmospheric environment will incorporate weather and climate, and ambient air quality considerations. Weather and climate baseline conditions have been obtained from regionally available meteorological data. Air quality baseline data has been collected from the local ambient air quality monitoring station.

From this ambient air quality baseline, anticipated Project-related impacts were assessed to determine the potential effects that the Project may have.

7.1.1.2 Regulatory Context

Relevant legislation includes:

- *Environment Act*, S.N.S. 1994-95, c.1
- Air Quality Regulations, N.S. Reg. 8/2020

7.1.1.3 Assessment Methodology

The assessment was completed through a review of the following resources:

- Ecological Land Classification for Nova Scotia (Neily et al., 2017)
- ECCC Canadian Climate Normals (ECCC, 2025b)
- NSECC Ambient Air Quality Data (NSECC, n.d.)
- Meteorological Data Report: Goldboro, Nova Scotia (Golder Associates, 2016)
- Risk Management Plan for the Goldboro LNG Project (Wood, 2021)

Process Emissions Modelling

To understand the Project-related impacts on air quality from process emissions, Ramboll Canada Inc. (Ramboll) completed an air quality screening (Appendix B), which was based on the Project's Pre-FEED report prepared by Wood (Wood, 2025).

The air quality screening was performed using the latest version of the United States Environmental Protection Agency (U.S. EPA) recommended screening-level dispersion model AERSCREEN (version 22112). AERSCREEN provides conservative estimates of off-property concentration for source-receptor distances up to approximately 50 km. AERSCREEN was used to model estimated emissions and determine whether the predicted maximum off-property concentrations were below Schedule A—Maximum Permissible Ground Level Concentrations under the Air Quality Regulations, N.S. Reg. 8/2020.

AERSCREEN was used to model ground-level concentrations of all Schedule A (N.S. Reg. 8/2020) parameters for the six significant emissions sources at the Facility over 335 operating days:

- Biomass belt dryer exhaust stacks
- Flare system stack
- Auxiliary boiler stack
- Jet fractionator fired heater stack
- CO boiler stack
- Sour gas waste exhaust stack

The methodology employed to model the estimated impacts included the following:

- Emission Data:
  - Emission rates are summarized in Tables B2 & B3, Appendix B, of the Air Dispersion Modelling Report (Ramboll, 2025).
  - Detailed source and emission data in Appendix C of the Air Dispersion Modelling Report (Ramboll, 2025).
- Modelled Domain:
  - Study Area: 15 km × 15 km area centred on each emission source.
  - Terrain Consideration: Complex terrain included in the screening analysis.
  - Modelling Grid:

        - Polar receptor grid centred on the source.
        - Receptor spacing:
            - 25 m up to 5,000 m from the source.
            - 100 m from 5,000 m to 15,000 m.
        - Radial spacing at 10° increments, covering 360°.
    - Terrain Data:
        - 30 m resolution elevation data used.
        - Processed with AERMOD Terrain Preprocessor (AERMAP).
- Belt Dryer:
    - Modelled with a single stack as a Total suspended particulates (TSP)-only source.
    - Peak hourly rates derived from annual processing are distributed over operating hours.
- Flaring Scenarios Modelled:
    - Low heat load flaring: Methanol + Natural Gas Pilot, 10.5 MW [37.5 million British thermal units per hour (MMBtu/h)].
    - High heat load flaring: Mixed fuel + Natural Gas Pilot, 55.3 MW (190.5 MMBtu/h).
- Boilers Assessed:
    - Auxiliary boiler (35.4 MW), jet-fractionator heater (23 MW), CO boiler (1 MW).
    - Contaminants: TSP, CO, sulphur dioxide (SO_2), $_2$), Nitrogen Dioxide (NO_2), volatile organic compounds (VOCs).
    - Emission factors selected based on the most conservative applicable values:
        - > 100 MMBtu/h (large)
        - 100 MMBtu/h (small)
        - 0.3–100 MMBtu/h (propane-fired)
- Sour Gas Waste Stack:
    - Modelled under 0% renewable energy input (worst-case).
    - Sour gas flow = 14,118 kg/h (most conservative emission estimate).
- Building Wake Effects:
    - Assessed using BPIPPRM and incorporated into the AERSCREEN model.
    - Applied to sources near solid structures.
- Shoreline Fumigation:
    - Dispersion modelling was conducted with and without this algorithm.

It is important to note that the emission rate calculations are based on preliminary design data and will require updates once final engineering has been completed and definitive equipment specifications, operating modes, and control efficiencies have been confirmed.

The assumptions and limitations made for the screening model were as follows:

- Most process operations are enclosed and non-venting.
- Air emission source sizing based on Pre-FEED heat/mass balance (Wood, 2025).

- Emission estimates based on capacity and engineering calculations (Appendix C in Ramboll, 2025).
- Facility emissions are modelled over 8,040 hours/year at 894,000 wet metric tonnes/year.
- Flaring emissions assume:
  - 1,000 hours/year for depressurization events.
  - Max daily emissions occur over 24 hours at peak rate.
- Contaminants from flaring: TSP, CO, NO_2, VOCs.
- Boilers are assumed to operate 365 days/year.
- All sulphur in sour gas assumed as H_2S; 98% removal efficiency applied.
- Fugitive/material handling emissions excluded.
- Natural gas during equipment startup considered negligible.
- Flare pilot emissions considered negligible but included in intermittent flaring analysis.
- Belt dryer, auxiliary boiler, and fired heater/CO boiler assumed near structures with wake effects.
- Virtual building dimensions based on preliminary engineering data.
- Structure heights assumed 10 m; stacks ≥ 2× structure height.
- Stack flow rate estimated from:
  - Heat input and fuel mix.
  - Complete combustion + up to 10% excess air.
  - Conservative stack temperature assumptions.
- Stack diameter based on exit velocities of 10 to 15 m/s.
- All nitrogen oxides (NOx) assumed emitted as NO_2.
- All particulate matter assumed as TSP.

For a detailed account of the technical approach, including modelling methodology, assumptions, and boundary conditions, refer to Appendix B.

Ozone Screening

Ozone is a secondary pollutant formed by Nonmethane Organic Volatile Compounds (NMOC) and NOx precursors. As a result, ozone concentrations could not be modelled using AERSCREEN. Instead, ozone concentrations generated from Facility were estimated using the U.S. EPA NMOC/NOx Point Source Screening Tables (US EPA, 1988), which estimates the ozone incremental concentration due to the Facility (i.e., increase in ozone concentration above the ambient background value) using short- and long-term NMOC and NOX emissions and their ratios (Ramboll, 2025).

7.1.1.4 Assessment Results

Weather and Climate

Nova Scotia's climate is quite varied and is largely governed by coastal influences and elevation (Davis & Browne, 1996). The Project is located within Guysborough County, the Eastern Interior (440) of the Eastern Ecoregion, and the Eastern Shore (820) of the Atlantic Coast Ecoregion (Drawing 7.1). The Eastern Shore is characteristically cool and moist due to

its proximity to the Atlantic Ocean. Similarly, the Eastern Interior is categorized by cool springs and a moist growing season (Neily et al., 2017).

Climate normals were obtained from the Collegeville meteorological station (Climate ID 8201000) (nearest meteorological station with available data) located approximately 38 km northwest of the Project at 45.483333 N, 62.016667 W. Environment and Climate Change Canada – Meteorological Service of Canada (ECCC-MSC) operate the Collegeville meteorological station (ECCC, 2025b). It is important to note that, since the station is 38 km from the Project, this data may not accurately represent the conditions (microclimate) observed within the Assessment Area.

Table 7.1: Climate Normals from the Collegeville (1991 to 2020)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature (°C)													
Daily Avg.	-5.7	-5.8	-1.9	3.4	9.1	14.1	18.6	18.5	14.3	8.6	3.8	-1.8	6.3
Daily Max.	-1.0	-1.0	2.8	8.1	15.1	20.2	24.5	24.3	20.2	13.7	8.1	2.1	11.4
Daily Min.	-10.4	-10.6	-6.5	-1.4	3.2	8.0	12.7	12.6	8.4	3.4	-0.6	-5.7	1.1
Extreme Max.	17.0	15.5	26.5	29.0	35.0	34.3	36.0	35.0	33.5	26.0	23.2	19.0	---
Extreme Min.	-33.0	-30.5	-27.9	-16.2	-13.5	-4.4	1.0	1.0	-5.4	-8.9	-14.1	-27.0	---
Rainfall and Snowfall													
Rainfall (mm)	43.2	38.1	54.0	48.0	73.9	85.8	79.7	95.5	108.6	130.8	118.5	61.6	937.9
Snowfall (cm)	35.1	43.6	27.0	10.2	0.5	0.0	0.0	0.0	0.0	0.6	7.5	37.5	161.9

(ECCC, 2025b)
All values are averages unless noted otherwise.
(1) Monthly sum.
'---' not applicable.

Based on the Collegeville meteorological station climate normals, the mean annual temperature was 6.3°C, with a mean daily maximum of 11.4°C and a mean daily minimum of 1.1 °C. January and February were the coldest months (mean daily average of -5.7°C and -5.8°C, respectively), while the warmest months were July and August (mean daily average of 18.6°C and 18.5°C, respectively). Over the climate normals period (1991 to 2020), the meteorological station recorded mean annual rainfall, snowfall, and precipitation. Rainfall was the highest in October (130.8 mm) and lowest in February (38.1 mm). Snowfall was the highest in December (37.5 cm), with no snowfall between June and September.
(ECCC, 2025b).

Wind speed and direction data were also obtained from the Hart Island [automatic (AUT)] meteorological station (Climate ID 8202318) located approximately 55 km northwest of the

Project at 45.483333 N, 62.016667 W (Table 7.2). Note that the Hart Island (AUT) meteorological station is the nearest meteorological station to the Project with available wind data, likely representative of the microclimate present in the Assessment Area.

Table 7.2: Climate Normals Wind Data from the Hart Island (AUT) Meteorological Stations (1991 to 2020)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Extreme Speed (km/h)	96	93	96	76	93	70	61	69	88	89	100	89
Direction of Extreme Speed	NW	E	NW	W	NW	NW	SW	NW	S	SE	NW	NW

(ECCC, 2025d)

The extreme wind speed recorded at the Hart Island (AUT) meteorological station between 1991 and 2020 ranged from 61 kilometres per hour (km/h) in July to 100 km/h in November. The direction of extreme wind speed observed at the Hart Island (AUT) meteorological station is from the northwest. Wind directions may occur in all directions (ECCC, 2025d).

The windrose plot for the Hart Island meteorological station [Canadian Radar Weather Network (CRWN)] illustrates the wind directions from 1991 to 2020 (Figure 7.1). Wind speeds above 12 m per second (m/s) (43.2 km/h) were most predominant in both the northwest and the southwest.

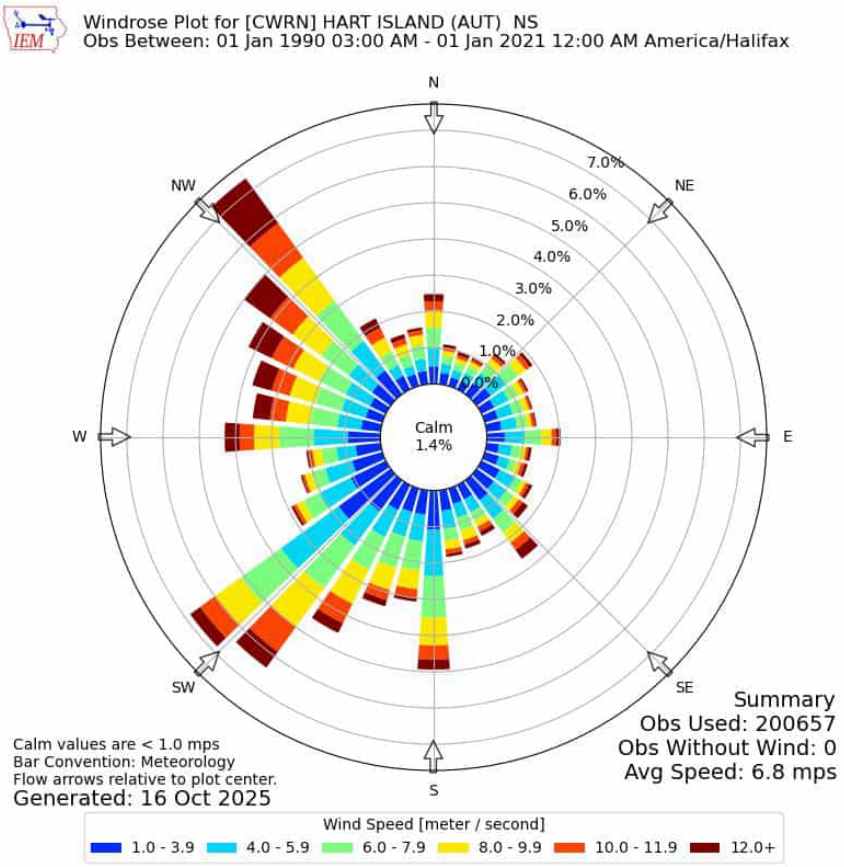

Figure 7.1: Windrose Plot for Hart Island Meteorological Station (CXTD) – January 1, 1990, through December 31, 2020 (ISU, 2025)

An on-site meteorological station (met-station) collected data from November 20, 2014, to December 31, 2015 (Golder Associates, 2016). The meteorological data included wind, air temperature, and barometric pressure measurements using a UT30 Campbell Scientific meteorological station. Based on the Golder Associates Ltd. findings:

- Wind speed was recorded at 3.5 ± 2.6 m/s (average ± standard deviation) over the annual cycle.
- Wind direction was predominantly from the west to northwest from November 2014 to April 2015 and from the west to southwest from September to December 2015. From May to August 2015, wind direction was more southerly and easterly.
- The strongest winds were recorded during winter and early spring, with the strongest hourly wind speed (average of the last 10 minutes of the hour) up to 16.3 m/s recorded on January 25, 2015. A peak gust of 22.7 m/s was recorded on March 15, 2015, within the 10-minute maximum wind speed time series. The calmest season was the summer, with average wind speeds up to 11 m/s.

- Air temperature varied on a diurnal cycle owing to solar warming and over seasons. The warmest and coldest seasonal average temperatures were recorded in summer (15.1 ± 4.5°C) and winter (-7.5 ± 5.3°C), respectively. The coldest temperature was -21.7°C on February 24, 2015, and the warmest was 25.5°C on September 3, 2015.

Currently, the on-site meteorological station is inoperable and cannot be used to capture weather and climate data.

Ambient Air Quality

The Government of Nova Scotia has legislated Air Quality Regulations (NS AQR), N.S. Reg. 8/2020, under the Environment Act, S.N.S. 1994-95, c. 1 (Table 7.3).

The ambient air quality standards published in the NS AQR set the maximum permissible ground-level concentration limits.

Table 7.3: Summary of Regulations Pertaining to Ambient Air Quality in NS

Contaminant	Averaging Period	Regulatory Threshold (µg/m^3)[(2)]
		Existing Provincial[1]
Carbon Monoxide (CO)	1-hour	34,600
	8-hour	12,700
Nitrogen Dioxide (NO_2)	1-hour	400
	24-hour	-
	Annual	100
Ozone (O_3)	1-hour	160
$PM_{2.5}$	24-hour	-
	Annual	-
PM_{10}	24-hour	-
	Annual	-
Sulphur Dioxide (SO_2)	1-hour	900
	24-hour	300
	Annual	60
Total Suspended Particulate (TSP)	24-hour	120
	Annual	70[(1)]

(Air Quality Regulations, N.S. Reg. 8/2020)
[(1)] Geometric mean, [(1)] Micrograms per cubic metre

NS monitors air quality at eight ambient air quality monitoring stations located throughout the province (NSECC, n.d.). Measured parameters at these locations may include the following:

- Carbon monoxide (CO)
- Ground-level ozone (O_3)
- Nitrogen oxides (NO_x)

- Nitric oxide (NO)
- Nitrogen dioxide (NO_2)
- Particulate matter ($PM_{2.5}$)
- Sulphur dioxide (SO_2)
- Total reduced sulphur (TRS)

The NO_2, O_3, and $PM_{2.5}$ values from seven of the eight ambient air quality monitoring stations (AAQMSs) are used to calculate a score on the Air Quality Health Index (AQHI) (ECCC, 2025a; NSECC, n.d.). The AQHI is a scale ranging from 1 to 10+, where scores correspond to the following health risk categories: Low (1 to 3), Moderate (4 to 6), High (7 to 10), and Very High (10+) (ECCC, 2025a).

The closest AAQMS with available data is the Port Hawkesbury station, approximately 15 km north of the Assessment Area at 45.614028 N, 61.362122 W.

Table 7.4 summarizes the current (baseline) maximum ambient air quality conditions observed at the Port Hawkesbury air quality monitoring station from January 2020 to December 2024. The monitored parameters are compared to the current NS AQR.

Table 7.4: Maximum Ambient Air Quality Conditions at Port Hawkesbury (January 2020 to December 2024)

Parameter	Averaging Period	O_3 (ppb)	SO_2 (ppb)	NO_X (ppb)	NO (ppb)	NO_2 (ppb)	$PM_{2.5}$ (ug/m^3)	TSP (ug/m^3)	CO (ppb)	H_2S (ppb)
Port Hawkesbury AAQMS January 2020 to December 2024	1-hour	92.5	89.7	139.1	93.9	49.3	64.6	-	-	-
	24-hour	47.6	15	41	21.2	19.7	20.1	-	-	-
	Annual	28.6	0.6	3.5	1.2	2.2	5.1	-	-	-
NS AAQS Schedule A[(1)]	1-hour	82	340	-	-	210	-	-	30,000	30
	24-hours	-	110	-	-	-	-	120	-	6
	Annual	-	20	-	-	50	-	70[(2)]	-	-
Fraction of NS AAQS Schedule A	1-hour	113%	26%	-	-	23%	-	-	-	-
	24-hours	-	14%	-	-	-	-	-	-	-
	Annual	-	3%	-	-	4%	-	-	-	-

(NSECC, n.d.)
[(1)] Ambient Air Quality Standards (NS AAQS) (Air Quality Regulations, N.S. Reg. 8/2020).
[(2)] Geometric mean.

As seen in Table 7.4, existing air quality conditions (i.e., baseline data) indicate that most of the measured contaminants are well below their respective NS AAQS Schedule A limits except O_3, O_3, which is 113% of the 1-hour limit. The reported AQHI typically scores 'low' at all times of the year

Process Emissions Modelling

Table 7.5 summarizes the maximum predicted concentrations for each contaminant and averaging period, based on the NS AAQS Schedule A limits. These values reflect the highest

incremental concentrations from Facility emissions (as calculated using AERSCREEN). Each result is compared against the corresponding NS AAQS Schedule A limit.

Table 7.5: Modelled Emission Concentrations Summary

Contaminant	Average Period	Schedule A Maximum Permissible Ground Level Concentration (µg/m³)	Maximum Facility Modelled Ground Level Concentration (µg/m³)	Fraction of NS AAQS (Facility only) (%)	Port Hawkesbury Average Ambient Monitoring Concentrations from 2020 to 2024 (µg/m³)	Cumulative Ground Level Concentrations (µg/m³)	Fraction of NS AAQS and (%)
Carbon Monoxide (CO)	1 hour	34,600	156	0.5	---(1)	156	0.5
	8 hours	12,700	141	1.1	---(1)	141	1.1
Hydrogen Sulphide (H_2S)	1 hour	42	9.2	21.9	---(1)	9.2	21.9
	24 hour	8	5.5	68.8	---(1)	5.5	68.8
Nitrogen Dioxide (NO_2)	1 hour	400	266(2)	66.5	51.2	317	79.3
	Annual	100	26.6(2)	26.6	4.3	30.8	30.8
Ozone (O_3)	1 hour	160	---(3)	---	93.6	93.6	58.5
Sulphur Dioxide (SO_2)	1 hour	900	1.1	0.1	40.1	41.2	4.6
	24 hour	300	0.7	0.2	40.1	40.7	13.6
	Annual	60	0.1	0.2	1.7	1.9	3.2
Total Suspended Particulate (TSP)	24 hours	120	64(4)	53.3	18.7	83.2	69.3
	Annual	70(5)	10(4)	14.3	5.1	15	21.4

(1) Background concentrations are not available for Carbon Monoxide, Hydrogen Sulphide, and $PM_{2.5}$.
(2) Assumes all nitrogen oxides (NO_x) were released as nitrogen dioxide (NO_2).
(3) Ozone concentration due to secondary formation from NOX and VOC emitted from the Facility was determined to be below the screening threshold and is considered insignificant.
(4) Assumes all Particulate Matter was released as Total Suspended Particulate (TSP).
(5) Geometric Mean.

The maximum incremental concentration attributable to the Facility is well below the permissible limits, with 24-hour H_2S having the highest percent of the limit at approximately 69%, followed by 1-hour NO_2 at approximately 67% of the limit. Detailed modelling results for the Facility emissions are presented in Table B3, Appendix B of the Air Dispersion Modelling Report (Appendix B). Note that NO_2 was modelled conservatively as 100% of NO_X was assumed to be emitted as NO_2.

It is important to note that baseline concentrations do represent a significant percentage of the air quality limit, particularly for TSP, NO_2, and SO_2 (Appendix B). The maximum predicted cumulative concentrations presented in Table 7.5 suggest that the Facility alone or cumulatively is not expected to contribute to the exceedance of the applicable Schedule A limits. The predicted concentrations, including cumulative effects with background concentrations taken into account, are well below the permissible limits.

7.1.1.5 Effects Assessment

From the ambient air quality baseline, anticipated Project-related impacts were assessed to determine the potential effects that the Project may have on ambient air quality during construction and operations; Project-related process emissions, fugitive dust, and exhaust emissions are considered.

Project-Atmospheric Interactions

Project activities have the potential to interact with the atmospheric environment through fugitive dust and exhaust emissions during various construction and operational activities (Table 7.6).

Table 7.6: Potential Project-Atmospheric Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Water Pipeline and Roadway Construction	X
Facility Foundation Construction	X
Transportation of Facility Components	X
Facility Assembly	-
Utility Connections	-
Removal of Temporary Works and Site Restoration	X
Operations and Maintenance	
Commissioning	-
Handling of Biomass	X
Production of SAF and Other Products	X
Product Storage	X
Vegetation Management	X
Decommissioning and Rehabilitation	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for the atmospheric environment is a 15 km × 15 km area centred on the respective source. The RAA is not applicable.

Assessment Criteria

The assessment criteria provided in Section 4.5 apply to the atmospheric environment. The VC-specific definition for magnitude is as follows:

- Low: Air quality is expected to remain less than or equal to the maximum permissible ground-level concentrations as defined by the NS AQR.
- High: Air quality is expected to exceed the maximum permissible ground-level concentrations as defined by the NS AQR.

Fugitive Dust

Fugitive dust emissions, including PM, may be generated from open-air activities such as soil disturbance, wind erosion, increased traffic, and biomass transportation. Fugitive dust emissions comprise soil minerals but may also include biomass dust, salt, pollen, spores, and tire particles. The two forms of PM most concerning for human health are PM_{10}, with diameters of 10 microns (µm) or smaller, and $PM_{2.5}$, with diameters of 2.5 µm or smaller. PM is measured as TSP and is defined as the mass of airborne particles having a diameter of less than 44 µm.

When fugitive dust enters the atmosphere, it has the potential to affect lung and heart functions. PM has been linked to premature death (people with lung and heart disease), non-fatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function, and increased respiratory symptoms such as irritation of the airways, coughing, or difficulty breathing. People with underlying lung and heart disease, children, and the elderly are the most susceptible to particulate pollution exposure (US EPA, 2024b).

Fugitive dust may also affect the environment through visibility impairment and environmental damage. Fine particles are the leading cause of reduced visibility in many cities, national parks, and wilderness areas. In addition, fugitive dust particles can be carried over long distances (via wind), deposited in other locations, and within surface water features. Some of the potential effects of particulate deposition may include the following (US EPA, 2024b).

- Increasing lake and stream acidity.
- Altering the nutrient balance in coastal waters and large river basins.
- Depleting the nutrients in the soil.
- Damaging sensitive forests and farm crops.
- Affecting the diversity of ecosystems.
- Contributing to acid rain effects.
- Suspension of contaminants from historical contamination.

Anticipated sources of fugitive dust emissions from the Project will be primarily associated with the Project's construction and may include the following activities:

- Soil disturbance during site preparation (e.g., clearing/grubbing, grading, blasting).
- Wind erosion from soil or rock stockpiles during grading.
- Increase in traffic on roadways from travel by Project personnel (to/from the site).
- Management of on-site materials transfers (i.e., loading/unloading).

While less prominent, fugitive dust emissions from the Project's operation include the following activities:

- Management of on-site materials transfers (i.e., loading/unloading).
- Biomass transportation from the marine terminal to the Facility, and handling and drying.
- On-site travel on the gravel access roads.
- Maintenance to access roads and surface water management (i.e., ditching, culverts, etc.).
- Stormwater pond dredging and sediment hauling.

The interaction with local receptors was assessed to determine environmental impacts on ambient air quality from fugitive dust emissions. The closest non-participating receptor is approximately 50 m from the Project Footprint and approximately 250 m from the nearest piece of proposed Project Infrastructure (Drawing 3.1). The effect of fugitive dust sources on air pollution depends on both the composition and quantity of the dust produced, as well as the behaviour of the particles once they are released into the atmosphere. Larger particles tend to settle quickly near their source, while smaller particles disperse significantly farther. The distance particles can travel is influenced by factors such as the height at which they are released, their deposition velocity, wind speed, and the degree of atmospheric turbulence. For instance, theoretical calculations indicate that at an average wind speed of 4.4 m/s, particles larger than 100 (microns) µm typically settle within 10 m of their emission point (Holsen et al., 2011). However, particles that are 30 µm to 100 µm in diameter are likely to deposit within 100 m from the emission source. Other finer particles have a slower settling velocity and may travel further before they settle (US EPA, 1995). Although particles smaller than 30 µm may remain airborne and travel greater distances before settling, they are expected to undergo dispersion and decrease in concentration with increasing distance from the source.

The closest non-participating receptor is within 50 m of the Project Footprint near Red Head Peninsula (Drawing 3.1) and could be subject to fugitive emissions during construction and operation. Much of the Assessment Area is a disturbed brownfield affected by historical mining and the early development of the Goldboro LNG Facility. Dust from a contaminated site can pose significant risks to both the environment and human health. When soils or materials containing hazardous substances such as arsenic and mercury are disturbed and become airborne, the dust can travel beyond the site boundaries and settle on surrounding land, vegetation, and waterbodies, leading to long-term environmental degradation. Inhalation of

contaminated dust particles can impact human health, as it may cause respiratory irritation, exacerbate conditions such as asthma, and lead to chronic exposure to toxic substances. Dust can also deposit onto soils and crops, entering the food change and creating additional exposure pathways. The Facility is surrounded by a forested buffer and given the separation distances to the closest non-participating receptor, it is anticipated that dust will be trapped, and particles will be reduced before they reach nearby receptors. The prevailing winds at the site are predominantly from the northwest and southwest, which would decrease the likelihood of emissions reaching the nearest non-participating receptor which is located west/southwest of the Facility.

Tailpipe/Exhaust Emissions

Construction of the Project may increase combustion residuals and/or exhaust tailpipe emissions, primarily PM, NO_x, SO_2, and CO from vehicles (i.e., travel by Project personnel, transport/delivery activities) and heavy equipment. The bulk of exhaust emissions will be generated within the Project Footprint where the construction will occur. A receptor is located within approximately 50 m of a portion of the Project Footprint (the haul road on Red Head Peninsula) along an existing roadway, exposed to exhaust emissions. The US EPA (2014) determined that for major roadways, emissions are contained within the first 152 m to 182 m (approximately) from the emission source, and emission quality improves with respect to distance from the source. This receptor may be subject to emissions during construction of that portion of the Project Footprint; however, it will be temporary and intermittent. The largest portion of Project Footprint where construction activities will be concentrated is the site of the Facility where approximately 250 m from the nearest receptor. Given that the closest non-participating receptor is buffered by approximately 250 m from this portion of the Project Footprint, impacts from tailpipe exhaust are anticipated to be negligible.

During the project's operational phase, an expected 60 trucks/day are expected at the Facility. This is a moderate increase to the 250 to 260 vehicles/day currently using Highway 316. Nearby receptors may be exposed to additional tailpipe/exhaust emissions from the passage of trucks along Highway 316. Their distance from Project Infrastructure indicates that emissions related to on-site activities and idling are unlikely to reach nearby receptors.

Process Emissions

Based on the modelling results from the Air Dispersion Modelling Report (Ramboll, 2025) (Appendix B), Facility emissions alone or cumulatively are not expected to contribute to the exceedance of the applicable NS AQR Schedule A limits. Furthermore, air contaminants are shown to disperse with respect to distance, and as such, impacts to local residential receptors and sensitive receptors are not anticipated. Overall, Facility emissions are considered low-magnitude, medium-term, continuous, and within the LAA.

Mitigation

An Air Quality Management (AQM) Plan will be developed as a component of the EMP to define measures to be employed to minimize and mitigate the creation and emission of pollutants during the Project's construction and operation phases.

In addition, general mitigation measures for fugitive (dust) emissions are provided below:

- Conduct grading and site preparation in phases to minimize disturbed soil areas until just prior to construction activities.
- Stabilize exposed soil surfaces by sloping or using vegetation, stone, soil, or geotextiles to prevent dust and airborne particles from accumulating.
- Compact and/or ridge disturbed soil to prevent dust formation.
- Cease dust-generating construction activities during periods of excessive wind.
- Enclose or cover soil storage and/or stockpile areas.
- Wet (with water) aggregate and soil stockpiles to control dust.
- Avoid over-saturation (with water) to prevent leaching of contaminants.
- Design storage areas and material stockpiles with prevailing wind directions in mind.
- Wet roadways and heavy traffic areas with water or dust suppressant technologies to minimize airborne emissions.
- Tie down, cover, and/or store loose site materials and/or products prior to inclement weather and wind events to prevent materials from becoming airborne.
- Cover open hauling trucks with tarps (where practical).
- Wash down vehicles and equipment using hoses and water to remove accumulated mud/dirt from undercarriages, tracks, or wheel wells, preventing off-site tracking of contaminants.
- Ensure Project personnel adhere to all safety protocols and wear appropriate personal protective equipment (PPE) in the event of significant fugitive emissions events (i.e., windstorms, dust storms).
- Revegetate with native species to cover and bind soil particles, thereby reducing soil erosion and dust.
- Restrict vehicles and machinery movement to designated paths with stabilized surfaces.
- Restrict site access to Project personnel only.
- Use low-speed limits on-site to reduce vehicle-generated dust.

General mitigation measures for exhaust emissions include:

- Ensure equipment meets all applicable provincial and air quality regulations and emissions standards.
- Ensure equipment is fueled using low-sulphur diesel (to reduce SO_x air emissions).
- Maintain engines and exhaust systems according to the manufacturer's specifications and the recommended maintenance schedule.
- Remove from service malfunctioning equipment and/or equipment generating excess amounts of smoke, odour, or noise, until an assessment and necessary repairs can be completed.
- Remove from service construction equipment with improperly functioning emissions control systems.
- Restrict the idling of equipment where feasible.

General mitigation measures for process emissions are provided below:

- Pre-dry biomass to reduce moisture content and lower CO and PM emissions during gasification.
- Maintain stable process temperatures and residence times to ensure complete thermal decomposition and minimize incomplete combustion byproducts.
- Install emission monitoring systems to track real-time concentrations of CO, NO_x, PM, and VOCs.
- Inspect and maintain reactors, gas lines, seals, and control equipment regularly to prevent leaks and malfunctions.
- Optimize operations to reduce the need for flaring by maximizing recovery and reuse of gas.
- Install high-efficiency flares with a combustion efficiency of greater than 98% to reduce emissions of soot, VOCs, and methane.
- Ensure correct flare tip design and regular maintenance to achieve complete combustion and minimize pollutants.
- Use real-time sensors to monitor flare performance, combustion temperature, and flare gas monitoring.
- Ensure personnel are adequately trained and specialized to perform daily inspections and maintenance on the thermal oil boiler stack.

7.1.1.6 Monitoring

An AQM Plan (including monitoring) will be developed and submitted to NSECC for approval prior to Project commissioning. Pre-operation ambient air quality levels will be measured to establish baseline conditions. Upon commissioning, operational air quality monitoring will be conducted quarterly at the Facility site for the first year of operation to verify modelling results and ensure compliance with ambient air quality levels. The quarterly monitoring results will be reviewed, and depending on the findings, ongoing operational monitoring may be required.

Note that the air quality screening completed by Ramboll is based on early engineering and screening-level analysis and should be revisited if any changes are made to the Project's design related to Project emissions and source configurations.

7.1.1.7 Conclusion

After mitigations, residual effects on the atmosphere and ambient air quality are characterized as follows:

- Magnitude: Low magnitude, as Project emissions are anticipated to remain below all regulatory thresholds.
- Geographic Extent: Within the LAA.
- Frequency: Occur continuously and intermittently during the Project lifespan.
- Duration: Be of medium duration, as emissions are expected to extend throughout the Project's operational phase.
- Reversibility: Irreversible, as the residual impacts are not anticipated to be reversed.
- Significance: Not significant.

7.1.2 Climate Change

The Project is being developed to produce sustainable aviation fuels. Climate change for this Project is addressed in terms of GHG emissions per the NSECC's A Proponent's Guide to Environmental Assessment (2025a) and Guide to Considering Climate Change in Project Development in Nova Scotia (2011c) and various GHG regulations. For the purposes of this EA, the GHG emissions include the emissions from the construction of the REP and the production of renewable fuels. This review will consider the Project's anticipated carbon footprint and the possible options to reduce GHG emissions through mitigation controls.

The GHG assessment includes only those emissions generated as part of EA scope. Therefore, emissions associated with marine shipment, handling, reprocessing, and distribution of SAF outside of the REP are not considered. Furthermore, this GHG assessment does not cover other Project phases not included in the EA, such as the wind and solar projects, and the transmission infrastructure.

7.1.2.1 Overview

Climate change is a long-term alteration of weather patterns and conditions strongly impacted by changes in temperature and precipitation. Climate change typically involves changes in average conditions, as well as changes in variability. The main contributor to climate change is GHGs from anthropogenic sources. Since GHGs disrupt the natural heat transfer processes within the Earth's atmosphere, a build-up of these gases has enhanced the natural greenhouse effect. These human-induced enhancements are especially of concern since ongoing GHG emissions have the potential to warm the planet to levels that have yet to be experienced (ECCC, 2019f).

The impacts of climate change on the Project are assessed separately in Section 11.0.

7.1.2.2 Regulatory Context

The climate change assessment considered the following Acts and Regulations:

- *Environment Act*, S.N.S. 1994-95, c. 1
  - Greenhouse Gas Emissions Regulations, N.S. Reg. 305/2013
- *Environmental Goals and Sustainable Prosperity Act,* S.N.S. 2007, c. 7
- *Canadian Environmental Protection Act*, *1999* (CEPA)
  - Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations, S.O.R./2010-201
  - Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations, S.O.R./2013-24
  - Ozone-depleting Substances and Halocarbon Alternatives Regulations, S.O.R./2016-137
  - Halocarbon Regulations, S.O.R./2022-110

Regulatory guidance was used to determine the appropriate assessment methodologies, mitigation controls, best management practices, and emissions targets.

7.1.2.3 Assessment Methodology

The objectives of this assessment include the following:

- Establish the sources of GHG contributions from the Project.
- Quantify baseline and Project-generated GHG emissions.
- Mitigate and minimize GHG generation from Project-related activities.

Sources of GHG emissions were identified through a review of the Project phases, components, and previous GHG assessments provided by the Proponent.

Construction GHG emissions were quantified using anticipated construction material quantities based on provided site plans and construction timelines from the Proponent, as well as conservative assumptions where details were not available. GHG emissions were quantified in accordance with the specifications described in the International Standard ISO 14064 (2019) and using published values found in the literature (sources provided in applicable sections that follow).

The Proponent provided operational GHG emissions through a simplified GHG calculation completed by COWI (2025) to support the EU RED III certification for the Project. The calculations from COWI were based on estimates of operational emissions, including electricity generation and biomass demand.

All GHG emissions are stated in tonnes of carbon dioxide equivalent (tCO2e).

7.1.2.4 Sources of Greenhouse Gas Emissions

The main GHGs of concern include:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Halocarbons
- Water vapour

GHGs may be natural or anthropogenic in origin, except halocarbons, which are human-made (ECCC, 2019a). The following subsections describe the GHGs and their contributors (sources) as anticipated during each phase of the Project.

Carbon Dioxide

The primary source of atmospheric CO_2 is burning carbon-containing fossil fuels (i.e., coal, oil, and natural gas) and deforestation/land clearing activities.

Site preparation and construction for the Project will include several activities that are likely to produce CO_2; these include, but are not limited to, the following:

- Use of heavy equipment (excavators, dozers, cranes, etc.).
- Use of light-duty vehicles and equipment (pick-up trucks, light plants, generators, etc.).
- Cement production results in the heating of limestone, which releases CO_2 (ECCC, 2019a).
- Steel production (off-site emission).
- Material transportation (haulage trucks).

During construction, clearing within the Assessment Area will be required, along with the loss of wetlands. These land use changes will impact GHG emissions through the loss of stored carbon and the loss of active carbon sequestration. However, any altered wetlands within the Assessment Area will be offset as required through the NSECC Wetland Conservation Policy (2019) (Section 7.3.3). The Assessment Area has abundant anthropogenic disturbance, and much of the on-site vegetation, which is to be cleared, consists of primary successional species (Section 7.4.1). Therefore, any impacts due to land use change are anticipated to be minor and are not quantified.

During the operations phase, CO_2 emissions will be produced during various processes and maintenance activities, including, but not limited to, the following:

- Use of vehicles and equipment for material handling and maintenance operations.
- Biomass collection, transportation, and preprocessing.
- Venting of biogenic CO_2 from biomass gasification.
- Use of electricity from the grid.

Methane

Methane (CH_4) is produced when fossil fuels are burned with insufficient oxygen to complete combustion (ECCC, 2019a). Another source of methane is the decay of organic solid wastes, and, indirectly, methane can also be released due to disturbance of wetlands (which act as methane sinks).

The Project's construction phase requires different heavy- and light-duty equipment, contributing to methane emissions. The decay of waste (i.e., workforce waste production) will also contribute to methane emissions. Where these activities are intermittent and short-term, the GHG contributions from construction are negligible and are not considered further.

During operations, methane emissions will be produced from maintenance activities (i.e., transportation and venting or purging of pipelines). The use of natural gas as an auxiliary energy source may release small quantities of unburned methane through combustion inefficiencies or leaks. Furthermore, leakages within the biomass gasifier or associated infrastructure can result in the generation of methane. These described activities are intermittent and short-term, and with proper process design and operational practices, emissions are expected to be minimal; therefore, methane emissions are negligible and are not considered further.

Nitrous Oxide

The primary sources of N_2O are related to the use of nitrogen-based synthetic fertilizers and manure. These sources have added significant amounts of reactive nitrogen to the Earth's ecosystems. Other contributors include the release of N_2O into the atmosphere during the combustion of fossil fuels and biomass (e.g., trees or wood-based fuels) and from some industrial sources (ECCC, 2019a). It should be noted that the Project will gasify and not combust biomass. Emissions associated with the Project's operation are detailed below.

The Project's construction phase requires heavy- and light-duty equipment, which can contribute to nitrous oxide emissions. Land restoration activities (i.e., soil amendments and reclamation) following construction will also contribute to nitrous oxide emissions. Overall, the production of N_2O in association with this Project is anticipated to be minimal.

During the operations phase, N_2O emissions from the production of SAF may occur as well as from maintenance activities (e.g., heavy- and light-duty equipment). The carbon equivalent emissions associated with the production of SAF are considered below. However, where N_2O emissions from maintenance activities are intermittent and short-term, these GHG contributions are negligible and are not considered further.

Halocarbons

Halocarbons are a group of synthetic chemicals containing a halogen group (e.g., fluorine, chlorine, and bromine) and carbon (ECCC, 2003). They are typically used in refrigerants, fire-extinguishing agents, solvents, foam-blowing agents, and fumigants (ECCC, 2003). There are various industrial sources, but the main contributor is aluminum production (US EPA, 2024a).

The primary source of halocarbon emissions from the Project will be associated with coolants in air conditioning units found in vehicles, portable construction buildings (i.e., trailers), and equipment. Air conditioning units will be used during the Project's construction and operation phases. Fire-extinguishing agents (containing halocarbons) may also be used at the Project in the event of an emergency which requires a fire-fighting response. Overall, halocarbon use is anticipated to be localized, intermittent, and negligible and is not considered further.

Water Vapour

Water vapour is the most important naturally occurring GHG. Human activities do not directly influence the amount of water vapour in the atmosphere as it is a function of the atmosphere's temperature. The atmosphere can hold about 7% more water vapour for every additional degree Celsius in air temperature. When the air becomes saturated with water vapour, the water vapour condenses and falls as rain or snow, leading to climate change effects (i.e., variances in weather patterns).

As climate warming gases (i.e., CO_2, CH_4, N_2O) increase in the atmosphere, the temperature rise increases water evaporation from the Earth's surface and increases the atmospheric water vapour concentrations. This increased water vapour, in turn, amplifies the warming from the initial GHGs, causing the cycle to repeat and temperatures to keep rising (ECCC, 2019a).

Water vapour emissions are not expected during the construction phase; however, water vapour is expected to be emitted during the operations phase. Water vapour has a relatively short residence time in the atmosphere, as it quickly condenses into liquid or ice and falls back to the surface as precipitation (NASA, 2022). Project activities contributing to GHG emissions are not anticipated to significantly impact water vapour concentrations in the atmosphere.

7.1.2.5 Quantification of the GHG Baseline Conditions

The GHG baseline is a reference of sources, sinks (removing), and reservoirs (storing) occurring in the absence of the Project and is used to compare pre- and post-project conditions. That said, the baseline determines the quantity of CO_2e emitted by petroleum-based aviation fuel for the same production capacity as the Project. There are no sinks and reservoirs attributed to the baseline scenario.

Carbon dioxide equivalent (CO_2e) is a measurement used to compare the emissions from various GHGs and their global warming potential.

For this Project, quantifying GHGs in terms of tCO_2e requires applying GHG intensity calculations for the Project SAF and comparing those to a standard petroleum-based aviation fuel GHG intensity. These values were provided by the Proponent and completed by COWI in 2025 (Appendix C). It should be noted that the COWI assessment considered emissions from chemical consumption, leakages, and wastewater treatment to be negligible.

7.1.2.6 Quantification of the Project-generated GHG Emissions

Construction Phase

The construction of the Project will take place over a three-and-a-half year period. The construction may impact the atmospheric environment through the release of GHGs, primarily from the combustion of fossil fuels.

Site Preparation

The Project will require the construction of new roads, which will involve the removal of vegetation and overburden, creating fugitive dust and GHG emissions. However, fugitive dust and GHG contributions for these activities, which are temporary and represent a small incremental addition to the overall Project emissions, were not quantified. Additionally, once completed, hydroseeding (or equivalent) will be used to cover areas of exposed earth, which will help prevent the resuspension of particulate matter.

Fugitive dust and air emissions as they relate to the Project, are discussed in Section 7.1.1 (Atmosphere and Air Quality).

Mobile Equipment

Mobile construction equipment, such as mechanical shovels and bulldozers, is required during the construction phase. Estimations and assumptions were made for the quantification of the GHG emissions and require the following inputs:

- The operating days of the equipment.
- The operating shift schedule.
- The equipment fuel consumption per hour (litre per hour).
- The amount of equipment required.

The amount of mobile equipment required for the construction phase of the Project is not yet known, nor is the fuel consumption for this equipment. Based on Strum's experience with similar construction projects, Strum has estimated the amount of equipment and fuel consumption for the mobile equipment expected to be required for the construction of the Project. The following mobile equipment was assumed to be required for the construction:

- Dozers (5)
- Excavators (5)
- Mechanical Shovels and Loaders (5)
- Trucks (Heavy Diesel) (5)
- Trucks (Light Gasoline) (10)
- Loaders (5)
- Tree Clearing and Harvesting Equipment (5)
- Pile Boring/Driving Machines (5)
- Vacuum Trucks (5)
- Welding Machines (5)
- Generators (5)
- Cranes and Manlifts (5)
- Rollers (5)
- Graders (5)

Although construction may occur 24 hours a day, this assessment considered that these pieces of equipment would run for 12 hours every day, excluding weekends and holidays, for three-and-a-half years (construction period). This reduction in equipment runtime was implemented because it is anticipated that half of the equipment will be operational at any given time. The average fuel consumption for each of these pieces of mobile equipment is presented in Table 1 (Appendix C)

The CO_2e emissions generated by the mobile equipment required to construct the REP are expected to be approximately **52,096.95 tCO2e**.

Detailed CO_2e calculations are provided in Table 1 (Appendix C).

Construction Materials

Various construction materials will be required for the Project; however, for this assessment and as a conservative GHG estimate, the construction materials will be lumped into concrete and steel. The materials needed for the REP are based on the details of the Pre-FEED provided by the Proponent (Wood, 2025). Since the Pre-FEED is a preliminary assessment, the Project details may vary as the design progresses. However, any updates to these Project

details are not anticipated to affect the enclosed findings. Where specific details were unknown, Strum provided conservative estimates to quantify GHG emissions where possible. All materials are assumed to come from local suppliers.

Concrete

As a conservative estimate, it is assumed that the concrete components required for the Project Infrastructure include a slab foundation for all the Project Footprint area, except laydown areas, ponds (e.g., water treatment or stormwater management ponds), and roads. The REP will require a significant quantity of concrete to be produced and delivered to the Project. However, all concrete is assumed to be made at the on-site concrete batch plant; therefore, all emissions associated with the transportation of concrete are assumed to be negligible.

The quantification of the GHG emissions requires the following inputs:

- The quantity of concrete produced for each structure's foundation base.

Table 7.7 summarizes the GHG emission factors for the different components used for concrete-related activities.

Table 7.7: Concrete Manufacturing Emission and Physical Property Factors

Component	Emission Factor / Density Factor
Concrete Production	$3x10^{-4}$ tCO_2e/kg
Concrete Density	2,400 kg/m^3

(Squared Consultants Inc, 2025; The Engineering ToolBox, n.d.-a)

The total amount of concrete required was based upon an assumed slab foundation construction (for a simplified yet conservative GHG estimate). The slab area was calculated based on the site plan provided by the Proponent. It excluded areas where concrete foundations would not be constructed (e.g., laydown areas, ponds, roads, etc.). The depth of any concrete foundation slab was assumed to be 0.25 m in thickness to calculate a total volume of concrete of 130,317.67 m^3 (312,762.42 t).

Given the mass of concrete required for the Project and the emission factors (Table 7.9), the CO_2e emissions for the concrete needed to construct the REP are expected to be approximately **93,828.72 tCO2e.**

Detailed CO_2e calculations are provided in Table 2 (Appendix C).

Metal Structure and Equipment

The Project will incorporate metal structures and equipment as part of its infrastructure, requiring extensive steel and metal fabrication. These materials and equipment will be manufactured and transported to the REP. While various types of metals will be utilized to meet the Project's demands, only steel will be included in the GHG quantification due to its significantly higher emissions during production than other metals (Ritchie, 2020).

To quantify GHG contributions from steel during the construction phase, the following items were assessed:

- The quantity of steel required.
- The transportation distances from the manufacturer to the Project location.
- The vehicle size and fuel type used to transport the materials and equipment.

For quantification purposes, the assessment assumed the following:

- Manufacturing locations.
- Route to the REP.
- Quantity of steel required.

Table 7.8 provides the approximate weight of metal structures and equipment required for the Project.

Table 7.8: Steel Manufacturing Emission and Physical Property Factors

Component	Emission Factor / Density Factor
Steel	$1.5x10^{-3}$ tCO_2e/t
Steel Density	8,000 kg/m^3

Estimated from the UK's mixture of steel types, excluding stainless steel (Hammond & Jones, 2008; The Engineering ToolBox, n.d.-b).

The amount of steel required was based upon an assumed enclosed structure around the Project Footprint area (for a simplified yet conservative GHG estimate). The Project Footprint was calculated based on the Project Infrastructure provided by the Proponent and excluded areas where an enclosed structure would not be constructed (e.g., laydown areas, ponds, roads, etc.). The steel enclosure was assumed to be 0.0254 m in thickness and 10 m in height. The geometry of the enclosure was assumed to be a square (five sides, including a roof), with each wall segment equal to the square root of the Project Footprint. The calculated total volume of steel is 916.93 m^3 (7,335.43 t).

$$(\text{SQRT}(\text{Footprint Area}) * \text{Height} * \text{Thickness}) * \text{Number of Sides} = Enclosure\ Steel\ Volume$$
$$(722.99\ \text{m} * 10\ \text{m} * 0.0254\ \text{m}) * 5 = 916.93\ m^3 \quad \text{(Eq. 1)}$$

Steel rebar is also assumed to be required for any foundation. A conservative estimate of the rebar required was made based on the Project Footprint, considering the use of 19.05 mm diameter rebar spaced 0.21 m in a single grid across the REP foundation. These parameters were fed into a simplified rebar calculator for concrete pours (Finity, 2024). The total amount of steel required for all the foundation rebar was estimated to be 1,408.27 m^3 (11,266.19 tonnes).

Finally, an equipment list was generated as part of the Project Pre-FEED. The equipment list identified one piece of equipment with a stated weight of 200 tonnes (25 m^3), the belt dryer. The belt dryer, for this assessment, was considered as a single piece of steel to quantify GHG emissions.

Given the steel required to produce the structural units for the Project and the emission factor (Table 7.9), the CO_2e emissions from the manufacturing of all the structures are expected to be approximately **28,202.40 tCO_2e**.

Steel for the Project is assumed to be supplied by local steel metal fabricators. The material is assumed to be transported from a local supplier in Point Tupper, Richmond County, NS, via a heavy diesel hauler to the Project location.

Table 7.9: Structure/Equipment Transportation Distances

Originating Destination	Final Destination	Distance (km)
Port Hawkesbury	Project Area	117

To determine the emissions associated with travel for steel, the following assumptions were made:

- Each heavy hauler can transport 38 tonnes of steel per trip.
    - Each trip comprises 117 km one-way.

GHG emission factors for the material transportation are provided in Table 7.10.

Table 7.10: Steel Transportation Emission Factors

Component	Emission Factor (tCO_2e/tonne·km)
Heavy Duty Truck (Diesel) with freight	$1.32x10^{-4}$
Heavy Duty Truck (Diesel) with no freight	$8.32x10^{-4}$

(US EPA, 2025)

Given the transportation distances and the emission factors (Table 7.10), the CO_2e emissions from the transportation of steel are expected to be approximately **339.41 tCO_2e**.

Detailed CO_2e calculations are provided in Table 2 (Appendix C).

Operations Phase

Following the construction phase, the REP will be operational, and the production and supply of SAF will begin. The Project will be capable of producing approximately 165 kt/a of SAF.

The Proponent provided the GHG intensity for the REP's SAF using the methods for EU RED III, which was estimated to be **21.5 grams of CO_2e per megajoule (gCO_2e/MJ)** and **6.6 gCO_2e/MJ** for ABF SAF (zero renewable energy input) and RFNBO SAF (high renewable energy input), respectively, based on a 2030, base case, production scenario. The GHG intensity calculations are sensitive to the balance of plant electricity consumption from the NS grid. Furthermore, the GHG intensity calculation considered the collection, processing, and transportation of forestry residues to the REP and final fuel distribution and use. Finally, the EU RED III assessment provided a reference carbon emission factor of 94 gCO_2e/MJ for a comparable petroleum-based aviation fuel.

Table 7.11: Emission Factors and Material Properties

Material Property	Value
GHG Intensity (ABF SAF)	21.5 gCO_2e/MJ
ABF Energy Content	2,744 Terajoules (TJ)
GHG Intensity (RFNBO SAF)	6.6 gCO_2e/MJ
RFNBO Energy Content	4,351 TJ
Reference Fuel (Petroleum-based)	94 gCO_2e/MJ

2030 Base Case Scenario (Appendix C)

The GHG intensity for either fuel can be multiplied by the energy content of the fuel (based on an annual basis) to provide an estimate of the GHG emissions associated with a year of SAF production. According to COWI (2025), the ABF SAF production will be 2,744 TJ, and the RFNBO SAF will be 4,351 TJ. This equates to emissions of **58,996.00 tCO_2e** and **28,716.60 tCO_2e**, respectively.

However, the respective GHG emissions to produce the reference fuel (petroleum-based) for an equivalent amount of energy of the ABF and RFNBO SAF are **666,930.00 tCO_2e**. Therefore, the emissions offset through the production of SAF is the difference between those produced by the reference fuel and those generated by SAF, which is anticipated to displace fossil fuels (reference fuel). Therefore, the emissions reduction for a year of SAF production is expected to be **579,217.40 tCO_2e** per year (Equation 2).

$$\text{Reference Fuel Emissions} - (\text{ABF SAF Emissions} + \text{RFNBO SAF Emissions}) = Emissions\ Reduction$$
$$666{,}930.00 - (58{,}996.00 + 28{,}716.60) = 579{,}217.40\ tCO_2e \quad \text{(E q. 2)}$$

The Project's operation will require activities, including scheduled routine maintenance. Where maintenance activities are intermittent and short-term, the GHG contributions are negligible, and no significant emissions are expected from these activities.

7.1.2.7 Decommissioning Phase

The Project's decommissioning at the end of its useful life will generate emissions similar to those during the construction phase. Dismantling the REP will likely require an effort comparable to building it. However, advancements in future technologies may reduce carbon emissions, potentially making the GHG emissions from decommissioning less than those produced during construction.

7.1.2.8 Effects Assessment

Potential Interaction and Effects Assessment

The Project is anticipated to reduce CO_2 that would have otherwise been released using fossil fuels, resulting in an overall net benefit and a positive reduction of GHG emissions. The following effects assessment will isolate and evaluate the GHG emissions from the Project's activities.

Project activities will emit GHGs during all phases of the Project (Table 7.12).

Table 7.12: Potential Project-GHG Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	X
Water Pipeline and Roadway Construction	X
Facility Foundation Construction	X
Transportation of Facility Components	X
Facility Assembly	X
Utility Connections	X
Removal of Temporary Works and Site Restoration	X
Operations and Maintenance	
Commissioning	X
Handling of Biomass	X
Production of SAF and Other Products	X
Product Storage	X
Vegetation Management	X
Decommissioning and Rehabilitation	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for GHG emissions is the Assessment Area. The RAA for GHG emissions is NS.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply to Project-related GHG contributions. The VC-specific definition for magnitude is as follows:

- Positive – Project is expected to have a net positive effect on GHG emissions.
- Negative – Project is expected to have a net negative effect on GHG emissions.

Effects

The Project is intended to have a net positive effect on the GHG environment (Table 7.13).

Table 7.13: Project GHG Emission Summary

Component	Emissions (tCO_2e)
Baseline	
Reference Fuel (Petroleum-based)	666,930.00
Construction Phase	
Concrete Production	93,828.67
Steel Manufacturing and Transportation	28,541.81
Construction Equipment	52,096.95
Total	**174,467.48**
Operations Phase	
SAF Production	87,712.60

Rounding errors may cause the values in this table to differ from those in Appendix C; however, the rounding errors are negligible and do not change their representation.

The Project's construction phase will generate the most GHGs from the operation of mobile construction equipment, as well as the manufacturing and transportation of steel materials, and the production of concrete for the construction of the REP. This construction is temporary, and it can be expected that emissions will fall once the REP is completed. The total GHG emission contributions from the construction phase are **174,467.48 tCO_2e.**

The operations phase will generate GHGs from the SAF at **87,712.60 tCO_2e/yr** for the Project's life span.

From Equation 2, once operational, the Project is anticipated to reduce **579,217.40 tCO_2e** annually. Based on the estimated construction emissions and the annual emission reductions, a payback period can be calculated (Equation 3).

$$\frac{Construction\ Emissions}{Emission\ Reductions} = \frac{174{,}467.48\ tCO_2e}{579{,}217.40\ tCO_2e/year} = 0.30\ years \qquad \text{(Eq. 3)}$$

Following the Project's commissioning, the Project is anticipating a 0.30-year payback period to offset the construction-related GHG emissions. Following this period, the Project is anticipated to positively offset GHG emissions from conventional fossil fuels.

The assumptions considered in this assessment propose an estimate of GHG emissions, which may differ if steel manufacturer locations are closer or further to the Project, manufacturing materials are less or more than assumed, or construction equipment is different than that assumed. Where assumptions may change the values provided in this assessment, the results remain constant; the Project will offset GHG produced by the construction and operation of the Project.

Mitigation

Mitigation measures to reduce the Project's contributions to GHG emissions, thus reducing the overall impact of climate change, include:

- Use locally sourced materials, where possible, to reduce CO_2, CH_4, and NO_x emissions associated with transport.
- Incorporate the shortest construction/transport routes where possible to minimize the use of fossil fuels during construction.
- Recover and recycle construction and demolition waste, where possible.
- Recycle and compost workforce waste (i.e., food waste). Diverting this waste will reduce the methane generated in landfills as it decomposes.
- Minimize deforestation during land clearing by only clearing the area that will be needed. This will reduce CH_4 and NO_x emissions associated with soil disturbance and limit the use of equipment (lowering emissions produced during equipment operations).
- Plan construction activities to reduce the double handling of materials, reducing GHG emissions associated with heavy equipment operations.
- Use recycled or repurposed materials, where possible, to reduce GHG emissions associated with embodied energy (i.e., the energy associated with manufacturing a product or service).
- Ensure Project equipment meets all applicable provincial and air quality regulations and emissions standards.
- Maintain engine and exhaust systems according to the manufacturer's specifications and applicable maintenance schedule.
- Remove from service malfunctioning equipment or equipment generating excess amounts of smoke, odour, or noise until an assessment and necessary repairs can be completed.
- Ensure construction equipment with an improperly functioning emission control system is not operated.
- Ensure regular equipment maintenance is undertaken to maintain good operations and fuel efficiency.
- Ensure equipment containing coolant (i.e., air conditioning units) undergoes preventative maintenance and inspections (i.e., leak testing).
- Train Project personnel (as appropriate) in the proper disposal of halocarbon-containing substances.
- Dispose of halocarbon-containing substances at an approved hazardous waste facility per applicable regulations and in compliance with local requirements.
- Ensure trucks removing waste from or bringing materials to the Project are filled to the maximum allowable capacity where practical (dependent on the truck size and load weight) to reduce transportation requirements and limit the number of trips.
- Implement an anti-idling policy to limit GHG emissions from vehicles and equipment and limit the use of fossil fuels.

Monitoring

No monitoring programs are recommended.

Conclusion

The impacts on climate change are characterized as follows:

- Magnitude: Project is expected to have a positive impact on climate change.
- Geographic Extent: Positive impacts expected to extend beyond the LAA.
- Frequency: Occur continuously during the Project lifespan.
- Duration: Long duration as the effects will last beyond the decommissioning phase.
- Reversibility: Irreversible, as the effects are unlikely to be reversed.
- Significance: No significant negative impacts. Positive impacts expected (significance not evaluated) due to net GHG emission reduction.

7.1.3 Sound

7.1.3.1 Overview

The assessment of sound included a field-based monitoring program to determine baseline sound levels within and near the Assessment Area and a qualitative assessment of the construction and operation-generated sound expected from the Project.

7.1.3.2 Regulatory Context

Changes to the acoustic environment during construction and operational activities could result in displacement, annoyance, and interference with communication, sleep, and/or working efficiency, as well as avoidance behaviour and sensory disturbance in wildlife. Sound levels are regulated at the various government levels to protect the public and ensure occupational health/safety at relevant receptor locations (Table 7.14).

Table 7.14: Summary of Sound Level Regulations and Guidelines

Source	Regulation/Guidance	Permissible Sound Levels (dBA)	Hours / Duration
For Residential Receptors			
NSECC	Guidelines for Environmental Noise Measurement and Assessment (NSECC, 2023)*	≤ 53	0700 to 1900
		≤ 48	1900 to 2300
		≤ 40	2300 to 0700
Municipality of the District of Guysborough	Noise Control By-law (MODG, 2011)**	65	0600 to 2300
		55	2300 to 0600
For Occupational Safety			
Workplace Health and Safety Regulations & Canadian Centre for Occupational Health and Safety (CCOHS)	Noise – Occupational Exposure Limits in Canada (CCOHS, 2024)	85	8-hour maximum daily duration

*$LAeq_{(1\ hour)}$ values, the average cumulative A-weighted sound level over a 1-hour period. As the nearby residential receptors are located within a rural setting, the Nova Scotia Guidelines for permissible sound levels in the Rural geographic region were applied (NSECC, 2023).
**Acute exceedance levels

Recommendations in the Guidelines for Environmental Noise Measurement and Assessment (NSECC, 2023) apply to activities that are regulated under the Activities Designation Regulations, which includes the Project. Municipal by-laws are generally established to protect the peace and tranquility of communities. For all those referenced in Table 7.14, provisions are in place to permit construction activities during specific hours (0700 and 2100) once a Building Permit has been issued (following EA approval).

7.1.3.3 Existing Environment

To assess current ambient sounds levels within the Assessment Area, a Baseline Sound Monitoring (BSM) program and review of aerial imagery (to identify nearby sources of sound) was completed. Ambient sound refers to baseline sound levels experienced in the vicinity of the Assessment Area prior to Project activities taking place. This includes sources of existing sound from both the natural and anthropogenic environment, and could include wind, vehicular traffic, and industrial and residential activities. Results from the BSM program will provide a baseline against which future monitoring events can be compared.

7.1.3.4 Baseline Sound Monitoring

The BSM was conducted in accordance with the recommendations outlined in the Guidelines for Environmental Noise Measurement and Assessment (NSECC, 2023) and the Health Canada Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise (Health Canada, 2017).

Monitoring Devices

The sound monitor (SM) selected for the BSM was the Cirrus Research Optimus CR:171C, a Class I sound level meter with 1/3 octave banding. This instrumentation complies with provincial guidance (NSECC, 2023) and was calibrated prior to each deployment.

The SM consists of microphone, sound level meter, and a power supply. The microphone was mounted on a tripod at a height of 1.5 m above ground level and positioned consistently across monitoring periods and locations. The sound level meter and power supply were both kept in a protective (Pelican) case. The SMs were installed away from extraneous sources of sound (e.g., running water) and located at least 3.5 m from nearby reflective surfaces. Sound level meters were programmed to record sound levels in A-weighted decibels (dBA).

Concurrently, a trail camera and a wildlife acoustic recorder (WAR) were deployed with the SM at each monitoring location to provide supplementary data for sound source identification. The equipment provided time-stamped videos and sound data, which were assessed for other environmental occurrences such as wildlife activity, human presence, vehicular traffic, or meteorological events which might influence the BSM results.

Monitoring Locations

Five monitoring stations were located within/near the boundaries of the Assessment Area associated with the proposed locations of the Facility and haul road (the areas where most constructional and operational sound will occur; Table 7.15; Drawing 7.2).

Table 7.15: Monitoring Locations

ID	Locations within the Assessment Area	Latitude Coordinates	Longitude Coordinates
SM1	Approximately 1 km north of the proposed Facility location	45.177292°N	61.622311°W
SM2	Approximately 250 m north of construction laydown	45.175434°N	61.631382°W
SM3	Near the eastern extent of the Assessment Area, near Facility	45.162938°N	61.62132°W
SM4	Near the proposed Facility location	45.166496°N	61.635703°W
SM5	Coastal extent of the Assessment Area, approximately 120 m from haul road	45.161678°N	61.64222°W

Timing & Duration

The BSM Program was completed between May 12 and 26, 2025. Monitoring data were collected for a targeted 72 hours per location (Table 7.16). Conditions such as surface type and ground cover were also noted, as these can lead to an increase or dampening of recorded sound levels.

Table 7.16: Monitoring Dates, Duration, and Corresponding Ground Conditions

Monitoring Information						Ground Conditions	
ID	Start Date (2025)	Start Time	Stop Date (2025)	Stop Time	Duration*	Surface Type (e.g., concrete)	Cover (e.g., snow)
SM1	May 12	13:45	May 15	11:53	70 hours	Organic	Vegetation
SM2	May 15	12:48	May 19	5:21	88 hours	Organic	Vegetation
SM3	May 15	15:25	May 19	5:27	84 hours	Organic	Vegetation
SM4	May 12	15:37	May 15	13:47	70 hours	Organic	Vegetation
SM5	May 23	14:34	May 26	13:15	70 hours	Gravel	Gravel/Vegetation

*Rounded to the nearest hour

Data Analysis

Raw baseline monitoring data were processed to enable comparison with NSECC permissible sound levels using measurements recorded under representative site conditions (i.e., wind speeds ≤10 m/s and precipitation < 0.5 mm/h) to establish a baseline for future reference).

The data were categorized based on weather conditions into two distinct groups:

1. Ideal Conditions: Defined as periods with low wind speeds (≤ 5 m/s) and precipitation less than 0.5 mm/h, representing conditions without steady precipitation, as per Guidelines for Environmental Noise Measurement and Assessment (NSECC, 2023).
2. Representative Site Conditions: Defined as periods with low wind speeds up to 10 m/s and precipitation less than 0.5 mm/h to capture typical on-site variability.

Sound levels were sorted by mean hourly sound level equivalents [$LAeq_{(1\ hour)}$] across the daytime, evening, and nighttime periods within the 72-hour monitoring duration at each location. The first and last hours of the recorded results were excluded from the analysis due to peaks in dBA associated with sound created during the deployment and collection of monitoring equipment. All values were rounded to the nearest whole number for clarity and comparison.

To assist in identifying the potential sources of elevated ambient sound, audio data from the WARs were reviewed in parallel with the sound level records. This allowed for spikes in sound levels to be attributed to specific acoustic events, such as bird calls, wind, or ocean waves. Trail camera footage was also examined to identify any wildlife activity or human presence near monitoring locations that may have contributed to ambient sound levels.

Weather Considerations

Local weather data were analyzed to determine if significant weather events may have affected the BSM results. A review of the local precipitation and wind data collected during the deployment period (May 12 to 26, 2025) was obtained from the Collegeville Auto meteorological station, located approximately 38 km northwest of the Assessment Area (Climate ID 8201001) and operated by ECCC-MSC (ECCC, 2025d). This location was selected as the closest ECCC-MSC weather station to the Assessment Area, with both precipitation and wind data recorded.

7.1.3.5 Results of Baseline Sound Monitoring

The Assessment Area is situated within an industrial resource zone; however, any nearby residential receptors are characterized as rural/residential with respect to sound emission guidance. Ambient sound within and near the Assessment Area is dominated by residential activities, vehicle traffic along nearby Highway 316 and secondary roads, the natural environment, and various other activities, with no industrial sources. Local roadways are travelled daily by vehicular traffic emitting varying sound levels, including transport trucks and motorcycles.

The results of BSM are summarized in Table 7.17. The highest mean $LAeq_{(1\ hour)}$ of 50 dBA was recorded during the daytime at SM5. The lowest mean $LAeq_{(1\ hour)}$ value of 34 dBA was recorded during the nighttime at SM1 and during both day and nighttime at SM2. Detailed sound monitoring data is provided in Appendix D.

Table 7.17: Mean $LAeq_{(1\ hour)}$ for Each Permissible Sound Level Time Period

ID	Evening (48 dBA)		Nighttime (40 dBA)		Daytime (53 dBA)	
	Ideal * (5 m/s)	Representative** (10 m/s)	Ideal* (5 m/s)	Representative** (10 m/s)	Ideal* (5 m/s)	Representative** (10 m/s)
SM1	36	--	34	--	41	48
SM2	--	38	--	34	38	34
SM3	--	**49**	--	**43**	--	39

ID	Evening (48 dBA)		Nighttime (40 dBA)		Daytime (53 dBA)	
	Ideal * (5 m/s)	Representative** (10 m/s)	Ideal* (5 m/s)	Representative** (10 m/s)	Ideal* (5 m/s)	Representative** (10 m/s)
SM4	37	--	37	--	38	43
SM5	**50**	--	**43**	--	42	--

*Low wind speeds (≤5 m/s) and precipitation less than 0.5 mm/h
**Low wind speeds up to 10 m/s and precipitation less than 0.5 mm/h

Comparing the results to the NSECC daytime (53 dBA), evening (48 dBA), and nighttime (40 dBA) permissible sound levels, the SM1, SM2, and SM4 locations remained below the applicable thresholds across all monitoring periods and under both ideal (≤ 5 m/s) and representative (up to 10 m/s) conditions.

At SM3, no ideal weather conditions were recorded. Daytime sound levels were below the limits of representative conditions; however, evening and nighttime sound levels exceeded the limits under representative conditions. Elevated evening and nighttime sound levels at SM3 were attributed to high bird activity in the area. The WAR, deployed alongside the SM equipment, recorded frequent and intense bird calls, which contributed to the elevated ambient sound levels during these periods.

At SM5, no representative weather conditions were present. Daytime sound levels remained below the threshold; however, evening and nighttime sound levels exceeded the recommended level under ideal conditions. The elevated baseline levels can primarily be attributed to the proximity of SM5 to the ocean shoreline, where continuous wave action generates naturally high ambient sound levels. The maximum $LAeq_{(1\ hour)}$ (dBA) was recorded during the evening, coinciding with tidal levels recorded at Goldboro during the monitoring duration, suggesting that high tides resulting in possibly loud ocean waves were the dominant source of sound at SM5 (ECCC, 2025e).

Weather Considerations

Weather data obtained from the Collegeville Auto Weather Station indicated no significant precipitation events (i.e., ≥ 25 mm) during the BSM Program. There were sustained winds [i.e., ≥ 29 km/h] during the May 15 to 26, 2025 monitoring period. Based on the hourly weather data collected, it is assumed that few to no significant weather events were recorded and hence did not influence BSM results (ECCC, 2025b).

Summary of Ambient Sound Levels

The results of the BSM study suggest that ambient sound levels within and near the Assessment Area generally fall below permissible sound level guidelines for rural areas (NSECC, 2023). Mean exceedances above recommended levels at two SM during the evening and nighttime monitoring periods were related to natural environmental activities including wave action and bird vocalizations. Existing sources of sound related to human activity primarily include vehicular traffic along local roadways.

7.1.3.6 Assessment Methodology

Anticipated sources and levels of sound associated with the Project were assessed to understand the potential effects on local receptors. The assessment of Project-related sound considers the construction and operational Project phases. Construction and operational sound related to the Project was assessed through a discussion of expected sound sources, a literature review of expected sound levels and a qualitative assessment of potential effects to human receptors and the application of guidelines.

Potential non-participating receptors (including sensitive receptors such as schools, daycares, and senior residences) located within 500 m of the assessment area were identified using GIS data from the Nova Scotia Geomatics Centre and aerial imagery, with supporting field data used where available (Drawing 3.1). As a conservative measure, no distinction was initially made between habitable dwellings and barns, sheds, or outbuildings.

Sound levels and related impacts from blasting activities are not included in this assessment as blasting requirements have not been confirmed. If blasting is determined to be required during construction, the Proponent will notify NSECC and apply for any required permits and approvals.

7.1.3.7 Sound Assessment Results

Construction Sound

During the site preparation and construction phases, sound will predominantly be generated through the operation of construction equipment and heavy machinery such as cranes, backhoes, excavators, dump trucks, graders, drilling units, and transportation vehicles. Construction activities are anticipated to occur year-round, commencing in 2028.Construction hours are expected to be primarily during the hours of 0700 and 2100; however activities may extend outside this period for specific activities. A summary of representative sources and anticipated sound levels produced during the Project's construction are provided in Table 7.18.

Table 7.18: Representative Sound Levels of Construction Equipment Required for the Project

Equipment	Sound Level Ranges (in dBA)
Concrete Truck/Pump	103-108[1]
Dozer	89-103[2]
Dump Truck	84-88[2]
Excavator	97-106[1]
Harvesting Equipment (log truck, manual faller, etc.)	85-103[3]
Loaders	77-106[4]
Pickup/Light Truck	95[5]
Drilling Units	91-107[6]
Man Lift/Bucket Machines	85[4]
Flatbed Truck	75[6]
Crane	78-103[2]

Equipment	Sound Level Ranges (in dBA)
Handheld Air Tools	115[1]
Compressor (drilling, pneumatic tools, etc.)	85-104[4]

Note that measurements shown are relevant to the decibel level ranges within close proximity (i.e., less than 15 m of distance) between a receptor and the associated piece of equipment.

Sources: [1](Transport Scotland, 2018)
[2](WorkSafe BC, 2019)
[3](WorkSafe BC, 2016)
[4](IHSAO, 2022)
[5](Oregon State Parks, n.d.)
[6](SCE, 2015; The Driller, 2005)

Overall, the range of decibels anticipated for the Project's construction activities are between 77 and 115 dBA (from a single piece of equipment within 15 m from the source).

Operational Sound

During the operational phase, sound will be generated at the Facility, along the haul road to/from the marine berth and offloading facility, during periodic maintenance along the freshwater pipelines, and from the operation of pumping stations at Meadow and/or Ocean Lake. External sources of sound at and near the Facility include transportation, biomass handling (including the use of mobile equipment and biomass receiving machinery), the operation of mechanical equipment, and components of the Facility itself. The Project is expected to be operational by 2031, with production occurring 24-hours per day, 365 days of the year. Table 7.19 outlines a range of operational sound emission sources associated with the Project and approximate sound levels for comparable facilities and equipment. Note that reported values are levels at the emission source; sound levels experienced by non-participating receptors will be lower as some equipment will be enclosed within structures/buildings, and sound will attenuate over distance. Sound level exposure to Project personnel working within the REP will meet Canadian Occupational Health and Safety guidelines (CCOHS, 2024).

Table 7.19: Representative Sound Levels of Equipment Required for the Project

Sound Emission Source	Sound Level at Source (dBA)
Biomass Conveyor	86-104[1]
Belt Dryer	85-112[2]
Air Coolers	119[3]
Air Cooled Condensers	111[3]
Compressors	104-131[3,4]
Cooling Water Tower	85[3]
Discharge Piping for Compressors	102* [3,4]
Glycol Chillers	100[4]
Hydrogen Electrolysers	90-101[3,5]
Elevated Flare	122[4]
Transformers (Substation)	108-112[3,4]

Sound Emission Source	Sound Level at Source (dBA)
Freshwater Pump	98** [6]
Mobile Equipment (Flatbed Truck)	75[7]
Mobile Equipment (Dump Truck)	84-88[8]

* Sound power levels for piping are shown on a per-metre basis

** Value adjusted to source level

Sources: [1] (Szczeszek et al., 2023)
[2] (Fraser, 2023)
[3] (Stantec, 2023)
[4] (Pattern Argentia Renewables, 2024)
[5] (Blohm & Dettner, 2023)
[6] (DEFRA, 2005; EBARA, 2025)
[7] (SCE, 2015)
[8] (WorkSafe BC, 2019)

The sound levels of equipment used during operations are expected to individually range from 70 to 131 dBA. Whereas some sources of sound will be nearly continuous during operations (e.g., utilities), others will be intermittent (such as mobile equipment).

7.1.3.8 Receptor Identification

Nine non-participating receptors are located within 500 m of the Assessment Area. Six of the receptors to the Project are located on the shores of Ocean Lake, within the Assessment Area (Drawing 3.1). Three additional receptors are within 500 m of the Project Footprint, near Highway 316, and 250 m to 760 m from the nearest piece of planned Project Infrastructure (haul road leading to the marine berth and offloading facility). None of these receptors are considered sensitive receptors (i.e., daycares, schools, senior residences). Table 7.20 summarizes the nearest distance between receptors and sources of construction and operational sound.

Table 7.20: Approximate Minimum Distance Between Non-Participating Receptors and Sources of Sound by Project Phase

Receptor	Nearest Project Feature	Minimum Distance to Construction Sound (m)	Minimum Distance to Operational Sound (m)
R1	Haul road to marine berth and offloading facility	435	760
R2	Haul road to marine berth and offloading facility	400	720
R3	Haul road to marine berth and offloading facility	50	250
R4	Ocean Lake pumping station and pipeline	2,730	2,730
R5	Ocean Lake pumping station and pipeline	2,310	2,310
R6	Ocean Lake pumping station and pipeline	830	830

Receptor	Nearest Project Feature	Minimum Distance to Construction Sound (m)	Minimum Distance to Operational Sound (m)
R7	Ocean Lake pumping station and pipeline	1,200	1,200
R8	Ocean Lake pumping station and pipeline	1,390	1,390
R9	Ocean Lake pumping station and pipeline	1,570	1,570

7.1.3.9 Effects Assessment

Project-Sound Interactions

Project activities will interact with the acoustic environment during all phases of the Project. Sound related to the decommissioning phase is not specifically addressed, as levels are expected to be comparable or less to those during construction (Table 7.21).

Table 7.21: Potential Project-Sound Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	X
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Water Pipeline and Roadway Construction	X
Facility Foundation Construction	X
Transportation of Facility Components	X
Facility Assembly	X
Utility Connections	X
Removal of Temporary Works and Site Restoration	X
Operations and Maintenance	
Commissioning	X
Handling of Biomass	X
Production of SAF and Other Products	X
Product Storage	X
Vegetation Management	X
Decommissioning and Rehabilitation	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for sound is the area anticipated to experience non-negligible sound produced by the Project, which is estimated to be a 500 m buffer around the Assessment Area (Drawing 7.2). The RAA is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for sound. The VC-specific definition for magnitude is provided for construction and operational sound as follows:

- Negligible: Sound levels from Project activities are expected to always be indiscernible at receptor locations.
- Low: Sound levels from Project activities are discernible at receptor locations but will be remain below regulatory thresholds.
- Moderate: Sound levels from Project activities are discernible at receptor locations, but may exceed regulatory thresholds during intermittent, high-impact activities.
- High: Sound levels from Project activities are expected to exceed regulatory thresholds at receptor locations during multiple activities (continuously).

Effects

The Facility will be in an industrial resource zone within a rural setting, where no sound-generating industrial activities are currently taking place. The BSM, which assessed baseline conditions within and near the Assessment Area, demonstrated that ambient sound is currently related to natural sources and vehicular traffic on local roadways. Although recorded sound levels exceeded provincial guidelines in some instances, exceedances were related to natural factors, and recorded sound levels were generally below recommended levels for rural environments. The construction and operation of the Project will require the use of industrial machinery and equipment that will increase sound levels within the LAA.

Nine non-participating receptors were identified within the LAA, none of which are considered sensitive receptors. Receptors fall in two groups based on their general locations: those located along Highway 316 near the haul road to the marine berth and offloading facility, and those on the shores of Ocean Lake. It is not possible to determine the precise levels of Project-related sound at this stage of the Project's design; however, a qualitative assessment is possible based on the representative range of sound levels described in Section 10.2.5.

Highway 316 Receptors

Three non-participating receptors were identified within the LAA along Highway 316. Receptors on Highway 316 are the closest receptors to the Project and may experience intermittent sound associated with construction, and intermittent and continuous sound associated with operation.

Project-related sound levels will likely be highest for R3, located approximately 50 m from the Project Footprint and 250 m from the nearest planned infrastructure (haul road). Sound levels associated with the construction of the haul road will be limited to the 0700 to 2100 window for construction sound recommended by MODG (Table 7.14). Construction related sound is considered a temporary and intermittent source of noise generated by the Project. Activities producing higher levels of sound, such as handheld air tools, will be less frequent and last for a very short duration.

During operations, sources of sound associated with the haul road will primarily be mobile equipment moving between the marine berth and offloading facility and Facility. Although the majority of operational deliveries will likely occur during daytime hours, it is possible that some occur throughout the evening and night. Sounds levels relating to the operation of the Facility are difficult to quantify at this stage of the Project's design as component manufacturers have not yet been selected and detailed noise specifications are unavailable. Comparisons to analogous facilities are complicated by the fact that few SAF Facilities currently exist. Noise modelling completed for the Bear Head LNG Project in Point Tupper, NS, which includes a green hydrogen and ammonia production facility, found that operational sound levels were expected to fall to 45 dBA within approximately 375 m to 1 km of the project area (Stantec, 2023). Similarly, a green hydrogen facility in the United Kingdom found the expected 40 dBA sound contour to extend to 330 m from the noisiest location of the study area. Based on the distance of receptors to the Facility (> 390 m), it is likely that the sound from the construction and operation of the Project will be perceptible to receptors along Highway 316. However, the use of noise mitigations within design, including sound suppression technology and enclosing components within warehouses, and scheduling operational activities strategically, will ensure that sound levels at nearby receptors are within regulatory thresholds.

Ocean Lake Receptors

Receptors located on the shores of Ocean Lake (R4-R9) are > 6 km from the nearest infrastructure relating to the Facility and material handling, with the closest planned infrastructure being the freshwater pump station and associated pipelines. It is not expected that construction or operational sound from the Facility will be noticeable to receptors around Ocean Lake due to the large separation distance between the Lake and Facility. It is possible that intermittent sound associated with the construction and maintenance of the freshwater pumping station and pipeline may be intermittently discernable to receptors. However, sound levels are likely to be low due to sound attenuation (> 830 m to nearest receptor), the sound levels of equipment expected to be used (Tables 7.18 and 7.19), and the enclosure of the freshwater pump within a structure.

Mitigation

To minimize construction and operational sound and the potential to disturb receptors during construction and operation, the following general mitigation/protective measures will be implemented:

- Consider the use sound suppressants (e.g., mufflers) on vehicles/equipment.
- Limit vehicle idling.
- Conduct construction activities within the recommended daytime (0700 to 2100) hours, as much as possible.
- Limit the use of operational mobile equipment during evening and night (1900 to 0700) hours when outside of the enclosed Facility, as much as possible.
- Consider additional sound mitigation measures (e.g., a constructed sound barrier) if concerns persist.

Monitoring

The Project will develop a complaint response protocol, which will consider concerns related to sound and outline a process to investigate complaints. Mitigation to resolve complaints, if determined to be necessary, will be completed on a case-by-case basis in consultation with the affected landowner.

Conclusion

After mitigations, residual effects on sound are characterized as follows for the operational phase:

- Magnitude: Moderate magnitude, as sound levels from Project activities are anticipated to remain below regulatory thresholds except during intermittent, high-impact activities during construction.
- Geographic Extent: Within the LAA.
- Frequency: Occur continuously and intermittently during the Project lifespan.
- Duration: Medium duration as the effects end after the decommissioning phase.
- Reversibility: Reversible as the residual effects would be reversed after the Project is completed.
- Significance: Not significant.

7.2 Geophysical Environment

7.2.1 Overview

The assessment of the geophysical environment included a review of topography, surficial geology, bedrock geology, hydrogeology (groundwater), and any related natural or artificial hazards, as well as a field assessment for existing AMOs. Given the nature of the existing environment, an effects assessment was completed to determine how the Project will interact with the geophysical environment.

7.2.2 Regulatory Context

Legislation relevant to the geophysical environment of the Assessment Area includes:

- Sulphide Bearing Material Disposal Regulations, N.S. Reg. 57/1995
- *Environment Act*, S.N.S. 1994-95, c. 1
- Contaminated Sites Regulations, N.S. Reg. 36/2020

If blasting is required for construction, groundwater wells within 800 m must undergo an assessment in accordance with NSECC's Procedure for Conducting a Pre-Blast Survey (1993).

7.2.3 Assessment Methodology

The assessment was completed through a review of the following resources:

- Aerial imagery and topography
- Ecological Land Classification for Nova Scotia (Neily et al., 2017)
- Nova Scotia Geoscience Atlas (NSNR, 2021f)
- Mineral Resource Land-Use Atlas (NSNR, 2021e)
- Nova Scotia Groundwater Atlas (NSNR, 2024b)
- Karst Risk Map (NSNR, 2019)
- Well Logs Database (NSECC, 2020a)
- Nova Scotia Pumping Test Database (NSNR, 2022b)
- Nova Scotia Groundwater Observation Well Network (NSECC, 2015a)
- Potential for Radon in Indoor Air (NSNR, 2009)
- AMO field assessments completed by Strum in 2024
- Phase I and II Environmental Site Assessments for the Goldboro LNG Project (Wood, 2018a, 2018b)
- Risk Management Plan for the Goldboro LNG Project (Wood, 2021)
- Phase I Environmental Site Assessment PID 35094770 and 35122068, Goldboro, Nova Scotia (WSP, 2024)

7.2.4 Assessment Results

Historical Mining Areas and Tailings

Historic mining activities and associated contaminants are widely spread across the site (Section 3.3.1.2) (Drawing 7.3). Phase I and II Environmental Site Assessments were conducted in 2018 for the proposed Goldboro LNG Project (Wood, 2018a, 2018b). The Phase I and II Environmental Site Assessments consisted of:

- Reviewing information pertaining to the site.
- Interviewing people knowledgeable about the site.
- Completing a detailed checklist during a site inspection.
- Collecting soil, sediment, groundwater, and surface water samples for the analysis of the identified contaminants of concern in the Phase I Environmental Site Assessment.

The Phase I Environmental Site Assessment identified arsenic, mercury, cyanide, and modified Total Petroleum Hydrocarbons (mTPH) as the primary contaminants of potential concern at the Project, largely due to the extent of historic gold mining activities. APECs were determined through a review of historical documentation and confirmed by on-site inspection during the Phase I Environmental Site Assessment. These APECs include locations where mining operations are known or suspected to have occurred, particularly areas exhibiting physical evidence of tailings deposits and/or AMOs, which indicate potential sources of contamination. Six APECs were delineated, consisting of APEC 2 through to APEC 7 (Drawing 7.3). Note that APEC 1 was identified in previous reports and is located on the Red Head Peninsula in Sculpin Cove, which was outside of the site boundaries for the Goldboro LNG Project and it was not

considered further or mapped (Wood, 2018a). However, it is within the Project's Assessment Area (Drawing 7.3). The updated Phase 1 Site Assessment completed by WSP in 2024 concluded that the six APECs identified by Wood (Wood, 2018a, 2018b) remain APECs and areas of environmental concern.

The Phase II Environmental Site Assessment (Wood, 2018b) investigation identified environmental impacts from historical gold mining activities on the site. These included elevated concentrations of arsenic, mercury, and mTPH exceeding applicable NS Tier I EQS criteria and background levels in the former mining areas, tailing disposal areas (Drawing 7.3), and/or in downstream drainage areas.

As part of the Phase II Environmental Site Assessment (Wood, 2018a), 169 soil samples were collected from 138 sample locations and analyzed for metals (including mercury), cyanide, methylmercury, and/or petroleum hydrocarbons. Soil samples reported arsenic concentrations that exceed applicable NS Tier I EQS criteria. The concentrations of petroleum hydrocarbons, cyanide, and all other metals parameters either complied with applicable NS Tier I EQS criteria or were within the range of regional background levels (e.g., iron and manganese). Of note, elevated arsenic concentrations were also reported in samples collected on neighbouring properties (Drawing 7.3). The Phase II Environmental Site Assessment (Wood, 2018a), did not specifically assess for ARD; however, the reported did note that the site lacks the classic signs of ARD. In addition, six groundwater well pairs (shallow and deep) were sampled for general chemistry and dissolved metals (including mercury), cyanide, and petroleum hydrocarbons. On-site groundwater samples reported arsenic concentrations that exceed the applicable NS Tier I EQS criteria for the site. The reported concentrations of hydrocarbons, cyanide, and all other metals complied with applicable criteria.

Topography

The Assessment Area lies within the Eastern Interior Ecodistrict to the northwest (440) and the Eastern Shore (820) Ecodistrict to the south and east (Drawing 7.1) (Neily et al., 2017). The Eastern Interior Ecodistrict is one of the largest Ecodistricts in the province, encompassing over 450,000 ha of land. The south and eastern portions of the Assessment Area are located within the Eastern Shore Ecodistrict, which is a thin section of land that borders the Atlantic Coast from the Chebucto peninsula in Halifax up to the Chedabucto peninsula in Guysborough. Glacial deposits overlie both Ecodistricts and drumlins, which are found throughout, and help shape the topography.

Within the Assessment Area, the elevation generally decreases from the inland region in the northwest to the coast, extending southward and southeastward. The highest elevation observed across the Assessment Area is approximately 97 m above sea level (masl) (along the proposed freshwater pipeline routes) and decreases to near sea level on the coast. However, several prominent ridgelines can be observed across the Assessment Area, with regional lows in between them where watercourses and wetlands tend to accumulate.

The Assessment Area is located within a "Low-Risk" area for encountering karst topography and/or naturally occurring sinkholes, according to the Karst Risk Map (Drawing 7.4) (NSNR, 2019).

Surficial Geology

Surficial geology within the Assessment Area consists of a Quaternary ground moraine and streamlined drift, creating a stony till plain. The ground moraine and streamlined drifts are accumulations of unconsolidated sediment, ranging in thickness from 2 m to 20 m, and generally provide rapid drainage. These features were formed through the deposition of sediment (derived from local bedrock sources) at the base of melting ice sheets. The other surficial geology encountered on site is located along the Meadow Lake freshwater pipeline corridor, which consists of organic deposits. These are generally wetlands of various types, such as bogs, fens, or swamps (Drawing 7.5) (Stea et al., 1992).

Bedrock Geology

The geological history of Goldboro is complex, with underlying fault blocks consisting of Cambrian to Ordovician metamorphosed sediments. These sediments were folded and faulted throughout the Acadian orogeny (Sangster & Smith, 2007).

Within the Assessment Area, the bedrock geology is the Goldenville and Halifax Formations of the Meguma Group. The Goldenville Formation comprises metamorphosed sandstone turbidites interbedded with some slate and is host to most of the gold deposits in NS (Drawing 7.6) (NSNR, 2015). The freshwater pipelines crosscut two sections of the Halifax Formation slates. These slates (mostly black and grey slates containing pyrite, pyrrhotite, and arsenopyrite) comprise metamorphosed siltstone and minor sandstone turbidites (Keppie, 2000). The breakdown of pyrite (and other sulphide-bearing minerals), when disturbed/ exposed at the surface, can lead to ARD. According to the Acid Rock Drainage Potential map (NSNR, 2021b), the ARD potential is only mapped for bedrock in southwestern Nova Scotia; however, based on Strum’s experience, all pyritic slate of the Halifax Formation has a high potential for producing ARD, and Goldenville Formation bedrock that is located near the boundary with Halifax Formation bedrock can also have a high potential of producing ARD.

Phase I and II Environmental Site Assessments and Risk Management Plan completed by Wood Environment & Infrastructure Solutions for the Goldboro LNG Project did not assess for ARD specifically; however, the following was noted in the reports:

- "The potential for acid rock drainage and metal leaching (ARD/ML) has not been assessed, however previous sampling of surface water, sediment, and tailings material have indicated that the presence of arsenic and mercury on-site and adjacent to the site are elevated above the NS Contaminated Sites Regulations Tier 1 EQS levels" (Wood, 2018a).

- "The potential for acid rock drainage/metal leaching (ARD/ML) has not been assessed as part of this Phase II, however previous sampling has indicated that the sulphur content is below the 0.4% Sulphide Bearing Material Disposal Regulations" (Wood, 2018b).

- "The lack of classic signs of acid rock drainage at the site (no low pH drainage in Unnamed Stream) or obvious rusty and heavily weathered waste rock, even after more than 100 years of inferred exposure for some materials, suggest a generally low potential for ARD. However, sulphide mineralization is present at the site as evidenced by association of host rocks related to gold mining activities. Therefore, localized zones of potentially acid generating rock produced during blasting cannot be ruled out" (as cited in Wood, 2021).

According to the Mineral Resource Land-Use Atlas, the Halifax Formation slates crosscut by the pipeline are sulphide-bearing slates (Drawing 7.7) (NSNR, 2021e).

In Nova Scotia, the Sulphide Bearing Material Disposal Regulations apply to any sulphide-bearing bedrock that may be disturbed by site development activities. If testing of the bedrock confirms that it is classified as a sulphide-bearing material under the Regulations, any disturbed bedrock must be disposed of or managed in accordance with the Regulations. This could include disposal of the bedrock at a licensed off-site facility or obtaining a permit from NSECC to manage the disturbed bedrock on site in a containment area.

Furthermore, according to the Potential for Radon in Indoor Air risk mapping, the Assessment Area is largely in an area considered ‘Low-Risk’, with a few smaller areas of ‘Medium-Risk’ (Drawing 7.8) along the freshwater pipeline (NSNR, 2009). Elevated radon concentrations are typically only considered a potential human health risk in residential or institutional buildings where people may spend significant time in the lower levels of a building where radon gas concentrations may be elevated (e.g., a basement in bedrock). Given the planned industrial use of the site, it is not expected that radon gas represents a concern for the Project.

Groundwater Quality and Quantity

The Assessment Area is underlain by metamorphic bedrock, which comprises the metamorphic groundwater region (NSNR, 2024b). Wells located in metamorphic rock have lower dissolved solids, hardness, and well water yields as a result of groundwater only flowing through fractures in the rock. Naturally occurring trace metals, such as iron, arsenic, and manganese, can be found in all groundwater regions; however, they are more commonly associated with plutonic and metamorphic groundwater regions (Kennedy & Drage, 2009).

According to groundwater risk mapping for bedrock aquifers, the Assessment Area is primarily located in a ‘High-Risk’ zone for arsenic, with ‘Medium-Risk’ along sections of the freshwater pipeline corridor (Drawing 7.9). Per the Phase II Environmental Site Assessment report completed for the Goldboro LNG Project (Wood, 2018b), six well pairs (shallow and deep) were sampled (11 samples) for general chemistry and dissolved metals (Including mercury), cyanide, and petroleum hydrocarbons. On-site groundwater samples reported arsenic

concentrations that exceed the applicable NS Tier I EQS criteria for the site. The reported concentrations of hydrocarbons, cyanide, and all other metals complied with applicable criteria. In addition, the Assessment Area is within a 'High-Risk' zone for manganese (Drawing 7.10), and a 'Low-Risk' zone for uranium (Drawing 7.11) (Kennedy, 2021; Kennedy & Drage, 2020, 2017).

Groundwater Wells

Water supplies near the Assessment Area are generally derived from individually drilled wells. According to the Phase II Environmental Site Assessment Report for the Goldboro LNG Project (Wood, 2018b), the interpreted potentiometric surface, based on groundwater monitoring wells, indicates that groundwater flows radially from the north to the south and southwest towards the coast.

Using the NSECC Well Logs Database (2020a), five water wells were identified within 800 m of the Assessment Area (IDs: 30324, 80314, 100051, 880366, and 981181) (Drawing 7.12). All were drilled into bedrock; see Appendix E for a summary of well logs. Any well logs with spatial reference accuracy exceeding 1,000 m were removed from this analysis. A summary of well statistics is provided in Table 7.22.

Table 7.22: Summary of Water Well Records within 800 m of the Assessment Area

	Drilled Date (year)	Well Depth (m)	Bedrock Depth (m)	Static (m)	Yield (Lpm)	Elevation (masl)
Minimum	1988	36.5	3.7	0.9	2.3	15.0
Maximum	2010	91.4	6.7	9.1	18.2	58.0
Average	n/a	78.3	4.9	5.6	5.3*	46.0

Adapted from the Well Logs Database (NSECC, 2020a).
* indicates geometric mean.

Based on short-term driller's estimates for these wells (Appendix E), well depth varied between 36.5 m and 91.4 m, with an average depth of approximately 78.3 m. Static water levels were on average at 5.6 m below the measure point (usually grade, or top of casing), with well yields averaging (geometric mean) 5.3 litres per minute (Lpm). These measurements represent very short-term yields estimated by the driller at the completion of well construction (NSECC, 2020a, 2022a). Of the five residential wells identified within 800 m of the Assessment Area, none are located within the Assessment Area.

It should be noted that not all wells are reported to NSECC, and therefore, do not appear in the Well Logs Database (2020). For example, a well record for the nearest receptor is not provided in the Well Logs Database (2020). The nearest receptor to the Project Footprint is located at 12486 Marine Drive (Highway 316), Goldboro, approximately 50 m from the Project Footprint, and 250 m from the nearest piece of proposed Project Infrastructure. This receptor is assumed to have a drilled well along with all other 14 receptors located within 800 m of the Assessment Area and the 5 receptors located within the Assessment Area around Ocean Lake.

A door-to-door survey within 1 km of the Assessment Area was previously conducted by AMEC Earth and Environmental (AMEC, 2013), which identified up to 40 wells in the community of Goldboro, most of which were dug wells. Given that municipal services do not supply potable drinking water to residences in the area, it's likely that all residences in the region are supplied by potable groundwater wells (dug or drilled).

The NSNR Pumping Test Database (2022) provides longer-term yields for select wells throughout the province, including the nearest pumping test well in Isaacs Harbour, 1.4 km west of the Assessment Area (Drawing 7.12). Constructed in 1974, this test indicates a long-term safe yield (Q_{20}) of 18.2 Lpm and an apparent transmissivity of 0.7 m^2/day.

NSECC maintains the Nova Scotia Groundwater Observation Well Network (2015a). The nearest provincial observation well to the Assessment Area is approximately 26 km northwest in Stillwater (#055). This well was drilled to a depth of 36.0 m through greywacke bedrock of the Goldenville Formation. Monitoring at this well location began in 1987 and is ongoing. In 2024, the average annual water elevation was 24.97 m above sea level (masl), and the annual water level fluctuation was approximately 1.31 m. The average depth to water in this well was 1.9 m below the top of casing in 2023.

Previous geotechnical investigations completed by Golder Associates (Golder Associates, 2014b) found a relatively shallow groundwater table, with an average depth of 2.19 m below the ground surface (ranging from 0.61 m to 9.28 m below the ground surface); groundwater elevations varied from 0.83 masl to 47.58 masl, which tended to be closer to the surface near watercourses, shoreline, and depressions, and deeper on higher ground.

Abandoned Mine Openings

AMOs are found throughout the Assessment Area, as Goldboro is a historic gold mining district. These AMOs are associated with former mining operations and are often expressed at the surface as vertical shafts or horizontal tunnels (NSNR, 1995). Many of these AMOs have been located and filled to reduce the risk of accidental injury; however, additional AMOs may be unidentified. Furthermore, of the filled AMOs, many are currently expressed as shallow pits or ponds that can pose a hazard to people.

The province and other consultants have assessed the extent of AMOs across the mining district, including within the Assessment Area. As many as 291 AMOs have been identified within the Assessment Area based on a review of the AMO Database (NSNR, 2024a), previous field surveys by Golder Associates and a field investigation completed by Strum in July 2024 (Drawing 3.2). AMOs that were located during Strum field surveys were flagged off to improve their visibility from 'on-foot', and a global positioning system (GPS) location point was taken along with an assigned hazard rating. The hazard rating was determined as either low or high. A low hazard rating was assigned if the AMO is visible, shallow (low fall risk), and/or does not contain hazards within (e.g., low drowning risk). A high hazard rating was given if the AMO was not visible, deep (high fall risk), and/or contained hazards within (e.g., a drowning risk). A full list of the AMOs identified during field surveys can be found in Appendix F.

7.2.5 Effects Assessment

Project-Geophysical Interactions

Project activities will primarily interact with the geophysical environment during site preparation, construction, and decommissioning; however, the geophysical environment may also be potentially impacted during the Project's operations and maintenance. (Table 7.23).

Table 7.23: Potential Project-Geophysical Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Water Pipeline and Roadway Construction	X
Facility Foundation Construction	X
Transportation of Facility Components	-
Facility Assembly	-
Utility Connections	-
Removal of Temporary Works and Site Restoration	X
Operations and Maintenance	
Commissioning	-
Handling of Biomass	-
Production of SAF and Other Products	-
Product Storage	-
Vegetation Management	-
Decommissioning and Rehabilitation	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for the geophysical environment is the Assessment Area. The RAA is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply to the geophysical environment. The VC-specific definition for magnitude is as follows:

- Negligible: No expected changes to local topography or geology; no anticipated impacts to groundwater quality/quantity.
- Low: Changes to local topography/geology are possible but not anticipated as no geologic hazards are present within the Assessment Area; impacts to groundwater quality/quantity are not anticipated.
- Moderate: Changes to local topography/geology are possible as geologic hazards exist within proximity to the Assessment Area but can be mitigated with routine measures;

impacts to groundwater quality/quantity may occur due to on-site contamination but risks can be appropriately mitigated.
- High: Changes to local topography or geology are anticipated due to the presence of geologic hazards within the Assessment Area that cannot be mitigated with routine measures; impacts to groundwater quality/quantity are anticipated if blasting is required.

Effects

The geophysical environment will be disturbed within the Assessment Area during both the site preparation and construction phases, as well as during the infrastructure removal and site decommissioning phases. During these phases, potential impacts related to the geologic environment are primarily due to the potential presence and subsequent disturbance of geologic hazards, including:

- Sulphide-bearing (i.e., ARD generating) bedrock
- Radon
- Arsenic- and/or manganese-containing bedrock
- Groundwater Quality and Quantity
- Contaminated materials
- AMOs

In Nova Scotia, several bedrock formations contain acid-generating rock (sulphide minerals such as pyrite and pyrrhotite) that, when disturbed, can produce ARD. ARD occurs when sulphide-bearing rocks are disrupted and exposed to air or water, producing sulphuric acid and metal oxides, which can be mobilized/leached through freshwater systems (NSNR, 2021a). Based on provincial risk mapping, sulphide-bearing slates can be found along the freshwater pipeline routes (NSNR, 2021e). Previous sampling (Wood, 2018b) has indicated that the sulphur content is below the 0.4% Sulphide Bearing Material Disposal Regulations (N.S. Reg. 57/1995); however, the presence/absence of sulphide-bearing material and the likelihood of ARD will be confirmed following the results of the geotechnical investigation.

Radon potential mapping indicates that the majority of the Assessment Area falls within a ‘Low-Risk' zone, with a few ‘Medium-Risk’ zones identified for radon in indoor air (NSNR, 2009). With shallow foundations, there are limited indoor air pathways for radon gas associated with the Project. Given that indoor air guidelines for radon are not typically applied to industrial buildings, and that radon venting will be implemented in the foundation design, radon gas is not considered a risk for indoor inhalation. Additionally, radon gas is not considered a risk for outdoor inhalation.

Construction activities, primarily blasting (if required), can impact the quality and quantity of the surrounding groundwater supply depending on the proximity to drinking water wells and the extent of disturbance caused by construction activities. Construction activities may:

- Fracture bedrock, creating new pathways for groundwater to move.
    - Blasting and excavation disturb soils and fractured bedrock, potentially mobilizing buried contaminants.
    - Vibrations and pressure changes can dislodge pollutants.
- Alter natural groundwater flow patterns, potentially draining aquifers or redirecting flow.
    - Blasting may alter local hydrogeological flow regimes, resulting in groundwater draining from or flowing towards existing wells.
- Reduce/increase groundwater recharge.
    - Grading removes protective soil layers or compacts soil, reducing its filtering capacity.
    - Surface contaminants may infiltrate the groundwater more easily.

Whether naturally occurring or resulting from historical activities, disturbance of tailings, soil and/or bedrock containing elevated concentrations of arsenic, manganese, mercury, uranium and/or other contaminants can mobilize these contaminants within groundwater and degrade the quality of nearby groundwater wells. Risk mapping shows the Assessment Area is situated in a region that has a ‘High-Risk’ and ‘Medium-Risk’ for arsenic (Drawing 7.9), ‘High-Risk’ for manganese (Drawing 7.10) and ‘Low-Risk’ for uranium and in bedrock wells (Drawing 7.11) (Kennedy, 2021; Kennedy & Drage, 2020, 2017). Additionally, the Assessment Area contains historical mine tailings with elevated concentrations of arsenic, mercury, and petroleum hydrocarbons. The soil and groundwater samples collected across the site and neighbouring properties (Drawing 7.3) contained elevated arsenic concentrations that exceed applicable NS Tier I EQS criteria; soil and groundwater concentrations of hydrocarbons, cyanide, and all other metals complied with applicable criteria and/or were within the range of regional background levels.

To monitor potential impacts on groundwater quality and quantity from blasting activities, wells located within 800 m of blasting activities require monitoring, as per NSECC’s Procedure for Conducting a Pre-Blast Survey (NSECC, 1993). The desktop review identified the potential for 14 residential wells within 800 of the Assessment Area, as well as 5 within the Assessment Area around Ocean Lake. Blasting and pre-blast survey requirements will be confirmed and assessed further during the Project’s final engineering design which will identify the need for blasting. Although there are five assumed residential wells within the Assessment Area, they are all located along the perimeter of Ocean Lake. One of these wells is within 800 of the Project Footprint, however it is unlikely that blasting would be completed along that portion of the Project Footprint (pipeline and pumphouse).

The closest groundwater well to the Project Infrastructure is located approximately 252 m away (R3, Drawing 7.12). While dependent on bedrock characteristics (i.e., hydraulic conductivity), contaminant transport can exceed 800 m in some instances (Ya et al., 2019). Given that most of the Assessment Area is part of the Goldenville Formation, groundwater flow is typically dependent on fracture flow and exhibits significantly higher concentrations of arsenic. Additionally, arsenic exceedances were reported in soil samples beyond the Assessment Area, which indicates that groundwater wells in the local area likely already contain elevated arsenic concentrations.

Lastly, the presence of AMOs within the Assessment Area is considered a geologic hazard as these features can affect groundwater and geologic stability. AMOs pose risks to groundwater as these features can introduce contamination (both at surface and subsurface) and also act as conduits for contamination migration. In addition, AMOs (and associated underground structures) may pose risks to infrastructure development as a result of sudden collapse and/or subsidence. Triggers for sudden collapse and/or subsidence are associated with degradation of the AMO along with disturbance during construction activities such as blasting and additional loading (from infrastructure) (City of Nanaimo, 2024). AMOs and associated risks to the development of the Project will be further characterized as part of the Project's geotechnical investigations.

Mitigation

To manage the legacy contamination from historical mining activities, the Risk Management Plan (Wood, 2021) for the Goldboro LNG Project will be updated to reflect the current state of the Assessment Area and the proposed developed activities to be undertaken. Emphasis will be on implementing risk management measures prior to and during the construction of the Facility. Based on the current design and engineering, remediation strategies will include:

- Ensuring erosion and sedimentation controls are installed prior to commencement to avoid contaminants being transported off-site.
    - Installation of surface water management system will be completed prior to commencement to ensure any surface water runoff is captured and treated (i.e., sediment removal) prior to discharge.
    - The goal will be to divert off-site water away from the active areas, and manage on-site water through the surface water management system and effective treatment (i.e., sediment ponds).
    - Silt fencing will be placed on the downstream slope of temporary soil stockpiles. Any stockpiles of impacted materials will be covered with a temporary barrier (e.g., tarps or low permeability clay).
- Ensuring the least amount of excavation is occurring, and rather focusing on raising the Project Footprint to the desired grades where possible.
    - The grading plan is focused on infilling rather than cutting.
    - Avoiding excavation of contaminated soils will reduce the risk of mobilizing and resuspending contaminants.
- Encapsulating as much of the contaminated soils as possible with appropriate barrier materials such as concrete infrastructure foundations and asphalt parking lots. Any remaining excavated material will be sent to an approved facility for disposal.
- Encapsulating historical mine tailings to prevent exposure.
- Grade historically deposited waste rock materials into managed areas and placed them under an approved, low-permeability cover to restrict infiltration.
- Conduct additional sampling and characterization of geological materials if potential unidentified mining tailings are uncovered during the geotechnical investigation.
    - Avoid disturbing tailings materials (where feasible) in the final engineering design.

  - If tailings materials are required to be moved, these should be placed in engineered containment areas with approved low-permeability barriers to limit the movement of contaminants.

Based on these risk management strategies, the Project was designed to minimize the impact on the surrounding environment and use existing infrastructure wherever possible. The following general mitigation measures will be implemented to minimize impacts on the geologic environment:

- Should blasting be required, it will be completed in accordance with provincial legislation and subject to the terms and conditions of applicable permits.
  - Conduct pre-blast surveys for wells within 800 m of blasting activities.
  - Ensure all blasts are conducted and monitored by certified professionals.
  - Ensure all necessary protective measures are implemented in advance of blasting activities.
  - Notify landowners in advance of any blasting activities.
  - Recover and revegetate exposed soils or bedrock as required to minimize any exposure following blasting.
- Include specific mitigation measures for sulphide-bearing materials in the EMP, if identified through pre-construction geotechnical surveys.
- Ensure rock removal in known areas of elevated sulphide potential will conform to the Sulphide Bearing Material Disposal Regulations, N.S. Reg. 57/1995 and in consultation with relevant regulatory departments.
- Place unweathered rock from blasting as fill in AMOs below the water table.
- Install erosion and sedimentation control measures prior to excavation activities and inspect controls on a regular basis.
- Remove temporary erosion and sedimentation controls once backfilled material has stabilized. Attention will be paid during site decommissioning to ensure areas will promote wildlife return to the area, to the extent possible.
- Flag any non-secured AMO and cap its opening.
- Place signage to warn of the presence of AMOs where AMOs have been identified.

Monitoring

A Groundwater Monitoring Plan will be developed as part of the EMP and the Risk Management Plan, which will include baseline monitoring prior to commencement.

If geological hazards (e.g., ARD, additional areas of mining tailings) are identified and required to be disturbed within the Assessment Area, monitoring requirements will be further detailed in the Project's EMP.

If blasting activities are required (to be confirmed during geotechnical investigations), groundwater wells within 800 m of blasting activities will be monitored as per the Procedure for Conducting a Pre-Blast Survey (NSECC, 1993).

Conclusion

After mitigations, residual effects on the geophysical environment are characterized as follows:

- Magnitude: Moderate magnitude as there are geologic hazards within the vicinity and historical contamination. Additionally, there are wells location within 800 m of the Assessment Area (the LAA) that could be impacted by blasting activities, if necessary. However, risks can be appropriately mitigated.
- Geographic Extent: Within the LAA.
- Frequency: Intermittent, as disturbance of the geophysical environment will only occur intermittently during the construction or operational phase.
- Duration: Medium-term, as although the residual effects are expected to be as a result of construction activities, monitoring may extend into the operation phase.
- Reversibility: Partially reversible.
- Significance: Not significant.

7.3 Aquatic Environment

The assessment of the aquatic environment included assessment of both i) waterbodies and watercourses (Section 7.3.1) and ii) fish and fish habitat (Section 7.3.2). These assessments were conducted to determine baseline conditions within the Assessment Area to inform the Project's design.

7.3.1 Waterbodies and Watercourses

7.3.1.1 Overview

The waterbodies and watercourses assessment was completed using the following approach:

- Complete a desktop review to identify watercourses and waterbodies within the Assessment Area (Drawing 7.13).
- Traverse the entirety of the Assessment Area to ground truth surface water features and provide characterization of any identified features (Drawing 2.3).
- Complete a chemistry review to establish pre-existing levels of potential contaminants of concern (PCOCs) in watercourses and waterbodies in the Assessment Area, where information is available.
- Use the information collected to inform Project design (e.g., avoid/minimize impacts to waterbodies and watercourses) to develop a Project Footprint.
- Use the information collected to inform mitigation and management practices.

In addition to the items listed above, a hydrological assessment is currently underway at two potential water sources (Meadow Lake and Ocean Lake) to determine the allowable water withdrawal rates from freshwater sources in proximity to the REP.

7.3.1.2 Regulatory Context

Under the provincial *Environment Act,* S.N.S 1994-95, c. 1, NSECC has the authority to promote the sustainable management of water resources in Nova Scotia. More specifically, as

per section 5A of the Activities Designation Regulations, N.S. Reg. 47/95, the alteration of a watercourse or the flow of water within a watercourse is an activity that requires an approval from NSECC, or a notification to NSECC if the work will be completed in accordance with the Nova Scotia Watercourse Alterations Standards (NSECC, 2015c).

The *Environment Act,* S.N.S. 1994-95, c. 1, s. 3be defines a watercourse as:

(i) the bed and shore of every river, stream, lake, creek, pond, spring, lagoon or other natural body of water, and the water therein, within the jurisdiction of the Province, whether it contains water or not, and
(ii) all groundwater

Using this guidance, watercourses were identified and described throughout the Assessment Area to support the description of fish habitat, and effects to regulated watercourses which may require provincial approval. While groundwater is included in the regulatory definition of a watercourse under the *Environment Act,* S.N.S. 1994-95, c. 1, this section focuses on surface water features in the context of fish habitat provision. In addition to the above-mentioned definition, the watercourse parameters listed in the Guide to Altering Watercourses (NSECC, 2015b) were used to aid in determining the presence of a watercourse.

Federally, the *Fisheries Act* (Canada, 1985d), SARA and *Canadian Navigable Waters Act* (Canada, 1985b) will impact the management of the waterbodies and watercourses within the Project Footprint. DFO has the responsibility to oversee and enforce the protection of fish and fish habitat through the *Fisheries Act* (Canada, 1985d), and SARA. Further context on the federal legislation governing the conservation and protection of fish and fish habitat in Canada is outlined in Section 7.3.2.2.

The *Canadian Navigable Waters Act* (Canada, 1985b) gives Transport Canada the authority to regulate interferences with the public's right to navigable waters, including approving and setting the terms and conditions for works within navigable waterways.

7.3.1.3 Desktop Review Methodology

The desktop review was conducted to identify mapped and potential waterbodies and watercourses within the Assessment Area, using the following sources:

- CanVec Database – Hydrographic Features (NRCan, 2023b)
- NS Topographic Database – Water Features (GeoNOVA, 2025)
- Wet Areas Mapping (WAM) (NSECC, 2022b)
- NS 1:10,000 Primary Watersheds (NSECC, 2011a)
- 1:10,000 Secondary and Shore Direct Watershed of Nova Scotia (NSECC, 2011b)

Desktop-identified watercourses, along with WAM and predicted flow data, were provided to field staff to guide the identification and assessment of watercourses within the Assessment Area.

7.3.1.4 Chemistry Review Methodology

The Phase II Environmental Site Assessment (Wood, 2018b) was reviewed to identify pre-existing levels of PCOCs in watercourses and/or waterbodies exceeding relevant environmental quality standards.

7.3.1.5 Field Assessment Methodology

Waterbody and watercourse assessments were completed during the summer months of 2024, as well as in November and December 2024 and summer of 2025. Confirmed watercourses were delineated to their termination point or to the boundary of the Assessment Area.

The watercourses were characterized using Strum's Baseline Delineation Form which records the following general survey details:

- Date and time
- Weather
- Watercourse type
- Flow characteristics (direction, velocity, etc.)
- Physical characteristics (width, length, etc.)
- Substrate composition
- Instream cover
- Riparian habitat
- Bank stability and siltation presence
- Photos, global positioning system (GPS) location, etc.
- Fish presence/habitat potential

Survey information was collected and georeferenced using Survey123. As a result of identified environmental constraints (such as watercourses), the Project's infrastructure layout underwent several iterations to minimize potential interactions and limit the number of required watercourse alterations.

7.3.1.6 Hydrological Assessment Methodology

A desktop hydrological assessment is currently underway to evaluate the allowable water withdrawals from freshwater sources in proximity to the REP. Preliminary analysis has identified Meadow and Ocean lakes as having the highest potential as freshwater sources. In-situ monitoring is currently in progress to validate the findings of the hydrological assessment and inform additional hydrological modelling. As part of the assessment, the drainage basins of both Meadow and Ocean lakes will be characterized to estimate their safe yields and to determine the extent to which sustainable water withdrawals can be supported.

Detailed assessments on Meadow and Ocean lakes will be completed following the completion of the hydrological assessment and confirmation of project design details. The results of these assessments will be provided in the NSECC surface water withdrawal application and associated review by DFO.

7.3.1.7 Desktop Assessment Results

Waterbodies

A review of the federal CanVec Database – Hydrographic Features (NRCan, 2023a) identified four unnamed waterbody features within the Assessment Area, along with 162 named and unnamed features within 5 km (Drawing 7.13). A complete list of named waterbodies located within 5 km of the Assessment Area is provided in Table 7.24.

Table 7.24: Named Waterbodies Within 5 km of Assessment Area

Name of Waterbody	Distance (km)
Waterbodies Within 5 km of Assessment Area*	
Back Pond	2.87
Basin Lake (Basin Lake Run)	4.96
Basin Lake Run	3.36
Beach Ponds	4.41
Beech Hill Lake	4.33
Crane Lake (Bettys Cove Brook)	0.17
Fowlers Lake	2.30
Frasers Lake	2.28
Glade Lake	4.31
Gold Brook	0.00
Gold Brook Lake	0.72
Gores Lake	0.88
Hay Lake	0.89
Indian Man Lake	3.49
Isaacs Harbour River	0.32
Lily Pond	3.23
Little Beech Hill Lake	3.82
Little Lake	2.11
Long Pond	4.86
Lucas Beach Pond	4.56
Meadow Lake (Isaacs Harbour River)	0.00
New Harbour River	3.93
Oak Hill Lake	2.11
Ocean Lake	0.00
Ocean Lake - The Narrows	0.28
Quinces Brook	2.71
Rocky Lakes	0.78
Rush Lake (East Brook)	1.78

Name of Waterbody	Distance (km)
Seal Harbour Lake	0.07
Stewart Lake	4.57
Stewart South Lake	4.56
Three Corner Lake (East Brook)	2.62
West Brook	1.58

*Measurement from the nearest point of the Assessment Area.

The Assessment Area boundary includes a 50 m buffer around Meadow and Ocean lakes. As the hydrological assessment is currently underway, no waterbody has been confirmed as the Project's withdrawal source. A desktop literature assessment was conducted on Meadow and Ocean lakes to describe the aquatic habitat. In 2006, AMEC conducted extensive surveys on potential sources of cooling or processing water for a Keltic petrochemical and liquefied natural gas facility to support the submission of an EA (AMEC, 2006). In this EA, AMEC provides detailed assessment results on both Meadow and Ocean lakes, including water quality, habitat assessments and fish capture.

AMEC summarized Meadow Lake as the largest and shallowest body in its watershed, with a maximum depth of about 2 m (AMEC, 2006). It receives inflows from the Garry River system and nearby tributaries like those from Beach Hill lakes. The lake's water chemistry reflects the surrounding geology, showing low conductivity but elevated levels of organic matter, colour, and aluminum. The aluminum samples exceed the CCME environmental guidelines (CCME, 2025) in all samples. Acidic precipitation combined with naturally low alkalinity results in low pH levels, which are unsuitable for Atlantic salmon reproduction, likely explain their near-absence in local fish surveys. The lake is bordered by forested areas dominated by spruce and tamarack, along with bog habitats rich in various shrubs, mosses, and wetland plants (AMEC, 2006). Due to its shallow depth, aquatic vegetation such as water lilies and pickerel weed are common throughout the lake.

Ocean Lake was described as a relatively deep body of water, reaching depths of around 20 m, and is fed by four small tributaries, the largest of which originates from Indian Man Lake to the northwest (AMEC, 2006). Ocean Lake drains north into New Harbour River. The water chemistry results showed elevated results for colour and aluminum, similar to Meadow Lake and other surrounding lakes within their study. The surrounding shoreline is densely vegetated, primarily with black spruce, balsam fir, tamarack, sheep laurel, and leatherleaf. Aquatic plant life is limited, with small patches found in shallower areas along the southeast and near the lake's outflow, where species such as tape grass, pickerel weed, and yellow pond lily are present. The lake's shallow margins feature consistent substrates made up of boulders, cobble, gravel, and sand.

Watercourses

The Assessment Area is located within the New Harbour/Salmon River primary watershed (1EQ) and the Country Harbour primary watershed (1EP) (NSECC, 2011a) (Drawing 7.13).

The Assessment Area falls within five secondary watersheds; three Shore Direct secondary watersheds (1EQ-SD29; 1EQ-SD31; 1EPSD1), the New Harbour River secondary watershed (1EQ-4), and the Isaacs Harbour River secondary watershed (1EP-1) (NSECC, 2011b) (Drawing 7.13). The largest watercourse flowing through the Assessment Area is Gold Brook. Gold Brook originates in Gold Brook Lake and flows southeast into Seal Harbour Lake. Seal Harbour Lake ultimately discharges into the Atlantic Ocean at Seal Harbour through two outlets: West Brook and East Brook. The Ocean Lake freshwater pipeline is proposed to cross Gold Brook.

A review of the NS Topographic Database – Water Features (GeoNOVA, 2025) identified 40 watercourse feature segments (i.e., linear sections of watercourses) within the Assessment Area and 1,701 feature segments within 5 km of the Assessment Area (Drawing 7.13). Gold Brook and Bettys Cove Brook were the only named watercourses identified within the Assessment Area (NRCan, 2023a).

Throughout the Assessment Area, WAM data indicates that groundwater ranges from depths of 0 m to > 10 m below the surface, with the majority being > 9.1 m below the surface on account of the area being rapidly to moderately-well drained (NSECC, 2022b) (Drawing 7.14). WAM results generally aligned with the locations of watercourses identified using topographic mapping (GeoNOVA, 2025).

7.3.1.8 Chemical Review Results

During the 2018 Phase II Environmental Site Assessment, the following activities were completed in the Assessment Area to evaluate potential impacts from former gold mining activities and establish background conditions:

- Sediment samples were collected from 16 locations at WC11 (including four duplicates; WC11 shown on Drawing 2.2A), five locations from Betty's Cove Brook (WC2), and one location along the shoreline of Dung Cove Pond for a total of 22 locations.
- Surface water samples were collected from 15 locations at WC11 (including three duplicates), and two locations at Betty's Cove Brook (WC2) for a total of 17 locations.
- All samples were submitted for laboratory analysis of petroleum hydrocarbons (PHCs), cyanide, and/or metals. Analytical results were compared to the relevant NS Tier I Environmental Quality Standards (EQS).

Sediment and surface water samples reported PCOCs at concentrations exceeding the NS Tier I EQS which have been summarized in Table 7.25 below. All remaining PCOCs were within the NS Tier I EQS. The highest concentrations were generally reported at WC11 in the vicinity of the former Giffin Mine. Sampling locations are displayed on Drawing 7.3.

Table 7.25: Surface Water and Sediment Chemistry Results Summary

PCOC	Maximum Value Reported	Applied EQS	# of Sample Locations Exceeding Criteria[2]
Sediment			
Modified TPH[1]	2,790 mg/kg		16/22
Arsenic	3,130 mg/kg	17 mg/kg	20/22
Manganese	8,840 mg/kg	1,100 mg/kg	2/22
Mercury	14.5 mg/kg	0.486 mg/kg	10/22
Surface Water			
Aluminum	537 µg/L	5 µg/L	8/17
Arsenic	1,810 µg/L	5 µg/L	15/17
Iron	1,400 µg/L	300 µg/L	8/17
Manganese	1,030 µg/L	820 µg/L	1/17
Mercury	0.154 µg/L	0.026 µg/L	10/17

[1]total petroleum hydrocarbons

[2]Expressed as a fraction of the total number of samples analyzed

7.3.1.9 Field Assessment Results

There were 21 water features confirmed within the Assessment Area (Drawings 7.15A-D), including perennial (9), intermittent (11) and ephemeral (1) features with an average channel width of 1.16 m, with the exception of Gold Brook, which has a maximum channel width of 60 m. Table 7.26 provides the assessment results of the 21 watercourses within the Assessment Area.

Table 7.26: Watercourse Characteristics within the Assessment Area

WC ID	Flow	Velocity (m/s)[1]	Channel Width (m)	Depth (m)	Substrate (%)	Habitat Types	Entrenchment	Bank Stability
WC1	Intermittent	<0.05	0.78-1.38	0.03-0.11	Rubble (30), Cobble (5), Gravel (15), Muck (50)	Flat	Moderately Entrenched	High
WC2 (Betty's Cove Brook)	Perennial	0-0.87	1.2-2.1	0.02-0.13	Muck (100)	Flat	Slightly Entrenched	High
WC3	Intermittent	0-0.92	0.6-1.2	0.02-0.1	Rubble (5), Muck (95)	Flat, No Defined Channel	Slightly Entrenched	High
WC4	Intermittent	0.00	0.45-0.70	0-0.12	Muck (100)	Run, Riffle	Slightly Entrenched	Moderate
WC5	Intermittent	0.00	0.95-1.00	0-0.05	Cobble (20), Gravel (15), Silt (5), Muck (60)	Flat, Pool	Slightly Entrenched	Moderate
WC6	Intermittent	0.00	0-0.8	0-0.2	Muck (100)	No Defined Channel	Moderately Entrenched	Moderate
WC7	Perennial	0.05-0.1	1.2-1.8	0.08-0.29	Bedrock (20), Muck (80)	No Defined Channel, Riffle, Run	Slightly Entrenched	High
WC8	Perennial	0.01-0.1	0.47-1.9	0.05-0.19	Cobble (50), Muck (50)	Flat	Moderately Entrenched	Low
WC9*	Ephemeral	N/A	~0.5-1.0	N/A	N/A	N/A	N/A	N/A
WC10	Perennial	0.10	0.32-0.58	0.05-0.28	Cobble (50), Muck (50)	Run, Riffle	Moderately Entrenched	Moderate
WC11 (Dung Cove Pond Inlet)	Perennial	0.01	1.34-4.1	0.15-0.25	Cobble (50), Muck (50)	Flat, Pool, Run	Not Entrenched	Moderate
WC12	Perennial	0.01	1.60-1.98	0.16-0.37	Cobble (50), Muck (50)	Flat	Not Entrenched	Moderate

WC ID	Flow	Velocity (m/s)[1]	Channel Width (m)	Depth (m)	Substrate (%)	Habitat Types	Entrenchment	Bank Stability
WC13	Perennial	0-0.01	0.51-1.55	0.03-0.17	Muck (100)	Pool, Flat	Slightly Entrenched	High
WC14	Intermittent	<0.05	0.4-0.7	0.02-0.24	Rubble (25), Cobble (5), Muck (70)	Run	Moderately Entrenched	Low
WC15	Intermittent	<0.05	0.03-0.18	1.5-2.5	Boulder (20), Rubble (10), Cobble (5), Gravel (10), Muck (55)	Run	Moderately Entrenched	Moderate
WC16 (Gold Brook)	Perennial (Large Permanent)	<0.05	57-60	0.55-2.8	Boulder (10), Rubble (5), Cobble (5), Gravel (5), Sand (10), Silt (25), Muck (30), Clay (10)	Flat	Moderately Entrenched	High
WC17	Intermittent	<0.05	1.8-2.67	0.03-0.6	Boulder (15), Rubble (10), Cobble (40), Silt (5), Muck (30)	Riffle-run	Moderately Entrenched	Moderate
WC18	Intermittent	<0.05	0.33-1.30	0	Boulder (35), Rubble (20), Cobble (15), Muck (30)	Riffle	Moderately Entrenched	Moderate
WC19	Intermittent	<0.05	1.3-2.2	0-0.03	Boulder (50), Rubble (10), Cobble (5), Gravel (10), Muck (25)	Riffle-run	Moderately Entrenched	Moderate
WC20	Intermittent	<0.05	1.1-1.82	0-019	Boulder (15), Rubble (20), Cobble (15), Muck (50)	Flat	Moderately Entrenched	Moderate
WC21	Intermittent	<0.05	0.7-1.5	0.05-0.1	Boulder (10), Rubble (25), Cobble (15), Gravel (10), Muck (40)	Flat	Moderately Entrenched	Moderate

[1]In watercourses where velocity was too slow to record (<0.05 m/s) or the depth did not allow for a velocity measurement the velocity was recorded as <0.05 m/s.
*WC9 delineated by aerial imagery.

Perennial, or permanent, features see flow for the vast majority, if not for the entirety of the year. Their continuous flow is often attributed to their direct connection to stable sources of water, including lakes and groundwater springs (US EPA, 2013). Small permanent features include streams, brooks, and creeks. These features are often first- and second-order streams fed by springs, groundwater, and run-off, and often act as tributaries to larger features, creating larger permanent features at their confluence. Large permanent features often exhibit lower flow path gradients, larger channel dimensions, and an increased flow (US EPA, 2013).

Intermittent watercourses typically exhibit a well-defined stream morphology with overland flow during all or some of the year. These watercourses can often have subterranean flow when overland flow is absent (US EPA, 2013). These features are heavily influenced by seasonality, often displaying characteristics similar to permanent features during periods of heavy rain, or after significant snowmelt. During drier times of the year, flow velocity within these features may reduce to pools of standing water, or eventually dry stream beds (US EPA, 2013).

Ephemeral watercourses do not have stable courses of water, and exhibit flow only after heavy precipitation or significant snowmelt events. Runoff is the primary source of water for these features, and they serve an important role of redirecting overland flow towards more established riverine environments (US EPA, 2013). As such, these features also play an important part in the flood prevention and nutrient cycling regimes of their respective environment.

Out of the 21 watercourses observed within the Assessment Area, eight are found within the freshwater pipelines that connect Meadow and Ocean lakes to the Facility (WC14 to WC21; Drawings 7.15A-D). Seven of the eight watercourses can be characterized as intermittent watercourses that at the time of assessment were predominately dry or lacked significant flow (< 0.05 m/s). Larger rocky substrates (boulder, rubble and cobble) and muck were found throughout these watercourses.

Watercourse 16 (also known as Gold Brook) was the outlier amongst the watercourses found within the freshwater pipelines that connect Meadow and Ocean lakes to the facility (Drawing 7.15A). This perennial watercourse originates at the southern outlet of Gold Brook Lake, flowing south until it drains into Seal Harbour Lake. The portion of WC16 (Gold Brook) that is anticipated to be crossed by the freshwater pipeline was recorded as 57-60 m wide flat with highly stable banks. This portion of WC16 was roughly 0.5-2.8 m deep with a variety of substrates present (ranging from boulder to silt). Through aerial imagery, this portion of WC16 can be observed to fluctuate in wetted width and depth seasonally.

The remaining 13 watercourses are found within the Project Footprint of the Facility (WC1 to WC13; Drawing 7.15A). Out of these 13 watercourses, 12 are unnamed, while WC2 is known as Betty’s Cove Brook. These 12 unnamed watercourses are ephemeral (1), intermittent (5) and perennial (6) in nature, with cobble and muck present as the dominate substrates. Majority of these watercourses channelize from headwater wetlands before dissipating within the same wetland or an adjacent wetland (WC1, WC3, WC4, WC6, WC7, and WC9).

WC11 is a perennial, second order watercourse that starts within WL26 and drains southwest through the Assessment Area and into Dung Cove Pond (Drawing 7.15A). This perennial watercourse varied between 1.34-4.1 m wide with a depth around 0.2 m. Similar to other watercourses within the Facility footprint, WC11 is dominated by a cobble and muck bottom. Flat and run habitats as well as small pools were observed within the watercourse. During the chemical review, WC11 had the highest concentrations of PCOCs in the vicinity of the former Giffin Mine (Section 7.3.1.8). The upper and lower extents of the watercourse fall within APEC 3 and APEC 2, respectively, as identified during the Phase I Environmental Site Assessment (Section 7.2.4; Drawing 7.3). WC10, a first-order tributary to WC11, also lies within APEC 3 and adjacent to a mapped tailings pile and multiple AMOs (Drawing 7.3).

WC2, also known as Betty's Cove Brook, is entirely contained within WL1 inside the Assessment Area (Drawing 7.15A). This perennial watercourse originates within WL1 and flows east outside the Assessment Area, under Highway 316 and eventually drains into the Atlantic Ocean, southeast of the Assessment Area at Betty's Cove Pond. This slightly entrenched watercourse is dominated by flat habitat, and the only substrate observed was muck and detritus.

Four of the 21 watercourses identified within the Assessment Area showed evidence of disturbance or alteration resulting from anthropogenic development activities throughout the last century. Four watercourses {WC2 (Betty's Cove Brook), 11, 12, 13] have been altered through the installation of culverts to facilitate road crossings. Representative photos of evidence of disturbance can be found in Appendix G, as available.

Pond 1 and Pond 2 were described due to the potential for impacts to these open water features. Given their similar characteristics, the ponds are described together. Located within the Assessment Area on the Red Head peninsula adjacent to Dung Cove (see Drawing 7.15A), Pond 1 and Pond 2 are brackish ponds that measure approximately 0.2 ha and 0.4 ha in size, respectively. Both ponds feature a silt layer over gravel and cobble substrate with shorelines composed of small rocks, including cobble and gravel, little shade or cover was observed within these ponds. Emergent and submergent vegetation was observed during the time of assessment. Representative photos of these ponds can be found in Appendix G.

7.3.1.10 Hydrological Assessment Results

Meadow Lake is estimated to sustainably accommodate withdrawals of approximately 350 m^3/hr. However, due to the limited data set, continued in-field water quantity monitoring is ongoing to inform the model, further validate pro-rated flows and confirm the environmental flow needs (EFNs) required to be maintained downstream.

For Ocean Lake, withdrawal capacity is governed primarily by the lake outlet elevation. The updated, simplified assessment indicates that Ocean Lake could support an annual average withdrawal of approximately 450 m^3/hr (with a nominal rate of 305 m^3/hr). Additional field monitoring is required to verify limiting factors during the low-flow summer period, and collection of bathymetric data will confirm lake storage capacity. Given that the current

assessment is based on a limited water quantity dataset, maximum allowable withdrawal rates remain subject to refinement as further field information becomes available. Continued in-field water quantity monitoring is ongoing to inform the model, further validate pro-rated flows and confirm the environmental flow needs (EFNs) required to be maintained downstream.

7.3.1.11 Effects Assessment

This section describes the methods used to assess potential Project-related environmental effects on surface water. These methods include determining thresholds of significance, including magnitude of effects and applied modelling techniques. These methods and definitions are carried forward to Project Interactions and Potential Effects.

Project Surface Water Interactions

Project activities, primarily those that involve earth moving, vegetation removal, and road construction have the potential to impact waterbodies and watercourses (Table 7.27). These potential impacts could include habitat loss, changes to water quantity, changes to water quality, and erosion and sedimentation of aquatic features.

Table 7.27: Potential Project-Surface Water Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Water Pipeline and Roadway Construction	X
Facility Foundation Construction	X
Transportation of Facility Components	X
Facility Assembly	X
Utility Connections	-
Removal of Temporary Works and Site Restoration	X
Operations and Maintenance	
Commissioning	-
Handling of Biomass	-
Production of SAF and Other Products	-
Product Storage	-
Vegetation Management	X
Decommissioning	
Infrastructure Removal	-
Site Reclamation	X

Assessment Boundaries

The LAA for watercourses includes the five secondary watersheds that the Assessment Area is within, three Shore Direct secondary watersheds (1EQ-SD29; 1EQ-SD31; 1EPSD1), the New Harbour River secondary watershed (1EQ-4), and the Isaacs Harbour River secondary

watershed (1EP-1) (Drawing 7.13). No RAA is defined for this VC, as effects are expected to occur within the LAA.

Assessment Criteria

Assessment criteria provided in Section 4.5 also apply to watercourses. The VC-specific definition for magnitude is as follows:

- Negligible: No loss of aquatic habitat. No expectation for altered hydrology.
- Low: No loss of aquatic habitat, with minimal potential for altered hydrology which can be managed with routine measures.
- Moderate: Small loss of aquatic habitat. Altered hydrology expected but can be managed with routine measures.
- High: Loss of aquatic habitat. Altered hydrology expected that would be challenging to manage with routine measures.

Direct Effects

Direct effects to surface water (i.e., habitat loss, destruction of aquatic features) are likely to be most prominent during the construction phase. Effect-specific active management, mitigation, and monitoring are required to eliminate, mitigate, or otherwise manage the magnitude of these direct effects.

The implications of potential direct effects on fish and fish habitat are discussed in Section 7.3.2.8.

Habitat Loss

Facility Construction

The Project design has been optimized to minimize interactions between the Project and surface water features. However, in areas where interactions are unavoidable, there is potential for direct habitat loss. During the detailed design phase, the Project's Footprint will be microsited to avoid impacts to watercourses. Any loss of habitat will be completed through consultation with DFO and the *Fisheries Act*.

Road Construction

Watercourse crossings will be confirmed and characterized during the permitting process, with specific design details finalized during the detailed design phase and included in any required applications for alteration or notifications to NSECC. Project engineers will determine final culvert installations during the design stage, ensuring crossings are constructed to industry standards. On-site roads are anticipated to be two-lane roads with a total roadway width of 6 m, including a 1 m shoulder on either side.

It is currently anticipated that one watercourse crossing will be required for the Project (WC12) to provide access to the marine terminal. WC12 is approximately 1.98 m wide and will be crossed by a 6 m wide road (with 1 m shoulders on either side), resulting in an estimated

crossing footprint of 15.84 m². This crossing will be confirmed and assessed through the permitting process, and detailed design will include micrositing to minimize direct impacts.

Additionally, the access road to the marine terminal runs adjacent to Pond 1 and Pond 2 (Drawing 7.15A). During the detailed design phase, the Proponent will microsite the road to avoid impacts to the two brackish ponds. At this time, no impacts to Pond 1 or Pond 2 are expected.

Freshwater Pipeline Construction

Of the 21 watercourses identified within the Assessment Area, eight intersect the proposed aboveground freshwater pipeline routes from Meadow and Ocean lakes to the Facility (Drawings 7.15A-D). The proponent is expecting to avoid direct impacts to surface water during pipeline construction and operation; no road construction is currently proposed, and the pipeline will be designed to avoid surface disruptions through directional drilling or spanning.

Final design will determine the specific methods of watercourse interaction. Should road access or other construction activities be required, all necessary applications for watercourse alteration will be submitted to NSECC as part of the permitting process.

Indirect Effects

Indirect effects such as erosion and sedimentation, or changes in water quantity and quality can be farther reaching, extending outside of the Project Footprint and into the LAA. These effects are often foreseeable, and research based BMPs can be implemented to mitigate the resulting outcomes, and the magnitude at which they are felt (DFO, 2022).

The implications of potential indirect effects on fish and fish habitat are discussed in Section 7.3.2.

Changes in Surface Water Quantity

Facility Construction

The construction of the Facility has the potential to affect surface water during site development and associated activities, including clearing, grubbing, and infrastructure placement. Surface water will be managed through on-site ditching and stormwater retention ponds within the boundaries of the industrial facility. Changes to local catchment areas and redirection of water from aquatic receivers can result in changes in water quantity sourced to those receivers, which can subsequently alter channel morphology, increase flood potential, and disrupt habitat characteristics (MTO, 2009).

At this stage, there is the potential for indirect effects to watercourses due to the management, collection and resulting discharge of water on-site, and associated treated wastewater discharge. Accordingly, a local catchment analysis was completed to understand the baseline movement of water within the Assessment Area east of Sable Road (Drawing 7.16). At the permitting stage, a detailed WBA will be completed to fully understand potential flow reductions through surface water features.

From the investigation of drainage pathways within the Assessment Area under the Facility east of Sable Road, eight local catchments were identified associated with watercourses within the Assessment Area (Table 7.28).

Table 7.28: Existing Local Catchment Areas within the Assessment Area

Catchment #	Associated Watercourse	Existing Area (ha)	Post-Development Area (ha)	% Change in Local Catchment Area	Length (m)	Watercourse Width (m)[1]	Area (m^2)
C6	WC5	3.8	0.6	-84.2	72	0.97	69.84
C5	WC6	4.6	0.7	-84.8	187	0.80	149.60
C4	WC7	14.2	1.8	-87.3	173	1.40	242.20
C3	WC8	10.3	1.9	-81.6	274	0.98	268.52
C8	WC9	10.6	1.3	-87.6	150	~1.00	150.00
C2	WC10	12.3	1.6	-87.0	252	0.44	110.88
C1	WC11	28.9	5.3	-81.7	943	2.28	2,150.04
C7	WC13	11.6	1.2	-89.7	227	1.12	254.24
Potential Total Impact Area to Surface Water							**3,395.322**

[1]Watercourse width taken from the average of the three transects.
[2] Preliminary estimate prior to consideration of mitigation measures. Detailed habitat assessments and a WBA to be conducted at permitting stage further refine and quantify impacts to surface water and fish and fish habitat.

The existing (i.e. baseline) local catchment areas, the post-development local catchment areas resulting from the Facility infilling, and the percent change for each catchment area are presented in Table 7.28 (Drawing 7.16). The local catchment analysis was only done to the Assessment Area boundary, as watercourse confirmation has not been completed beyond the Assessment Area. Additional field assessments within the broader LAA will be completed at the permitting stage should this be required to support the development of the WBA.

Due to the change in local catchment area for all 8 catchments, it is expected that WC5, WC6, WC7, WC8, WC9, WC10, WC11, and WC13 will all experience considerable changes in flow based on expected catchment area adjustments. To further understand the extent of this change in water quantity, a detailed WBA will be completed during permitting to quantify impacts to these watercourses.

During this stage of design, a Stormwater Management Plan has not been developed to fully understand on-site water management, primarily stormwater capture and flow. Water will be captured on site and ditched into multiple stormwater retention ponds (Drawing 2.2A) and discharged back into the surrounding watercourses. Discharge of water will be microsited during the design phase to reduce impacts to watercourses within the Assessment Area by increasing flow through select watercourses that are anticipated to experience a loss in local catchment area (e.g., WC11). The detailed WBA will support the selection discharge locations and characterization of potential mitigating effects.

To gain a better understanding of water movement on the facility, a WBA will be completed during the permitting process to more accurately predict potential changes to contributing drainage areas and associated effects on surface water. Watercourse alteration applications will be submitted and permitting will be obtained as necessary prior to Project alterations.

Facility Operation: Water Withdrawal

The Facility will require an estimated 586 m^3/h through water withdrawal, which may change during detailed design through optimization. Currently, Meadow and Ocean lakes are subject to an on-going detailed hydrological assessment and water balance assessment to determine safe yields. The effects of the water withdrawal will be evaluated through the permitting and approvals process for water withdrawals.

Specific details of water withdrawal interactions with surface water will be finalized during the detailed design phase and applications for alteration will be completed during the permitting process and submitted to NSECC.

Changes in Surface Water Quality

Changes in the quality of surface water can arise from alterations to the surrounding environment and can include an increase in water temperature from decreased shade and increased impervious surface, an increase in pollutants from machinery and infrastructure, wastewater discharge, and the mobilization of sediments (MTO, 2009). Given the dynamic nature of channeling water, effects upon water quality can quickly spread throughout different reaches of the respective watershed. Legacy contamination in WC11 can also impact water quality be should sediments be re-mobilized.

The mobilization of sediment within aquatic environments can cause shifts in ecological integrity, including changes to the plant species composition, the distribution of primary and secondary producers, and the habitat suitability for vulnerable species (Tilman et al., 1997). Re-mobilizing contaminants like mercury and arsenic from historic tailings into aquatic ecosystems can negatively impact fish through bioaccumulation, posing risks to fish health and human consumption (LeBlanc et al., 2020). Erosion and sedimentation can occur throughout the lifecycle of the Project, including during construction efforts, routine road maintenance, and daily traffic. However, the highest potential for these effects is through the Facility development and associated activities, such as clearing, grubbing, and infrastructure placement. Site access and movement of equipment across watercourses may be necessary to support the installation of drainage structures such as ditches and culverts. The alteration or removal of riparian vegetation can also result in bank instability and erosion.

Facility Operation: Water Treatment and Discharge

In general, the REP's raw water treatment system will receive, treat, store, and distribute treated water to the Facility. The water used for cooling and firewater systems will require filtration of any suspended matter to ensure the water does not contain any debris. The water used for electrolysis will require ultrafiltration, UV sterilization, and reverse osmosis to purify the water. This treated wastewater will then be either discharged into retention ponds and then

into the freshwater receiving environment or through a pipeline into the marine environment, provided water quality meets all discharge requirements. Effects to the marine environment will be discussed within a *Fisheries Act* (Canada, 1985d) Authorization specific to marine construction impacts. Final discharge location will be determined during detailed design.

Wastewater from the demineralization system and cooling tower blowdown will contain a high concentration of total dissolved solids. These are not suitable for treatment in the biological system and water will instead be pretreated prior to entering a reverse osmosis system. This process will allow up to 75% of the water to be reused in the facility, with the remaining concentrate discharged to a retention pond or a marine outfall provided water quality meets all discharge requirements. Wastewater will be managed through the development of an Effluent Management Plan.

Mitigation

Avoidance of direct impacts to surface water is the highest priority in the mitigation sequence. Throughout the iterative process of developing the current Project Infrastructure layout, avoidance of effects to surface water was attained through several key design considerations. Initial identification and characterization of surface water within the Assessment Area helped inform an optimized site layout and reduce potential direct impacts to surface water.

As required, all work completed under the provincial watercourse alteration process will be completed in accordance with the Nova Scotia Watercourse Alterations Standards and will be executed by a certified Watercourse Alteration Installer/Sizer. For work requiring an approval, specific and detailed mitigation will be developed and submitted to NSECC as part of the application process.

Where avoidance of impacts to surface water is not possible, mitigation measures must be employed to further reduce impacts. Standards and best practices for working in and near water are well understood and will be followed (DFO, 2025b). The following mitigation measures will be included in the design of the Project:

Habitat Loss

- Educate Project personnel on the sensitivity of aquatic habitat.
- Flag watercourses and avoid impacts to the watercourse and adjacent riparian habitat to the extent possible.
- Obtain watercourse alteration approval from NSECC and adhere to the terms and conditions of the approval, as required.
- Require that Project activities (fueling included) or removal of vegetation shall not be conducted within 30 m of any delineated or mapped watercourse, without authorization from NSECC.
- Revegetate along the watercourse edge and above the ordinary high-water mark to facilitate the stabilization of the area, and restoration of fish habitat.

- Conduct any work within the bed of a watercourse between June 1 and September 30, to better control water flow, to allow for a faster revegetation period and avoid sensitive fish life cycle stages (NSECC, 2015b).
    - Consult with NSECC and DFO if work is required outside of appropriate timing windows.

Changes in Surface Water Quantity

- Complete a WBA to further analyze indirect impacts to surface water quantity.
- Integrate water management systems including diversion and collection ditches, roadside drainage channels, vegetated swales, and retention ponds as required to manage water quality and quantity during construction and operations.
- Develop a Stormwater Management Plan
- Develop an Effluent Management Plan

Changes in Surface Water Quality

- Leave riparian vegetation as intact as Project developments will allow.
- Integrate outlet protection features to dissipate flow velocities and decrease erosion at the outflow.
- Use untreated, rot-resistant timber (e.g., hemlock, tamarack, juniper, or cedar) below the ordinary highwater mark to avoid the leaching of toxic preservatives into waterways (NSECC, 2015b).
- Use rock material that is clean, coarse granular, non-ore-bearing, non-watercourse-derived, and non-toxic to aquatic life (NSECC, 2015b).
- Develop a site-specific erosion and sedimentation plan during the detailed design phase.
- Properly install, monitor, and maintain erosion and sediment control devices.
- Limit the area of exposed soil and the length of time soil is exposed without mitigation (e.g., mulching, seeding, rock cover).
- Limit the slope and gradient of disturbed areas to minimize the velocity of surface water runoff.
- Minimize surface run-off containing suspended materials or other harmful substances.
- Direct run-off from construction activities away from wetlands and watercourses.

Monitoring

A Surface Water Monitoring Plan will be developed as part of the permitting process after a detailed WBA is completed to fully understand impacts to surface water, This Surface Water Monitoring Plan will be employed to ensure water quality meets regulatory requirements and include monitoring locations for water quantity. Data collected on actual conditions will be compared to the predicted stream flow reductions. Monitoring will verify the predictions made and ensure potential adverse impacts to surface water outside of the predicted effects does not occur. Baseline water quality samples will be collected prior to Facility development for comparison against samples collected during Facility development.

Conclusion

After mitigations, residual effects on waterbodies and watercourses are characterized as follows:

- Magnitude: Moderate magnitude such that a small loss of aquatic habitat will occur and altered hydrology is expected but can be managed with routine measures.
- Geographic Extent: Within the LAA.
- Frequency: Continuous as some effects due to altered hydrology will persist until decommissioning; however, other effects related to construction (habitat destruction) will be a single event, or intermittent during operations (vegetation management).
- Duration: Medium duration as the residual effects will continue through to decommissioning.
- Reversibility: Reversible, as the effect will terminate at the end of the Project lifespan.
- Significance: Not significant

7.3.2 Fish and Fish Habitat

7.3.2.1 Overview

The fish and fish habitat assessment was completed using the following approach:

- Complete a desktop review to identify potential fish habitat (waterbodies, watercourses, and wetlands) within the Assessment Area.
- Assess the quality of fish habitat within the Assessment Area via field surveys.
- Inventory and assess abundance and diversity of fish species within the Assessment Area.
- Use the information collected to inform the Project design (e.g., avoid/minimize impacts to fish and fish habitat).
- Use the information collected to inform mitigation and management practices and further refine the Project Footprint.

7.3.2.2 Regulatory Context

The *Fisheries Act* (Canada, 1985d) is the primary federal legislation governing the conservation and protection of fish and fish habitat in Canada. The *Fisheries Act* (Canada, 1985d) prohibits any work, undertaking, or activity that results in harmful alteration, disruption, or destruction (HADD) of fish or fish habitat, unless such activities are authorized through appropriate regulatory approvals.

Section 34.4(1) of the *Fisheries Act* (Canada, 1985d) states that “No person shall carry on any work, undertaking or activity, other than fishing, that results in the death of fish”, and Section 35(1) states that “No person shall carry on a work undertaking or activity that results in the harmful alteration, disruption or destruction of fish or fish habitat”. Under Section 35(2) of the *Fisheries Act*, authorization may be granted for a proposed work, undertaking, or activity that may, respectively, result in the death of fish or the harmful alteration, disruption, or destruction of fish habitat.

The *Fisheries Act* (Canada, 1985d) defines the following:

Fish:

> "(a) parts of fish, (b) shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and (c) the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals;",

Fish Habitat:

> "waters frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas (Authorizations Concerning Fish and Fish Habitat Protection Regulations, 2019)".

If an alteration to a watercourse or waterbody is required, or impacts to fish and fish habitat are expected, a review under the DFO Request for Review process may be required. DFO review typically occurs through the provincial watercourse alteration application process.

SARA provides federal protection for species listed as "Endangered", "Threatened", or "Special Concern". These species are determined through assessments conducted by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Provincially, the ESA lists species as "Endangered", "Threatened" or "Vulnerable". These species also have a subnational (provincial) rank (S-Rank) of "S1", "S2", or "S3" (ACCDC, 2025) to further define their status.

Under the provincial *Environment Act,* S.N.S 1994-95, c. 1, NSECC, has the authority to promote the sustainable management of water resources in Nova Scotia. Specifically, as per section 5A of the Activities Designation Regulations, NS Reg 47/95, "*the alteration of a watercourse or the flow of water within a watercourse is an activity that requires an approval from NSECC, or a notification to NSECC if the work will be completed in accordance with the Nova Scotia Watercourse Alterations Standards*" (NSECC, 2015c).

The *Environment Act,* S.N.S. 1994-95, c. 1, s. 3be defines a watercourse as:

> (iii) the bed and shore of every river, stream, lake, creek, pond, spring, lagoon or other natural body of water, and the water therein, within the jurisdiction of the Province, whether it contains water or not, and
> (iv) all groundwater

While groundwater is included in the regulatory definition of a watercourse under the *Environment Act,* S.N.S. 1994-95, c. 1*,* this section of the EARD focuses on surface water features in the context of fish habitat provision. Refer to Section 7.2 for ground water assessment methods.

Provincially, the potential for alterations/activities to impact fish and fish habitat is considered through the watercourse and/or wetland alteration application process, as appropriate.

7.3.2.3 Desktop Review Methodology

The desktop review was conducted to identify potential and historical fish presence within the Assessment Area using the following sources:

- Aquatic Species at Risk Map (DFO, 2025a)
- NS Significant Species and Habitats Database (NSNR, 2024e)
- ACCDC Data Reports (ACCDC, 2024a, 2024b)

A literature review was completed to determine historic assessments and baseline conditions within the Assessment Area and included the following resources:

- Goldboro LNG - natural gas liquefaction plant and marine terminal Environmental Assessment (AMEC, 2013)
- Keltic Petrochemicals and liquefied natural gas facility, Goldboro, NS Environmental Assessment (AMEC, 2006)
- Goldboro Gold Project EARD (GHD, 2022)

Surface water (including waterbodies and watercourses) is discussed in Section 7.3.1. For wetlands, refer to Section 7.3.3.

7.3.2.4 Field Assessment Methodology

Qualitative fish habitat assessments were completed in the summer months of 2024, November and December of 2024 and the summer of 2025 in the Assessment Area. Assessments documented habitat conditions and characteristics, fish observances, barriers to fish passage, and general habitat notes to support Strum's Baseline Delineation Form which was completed in tandem with these surveys (Section 7.3.1).

Results of the field and desktop assessments were used to select locations for fish collection (trapping and qualitative electrofishing) (Drawing 7.17). The locations selected for fish collection also considered the position of surface water features relative to Project Infrastructure, the potential for direct or indirect impacts, access, and safety.

Electrofishing Surveys

Electrofishing is a standard fish capture measure used to collect juvenile and adult fish in streams, rivers, and standing bodies of water (e.g., lakes). The process involves submerging an anode and cathode in the water and passing an electrical current through the water to attract and immobilize fish for capture. Qualitative electrofishing surveys were conducted in August 2024 to evaluate fish species presence and relative abundance under DFO Scientific License #360444.

DFO's Interim Policy for the Use of Backpack Electrofishing Units (DFO, 2003) was reviewed and followed by all members of the electrofishing crew. This document provides a detailed list of standard equipment, safety, training, and emergency response procedure requirements for electrofishing. Each electrofishing crew consisted of two individuals, one of which (the crew lead) was a qualified person as defined under the DFO Interim Electrofishing Policy. The crew lead is responsible for operating the backpack electrofisher according to their training and the Policy, and for communicating safety policies and electrofishing procedures to the crew members.

Fish were sampled using a Halltech Battery Backpack Electrofisher (HT-2000) with un-pulsed direct current. A crew member walked alongside the electrofisher operator to net any stunned fish using a D-frame landing net (1/8" mesh). All captured fish were held in a live well containing ambient stream water, kept out of the sun, checked regularly for any signs of stress. At the conclusion of the pass, all fish were identified, weighed, and measured for length. After recuperating, all fish were released back into the watercourse. As part of the assessment, field staff took notes on any fish observed but not caught, along with any points of concern such as obstructions to fish passage (e.g., elevated culverts, waterfalls, etc.).

The qualitative electrofishing surveys were conducted using a closed, single-pass approach with a target sampling effort of 5 seconds per square metre (sec/m²) over 200-metre reach lengths along selected watercourses. To establish a closed system, barrier nets were installed upstream and downstream. Species abundance was qualitatively estimated using electrofishing Catch Per Unit Effort (CPUE) indices, standardized to 300 seconds of effort following Scruton and Gibson (1995).

The following watercourses were selected for qualitative electrofishing surveys within the Assessment Area:

- WC2 (Betty's Cove Brook)
- WC11 (Dung Cove Pond Inlet)

Qualitative electrofishing details are provided in Table 7.29. Electrofishing reaches are shown on Drawing 7.17.

Table 7.29: Electrofishing Locations and Details

Electrofishing Location	Survey Date	Coordinates (UTM)		Reach Length (m)
		Easting	Northing	
WC2 (Betty's Cove Brook)	August 29, 2024	608192	5003316	200
WC11 (Dung Cove Pond Inlet)	August 29, 2024	607082	5002078	200

Trapping Surveys

A trapping survey was conducted on September 11 and 12, 2024, in two brackish ponds (Pond 1 and Pond 2) using minnow traps. Trapping was completed to supplement results from the 2006 AMEC report and involved deploying a single trap in each pond to confirm fish presence. The

minnow traps were baited with cat food and were set in sufficient water depths to cover the traps, left overnight, and collected the following day.

Minnow trap locations and details are provided in Table 7.30 and shown on Drawing 7.17.

Table 7.30: Trapping Locations

Trapping Location	Survey Dates	Coordinates (UTM)		Traps Deployed	
		Easting	Northing	Trap Type	Number of Traps
Pond 1	September 11-12, 2024	606819	5001576	Minnow Trap	1
Pond 2	September 11-12, 2024	606838	5001614	Minnow Trap	1

In-Situ Water Quality Measurements

Water quality parameters were measured in-situ by Strum personnel in Pond 1 using a calibrated YSI Professional Plus Multi-Probe on September 11, 2024, during trapping surveys. Parameters recorded include dissolved oxygen (DO), water temperature, pH, specific water conductivity (SPC), and total dissolved solids (TDS).

7.3.2.5 Desktop Review Results

The Aquatic Species at Risk Map (DFO, 2025a) is a federal database showing the distribution of SAR and their associated critical habitat within Canadian waters. A review of this database determined no freshwater SAR species or associated critical habitat are located within the Assessment Area. The nearest SAR species or critical habitat from the Project is the mollusc species brook floater (*Alasmidonta varicose)* which is located approximately 13.5 km north of the Assessment Area (DFO, 2025a).

The ACCDC reports identified two priority freshwater fish species recorded within 5 km of the Assessment Area. Atlantic salmon – NS southern upland population (COSEWIC Endangered; S1) and brook trout (S3N) were both recorded within 1.9 +/- 1.0 km of the Assessment Area (ACCDC, 2024a, 2024b). Based on previous fish studies (AMEC, 2006, 2013), American eel (COSEWIC Threatened; S3N) is also expected to be present within the Assessment Area.

A complete list of species within 100 km of the ACCDC Study Area is provided in Appendix H.

Meadow and Ocean lakes have been identified as potential water sources for the Project. As the hydrological assessment is currently underway, no waterbody has been confirmed as the Project's withdrawal source. A literature review was conducted on Ocean and Meadow Lake to describe the aquatic habitat. Additional information for fish habitat features within the Assessment Area including Dung Cove Pond, its inlet, Ponds 1 and 2, and Betty's Cove Brook has been pulled forward from AMEC (2006, 2013).

In 2006, AMEC conducted extensive surveys on potential sources of cooling or processing water for a Keltic petrochemical and liquefied natural gas facility to support the submission of

an EA (AMEC, 2006). In this EA, AMEC provides detailed assessment results on both Meadow and Ocean lakes, including water quality, habitat assessments and fish capture.

Meadow Lake was described as a shallow lake, up to 2 m in depth, with forest and bog as the dominant riparian habitats (AMEC, 2006) (Drawing 7.15D). Along the shallow margin of Meadow Lake, the dominant substrates include boulder and cobble, in deeper sections, silt was the dominant substrate. There were also sand and gravel sections noted along the shoreline (AMEC, 2013). Nine tributaries discharge into Meadow Lake, seven of which are characterized as small, first order streams. Issac's Harbour River is the largest tributary and feeds into Meadow Lake in the most northern portion of the lake. American eel, ninespine stickleback, white sucker (*Catostomus commersonii)*, blacknose shiner (*Notropis heterolepis*), brook trout, golden shiner (*Notemigonus crysoleucas*), yellow perch (*Perca flavescens*), and a single male Atlantic salmon in spawning condition have been collected in Meadow Lake (AMEC, 2006). Local residents have reported that Atlantic salmon have historically spawned upstream and downstream of Meadow Lake within Isaacs Harbour River (AMEC, 2006). However, the near-absence of Atlantic salmon from fish collection surveys (2001, 2004, 2005) within Meadow Lake and its associated tributaries is likely indicative of poor habitat quality due to low pH (AMEC, 2006, 2013). AMEC (2006, 2013) also reported that local residents noted low flows have prevented upstream salmon migration through Isaacs Harbour River. All other species collected in Meadow Lake, with the exception of American eel, would be expected to spawn in the watershed. Abundant feeding, rearing and nursing habitat was also noted (AMEC, 2006).

AMEC (2006) describes Ocean Lake as a relatively deep lake, with a maximum depth of approximately 20 m (Drawing 7.15C). There are four small tributaries that flow into the lake, the largest of which originates in Indian Man Lake. The substrate in the shallow areas along the lake margin was dominated by boulder, cobble, gravel, and sand (AMEC, 2006). Fish species collection included American eel, ninespine stickleback, banded killifish, white sucker, and brook trout (AMEC, 2006). Aside from American eel, all species collected in Ocean Lake would be expected to spawn in the lake or its tributaries. Abundant feeding, rearing, and nursing habitat was also noted (AMEC, 2006).

Dung Cove Pond is a freshwater pond and the largest on Red Head Peninsula and within the Assessment Area, with substrates dominated by silt with scattered boulders around the perimeter (AMEC, 2013). AMEC completed fish capture in the fall of 2004 and spring of 2005, resulting in the capture of American eel, ninespine stickleback, banded killifish, mummichog, and adult brook trout (AMEC, 2013). Dung Cove Pond was described as supporting foraging habitat for adult brook trout, as well as juvenile foraging and rearing habitat for both trout and American eel. Forage species all likely complete their life histories within the pond. Fish captured within the Dung Cove Pond Inlet (WC11) in 2008 included brook trout and American eel, and the unnamed watercourse was described as providing some nursery/juvenile rearing habitat for both species (AMEC, 2013). In-situ water quality measurements of temperature, dissolved oxygen, and pH recorded in spring 2005 were 14.93°C, 10.03 mg/L, and 8.46, respectively. Temperature and pH measurements recorded in the pond in 2008 as part of fish

habitat and invertebrate studies were 16.1°C and 5.6 in June, and 17.3°C and 7.1 in September. Temperature and pH recorded in the Dung Cove Pond Inlet ranged from 9.4°C to 14.3°C and 5.4 to 6.2, respectively. Though pH levels fall below the Canadian Council of Ministers of the Environment (CCME) recommended range for freshwater aquatic life (6.5-9), acidity levels are not considered limiting to species present. Brook trout, which of all species recorded would be considered the most acid and temperature sensitive, can tolerate a range of 4.0-9.5 (Raleigh, 1982). Recorded temperatures remained below this species' upper tolerance limit of 20°C (Raleigh, 1982). Sediment and surface water samples from Dung Cove Pond and WC11 reported PCOCs at concentrations exceeding Teir I EQS guidelines (Table 7.25), indicating that the historic mine tailings have migrated into this system.

Smaller ponds to the south of Dung Cove Pond (herein referred to as Ponds 1 and 2) were described by AMEC (2013) as brackish ponds with substrates dominated by cobble and gravel overlain by organic silt. Thick mats of filamentous algae were observed during 2005 surveys. In-situ water quality measurements of temperature, dissolved oxygen, and pH recorded in spring 2005 ranged from 16.59 to 18.75°C, 9.34 to 10.03 mg/L, and 7.43-8.46, respectively. Only stickleback species were captured during 2006 fish capture surveys (Table XX).

Betty's Cove Brook was surveyed in 2006 and again in 2008, with confirmed fish species including brook trout, American eel, and ninespine stickleback. According to AMEC (2013), brook trout and ninespine stickleback likely spawn in this watercourse, and the watercourse supports feeding and migratory habitat for American eel. Water quality was consistent with other aquatic features surveyed, with pH measured as 6.3.

A review of the Goldboro Gold Project EARD eDNA results revealed that Atlantic salmon DNA was not detected within the Shore Direct secondary watershed (1EQ-SD31), which is where the majority of the Assessment Area lies (GHD, 2022). However, Atlantic salmon DNA was detected in the New Harbour secondary watershed (1EQ-4), which contains a portion of the freshwater pipeline leading to Ocean Lake as well as Ocean Lake (GHD, 2022).

Table 7.31 summarizes the historic fish capture results within the Assessment Area.

Table 7.31: Summary of Historic Fish Species Capture within the Assessment Area

Location	Common Name	Scientific Name	Year of Collection	Associated Reports
Meadow Lake	American eel	*Anguilla rostrata*	2001 - 2005	Keltic Petrochemicals and liquefied natural gas facility Environmental Assessment (2006)
	Ninespine stickleback	*Pungitius pungitius*		
	White sucker	*Catostomus commersonii*		
	Brook trout	*Salvelinus fontinalus*		
	Golden shiner	*Notemigonus crysoleucas*		
	Yellow perch	*Perca flavescens*		
	Atlantic salmon	*Salmo salar*		
	Blacknose shiner	*Notropis heterolepis*		

Location	Common Name	Scientific Name	Year of Collection	Associated Reports
Ocean Lake	American eel	*Anguilla rostrata*	2004 - 2005	
	Ninespine stickleback	*Pungitius pungitius*		
	Banded killifish	*Fundulus diaphanous*		
	White sucker	*Catostomus commersonii*		
	Brook trout	*Salvelinus fontinalus*		
Pond 1 and Pond 2	Threespine stickleback	*Gasterosteus aculeatus*	2006	
	Fourspine stickleback	*Apeltes quadracus*		
	Ninespine stickleback	*Pungitius pungitius*		
Betty's Cove Brook	Brook trout	*Salvelinus fontinalus*	2006 and 2008	Keltic Petrochemicals and liquefied natural gas facility Environmental Assessment (2006) and Goldboro LNG Environmental Assessment (2013)
	American eel	*Anguilla rostrata*		
	Ninespine stickleback	*Pungitius pungitius*		
Dung Cove Pond Inlet	Brook trout	*Salvelinus fontinalus*	2008	Goldboro LNG Environmental Assessment (2013)
	American eel	*Anguilla rostrata*		
Dung Cove Pond	Brook trout	*Salvelinus fontinalus*	2004 and 2008	Keltic Petrochemicals and liquefied natural gas facility Environmental Assessment (2006) and Goldboro LNG Environmental Assessment (2013)
	American eel	*Anguilla rostrata*		
	Ninespine stickleback	*Pungitius pungitius*		
	Banded killifish	*Fundulus diaphanous*		
	Mummichog	*Fundulus heteroclitus*		
Gold Brook	American eel	*Anguilla rostrata*	2020 - 2021	Goldboro Gold Project Environmental Assessment (2022)
	Brook trout	*Salvelinus fontinalus*		
	Banded killifish	*Fundulus diaphanous*		
	Golden shiner	*Notemigonus crysoleucas*		
	Yellow perch	*Perca flavescens*		

7.3.2.6 Field Assessment Results

The results of fish capture surveys are provided in the following sections. Morphological characteristics of watercourses are described in Section 7.3.1.9. Fish habitat within the Assessment Area has been inferred based on cumulative surveys performed to date.

Electrofishing Surveys

Electrofishing was conducted on August 29, 2024, in two watercourses within the Assessment Area, WC2 (Betty's Cove Brook) and WC11 (Dung Cove Pond Inlet) (Drawing 7.17). Representative photos are found in Appendix I, and results are provided in Table 7.32.

Table 7.32: Electrofishing Survey Results

Electrofishing Site	Survey Date	Fish Species Collected		Catch Per Species	Total Catch	Total Effort (seconds)	CPUE (fish/300 seconds)
		Common Name	Scientific Name				
WC2 (Betty's Cove Brook)	August 29, 2024	American eel	*Anguilla rostrata*	3	24	1,547	4.65
		Brook trout	*Salvelinus fontinalis*	21			
WC11 (Dung Cove Pond Inlet)	August 29, 2024	American eel	*Anguilla rostrata*	1	29	905	9.61
		Brook trout	*Salvelinus fontinalis*	28			

The electrofishing surveys resulted in the capture of 49 brook trout (both juvenile and adult) and four American eel (both juvenile and adult) in the two surveyed watercourses. WC11 had the highest CPUE (9.61), and WC2 had a CPUE of 4.65.

The results from the desktop review are consistent with these results. In addition to the fish caught during the 2024 field season, ninespine stickleback, banded killifish, and mummichog are expected in WC11, and ninespine stickleback in WC2 (AMEC, 2013).

Trapping Surveys

Trapping surveys were conducted between September 11 and 12, 2024. The results of trapping efforts using minnow traps in Pond 1 and Pond 2 are presented in Table 7.33 and representative photos are found in Appendix I. Relative abundance has been expressed through CPUE per trap.

Table 7.33: Summary of Trapping Efforts in Pond 1 and 2

Trapping Location	Survey Date	Fish Species Collected		Total Catch	Total Effort (hours)	CPUE (per trap)
		Common Name	*Scientific Name*			
Pond 1	September 12, 2024	Mummichog	*Fundulus heteroclitus*	31	29.5	1.05
Pond 2	September 12, 2024	Mummichog	*Fundulus heteroclitus*	38	28.5	1.33

The trapping survey efforts resulted in 69 mummichog captured between Pond 1 and Pond 2. The total trapping effort was 58 hours. Pond 2 had the highest CPUE (1.33), and Pond 1 had a CPUE of 1.05. Surveys conducted by AMEC in 2004 and 2005 in Pond 1 and Pond 2 resulted in the capture of threespine stickleback, fourspine stickleback, and ninespine stickleback (AMEC, 2013). In-situ water quality was recorded only within Pond 1 using a calibrated YSI Professional Plus Multi-Probe. Parameters recorded included temperature (16.9 ºC), dissolved oxygen (11.97 mg/L), pH (9.34) and specific conductivity (47.86 µS/cm).

Priority Species

Based on the results of the field and desktop assessments, the following fish species were identified as priority species and are discussed in further detail below.

American Eel

The American eel is assessed as “Threatened” under COSEWIC and ranked “S3N” by ACCDC (2025). American eels are a migratory species with life stages in freshwater, estuary, and marine environments (COSEWIC, 2012). Though much is still unknown about the American eel, several studies have shown a temperature preference of around 16.7°C (Blakeslee et al., 2018). Spawning and maturation occurs in the marine environment, where adults migrate inland to freshwater habitats. Within freshwater habitats, this species of eel is typically found in rivers and lakes, and will readily burrow into mud, sand, fine gravel, cobble, and woody debris. Within marine environments, American eels are commonly associated with protected shallow waters containing submerged vegetation (e.g., eelgrass) and woody debris (COSEWIC, 2012).

American eel were captured by Strum in WC2 (Betty’s Cove Brook) and WC11 (Dung Cove Pond inlet) in 2024, where field staff recorded four individuals during electrofishing surveys (Drawing 7.17). American eel were historically captured within Dung Cove Pond, Gold Brook, Meadow Lake and Ocean Lake as well. Rearing, and foraging habitat for eel is present within these features.

Atlantic Salmon

The Atlantic salmon – Nova Scotia southern upland (SU) subspecies is assessed as “Endangered” by COSEWIC and ranked “S1” by ACCDC (2025). SU Atlantic salmon are a genetically distinct population of Atlantic salmon that occupy rivers in both the Eastern Shore and South Shore, draining into the Atlantic, as well as Bay of Fundy Rivers south of Cape Split (COSEWIC, 2011). The exact number of rivers that contain SU Atlantic salmon is unknown; however, they have been historically considered present in 72 rivers (DFO, 2013).

For freshwater habitat, Atlantic salmon prefer clear, cool, well-oxygenated waters in streams with bottoms of gravel, cobble, and boulder (COSEWIC, 2010a). Gravel and cobble are the preferred substrates for spawning (COSEWIC, 2010a). Redd sites, which are depressions dug into the substrate by female salmon to deposit eggs, are typically located in well-aerated areas – a riffle above a pool, or at the tail of pools on the upstream edge of riffles with depths of 10-70 cm (Grant & Lee, 2004). Juvenile (parr) and adult salmon use a variety of different habitat types, including freshwater fluvial, lacustrine, and estuarian, however, juvenile Atlantic salmon

typically found in streams where good foraging conditions exist (COSEWIC, 2010a). Older parr are usually found in riffles, except during low water levels, high water temperatures, and winter freeze, during which deeper pools are the preferred habitat (Grant & Lee, 2004). As temperatures rise above 22°C, habitat potential decreases, and Atlantic salmon will search for cooler waters (COSEWIC, 2010a, p. 201). The maximum temperature that Atlantic salmon will tolerate before exiting a habitat (if possible) is 27.8°C (COSEWIC, 2010a). Furthermore, Atlantic salmon prefer a circumneutral pH ranging from 6.5 to 7.5 (MDEP, 2022).

Atlantic salmon species undertake long feeding migrations to the ocean as older juveniles and adults and return to freshwater streams to reproduce. Marine requirements for Atlantic salmon are not as well understood, but temperature is thought to be important. Atlantic salmon smolts migrate seaward from rivers during May and June (DFO, 2018). Adults return to the rivers in the late fall to spawn (COSEWIC, 2011).

Historically, a population of Atlantic salmon was supported by the Isaacs Harbour River secondary watershed (1EP-1), within spawning reported to occur in tributaries along Isaacs Harbour River and Meadow Lake (AMEC, 2013). A single, mature male in spawning condition was captured in 2001 in Meadow Lake, and a single juvenile was captured in 2004 in Isaacs Harbour River. Salmon habitat within Meadow Lake is considered poor quality and limited by depth, temperature, and pH. Remnant individuals may persist within the system, but acidity levels are generally considered too low to support the successful reproduction of the species (AMEC, 2013). The results of the desktop review of the Goldboro Gold Project EARD eDNA results detected Atlantic Salmon in the New Harbour secondary watershed (1EQ-4), which contains a portion of the Ocean Lake freshwater pipeline and Ocean Lake (GHD, 2022). Therefore, Atlantic salmon are likely present within Ocean Lake and adjacent watercourses (Drawing 7.15C). No detections of Atlantic salmon were made within Gold Brook secondary watershed. Atlantic salmon are unlikely to be found in aquatic features within the Facility, as these are characterized as first and second order streams which commence within the Assessment Area and provide no passage to upgradient fish habitat (Drawing 7.17).

Brook Trout

Brook trout are not listed under federal (SARA) or provincial (ESA) legislation as a SAR; however, they are ranked as “S3” (ACCDC, 2025). This species of trout is typically found in cold, clear, and well oxygenated rivers and lakes with plenty of shade and gravel substrate (Raleigh, 1982). They prefer water temperatures that do not exceed 20° C, though adult fish can tolerate temperatures of up to 25°C for short periods of time (MDNR, 2012). Furthermore, despite being able to reproduce in waters with a pH as low as 4.5, they do best in a pH range of 5.0 to 7.5 (MDNR, 2012).

Brook trout are a migratory species that migrate further inland to rivers and lakes during the fall months to spawn. Sea-run Brook trout may spend April to June in marine environments, but migration to marine habitat does not always occur year to year (DFO, 1988). In Nova Scotia, brook trout are considered the number one sportfish, with approximately 2 million trout stocked within the province on an annual basis (NSFA, 2005).

Brook trout were captured in WC2 (Betty's Cove Brook), WC11 (Dung Cove Pond inlet), Dung Cove Pond, Gold Brook Meadow Lake and Ocean Lake. A total of 49 brook trout, including both juveniles and adults, were captured during the Strum electrofishing surveys in WC2 and WC11 in 2024. Both watercourses likely support brook trout spawning based on the presence of juveniles within each system.

7.3.2.7 Fish Habitat Summary

At present, fish habitat within the Assessment Area is based largely on qualitative assessments and limited fish capture results. In an effort to make conservatively inclusive decisions in the effects assessment, even those watercourses appearing to lack connectivity to known fish bearing streams (i.e., WC1, WC3, WC4, WC5, WC6, WC9, WC10) are currently considered fish habitat (Drawing 7.17). Fish presence within these systems is currently unknown, and it is likely that most indirectly support fish habitat through hydrological inputs to down-gradient systems as opposed to directly supporting fish. In addition, those watercourses that extend beyond the Assessment Area (i.e., WC7, WC8, and those located along the pipeline route) are also considered fish habitat as delineation was confined to the boundaries of the Assessment Area. Most watercourses within the Assessment Area (57%) are described as intermittent or ephemeral, with potential fish habitat being limited by seasonality of flow.

Out of the 83 wetlands field delineated within the Assessment Area, three are considered to contain potential fish habitat: WL19, WL24, and WL26 (Drawing 7.15A). WL19 is described as a marsh, which serves as a headwater source for WC10. Flooding is possible in the southeastern part of the wetland, where a small, shallow pond is surrounded by grasses and ferns. WL24 is a riparian fen that receives unconfined flow from WC11, which slightly encroaches into its western boundary. WL26 is a shrub swamp which serves as a headwater source for WC11. The wetland contains some shallow surface water, but access into the wetland is currently impeded by an old skidder trail which bisects its western edge. This likely poses a barrier to fish passage, but fish presence within the wetland has not been ruled out. The full extent of fish habitat within each wetland will be confirmed during the permitting phase. For all other wetlands, fish habitat is either absent (e.g., isolated swamps) or restricted to the bed and banks of the associated watercourse or waterbody (e.g. WL1 and WC2).

WC2 and WC11, the two primary watercourses within the Facility, likely support brook trout spawning, despite the lack of optimum spawning habitat documented during field surveys (i.e., clean gravels). Brook trout have been found to spawn over silt and detritus providing there is groundwater seepage (Grant & Lee, 2004), and historic summer temperature data (AMEC, 2013) and perennial flow in summer months suggests a possible groundwater contribution to these systems. Rearing, foraging, and overwintering habitat is also likely supported for American eel. Small-bodied forage fish (sticklebacks, killifish, and mummichogs) likely complete their lifecycles within the ponds and slow-moving reaches of streams. Brook trout overwintering habitat may be provided by Dung Cove Pond, which would be further supported by confirmation of groundwater upwelling. Based on historic data, water quality in main systems does not appear to be limiting to species present.

Detailed fish habitat assessments, during which fish habitat is described and quantified, will be completed during the permitting process to support provincial (watercourse alteration) and federal (*Fisheries Act* (Canada, 1985d) Authorization) permitting requirements, as needed.

7.3.2.8 Effects Assessment

Project-Fish and Fish Habitat Interactions

Project activities, primarily those that involve watercourse crossing, earth moving, or vegetation removal, have the potential to impact fish and fish habitat (Table 7.34). These potential impacts could include habitat removal, disruptions to hydrology, and/or displacement of sediment.

Works determined to result in HADD of fish habitat or death of fish by means other than fishing require authorization under Section 35 of the *Fisheries Act.*

Table 7.34: Potential Project-Fish and Fish Habitat Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Water Pipeline and Roadway Construction	X
Facility Foundation Construction	X
Transportation of Facility Components	X
Facility Assembly	-
Utility Connections	-
Removal of Temporary Works and Site Restoration	X
Operations and Maintenance	
Commissioning	-
Handling of Biomass	
Production of SAF and Other Products	-
Product Storage	-
Vegetation Management	X
Decommissioning	
Infrastructure Removal	-
Site Reclamation	X

Assessment Boundaries

The LAA for fish and fish habitat includes the five secondary watersheds that the Assessment Area is within, three Shore Direct secondary watersheds (1EQ-SD29; 1EQ-SD31; 1EPSD1), the New Harbour River secondary watershed (1EQ-4), and the Isaacs Harbour River secondary watershed (1EP-1) (Drawing 7.13). No RAA is defined for this VC, as effects are expected to occur within the LAA.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for fish and fish habitat. The VC-specific definition for magnitude is as follows:

- Negligible: No loss of fish habitat or impact to fish behaviour expected.
- Low: Small loss of fish habitat or impact to fish behaviour.
- Moderate: Moderate loss of fish habitat or impacts to fish behaviour, but these impacts will only be experienced by individuals rather than entire populations and can be managed with routine measures.
- High: High loss of fish habitat and impacts to fish behaviour that will be experienced by entire populations and cannot be managed with routine measures; the population's life history is permanently altered.

Direct Effects

Direct effects to fish and fish habitat (i.e., habitat destruction and death of fish) are likely to be most prominent during the construction phase and limited to the extent of the Project Footprint. Effect-specific active management, mitigation, and monitoring are required to eliminate, mitigate, or otherwise manage the magnitude of these direct effects.

Destruction

Habitat destruction is defined as any permanent change of fish habitat that renders it completely unsuitable for future production of fish (DFO, 2006). In the context of Project-related effects, this includes any fish habitat feature directly overlayed by infrastructure. Potential causes of habitat destruction are the construction of buildings or stormwater retention ponds, the alteration of bank or channel grades for road development.

Facility Construction

The Project design has been optimized to minimize interactions between the Project and fish habitat features. However, if interactions are unavoidable, there is potential for direct habitat loss. Currently, the only infrastructure that overlaps potential fish habitat features are two stormwater retention ponds on WC6 and WC10 (and associated WL19) (Drawing 7.15A). The portion of the facility that partially overlaps WL26 is not infringing on potential fish habitat. During the detailed design phase, the Project's facility footprint will be microsited to avoid impacts to watercourses and wetlands that support fish, and no destruction of fish habitat is anticipated.

Freshwater Pipeline Construction

Of the 21 watercourses identified within the Assessment Area, eight intersect the proposed aboveground freshwater pipeline route from Meadow and Ocean lakes to the Facility (Drawings 17.5A-D). The Proponent has committed to avoiding direct impacts to fish and fish habitat during pipeline construction and operation; no road construction is currently proposed, and the pipeline will be designed to avoid impacts to fish habitat through directional drilling beneath watercourses or spanning.

Final design will determine the specific methods of watercourse interaction. Should road access or other construction activities be required additional micrositing during the detailed design phase will minimize impacts to fish habitat from road construction. Each crossing will be designed to avoid any permanent diversion, restriction, or blockage of natural flow, such that the hydrologic function of the watercourse and potential surrounding wetlands are maintained (DFO, 2022). Sufficient water depth and appropriate velocities will be maintained to support fish passage for species known within the Assessment Area.

Specific details of each crossing will be finalized during the detailed design phase and will be included in any necessary applications for alteration or notifications to NSECC and DFO.

Road Construction

Watercourse crossings will be confirmed and characterized during the permitting process, with specific design details finalized during the detailed design phase and included in any required applications for alteration or notifications to NSECC. Project engineers will determine final culvert upgrades or installations during the design stage, ensuring each crossing is constructed to industry standards. On-site roads are anticipated to be two-lane roads with a total roadway width of 6 m, including a 1 m shoulder on either side.

It is currently anticipated that one watercourse crossing will be required for the Project (WC12) to provide access to the marine terminal. WC12 is approximately 1.98 m wide and will be crossed by a 6 m wide road (with 1 m shoulders on either side), resulting in an estimated crossing footprint of 15.84 m². This crossing will be confirmed and assessed through the permitting process, and detailed design will include micrositing to minimize direct impacts.

Additionally, the access road to the marine terminal runs adjacent to Pond 1 and Pond 2 (Drawing 7.15A). During the detailed design phase, the Proponent will microsite the road to avoid impacts to the two brackish ponds. At this time, no impacts to Pond 1 or Pond 2 are expected.

Death of Fish

Water management and industrial activities can lead to direct fish mortality through the use of water intakes and industrial equipment. Direct impacts to fish through the use of industrial equipment in or near water, or impingement or entrainment of fish through water management activities can be mitigated through widely accepted best management practices (BMPs) and standards for working in and near water, including but not limited to following the DFO interim code of practice: end-of-pipe fish protection screens for small water intakes in freshwater, timing in-water works with appropriate fish timing windows, isolating in-water work areas and performing fish rescues prior to equipment mobilization.

Indirect Effects

Indirect effects include any Project interactions that may result in a harmful alteration or disruption of fish habitat. A harmful alteration is defined as “any change to fish habitat that

reduces its long term capacity to support one or more life processes of fish but does not permanently eliminate the habitat", while disruption refers to "any change to fish habitat occurring for a limited period that reduces its capacity to support one or more life processes of fish" (DFO, 2006). Indirect effects can range from short-term to permanent. The spatial extent of indirect effects such as changes in water quantity and quality can be farther reaching (LAA) but are often foreseeable and well-studied. Standardized BMPs and careful consideration for surface water management planning can be implemented to mitigate the resulting outcomes.

Indirect effects can occur through any mechanism that alters or disrupts the habitat's ability to support one or more life processes of fish. Throughout this section, indirect effects to fish and fish habitat will be explored through the following pathways of effects:

- Changes to surface flow (i.e., flow regime) from a combination of surface water management, changes to contributing drainage areas, and groundwater inputs.
- Changes in water quality through industrial activities, water management, or release of deleterious substances including sedimentation and erosion.

Changes in Surface Water Quantity

Changes to the amount of water within an aquatic system can lead to alterations or disruptions channel morphology, increase flood potential, and disrupt habitat characteristics that support vulnerable species (MTO, 2009). Changes in surface water quantity may result from site water management, changes in catchment areas, and water withdrawal from Meadow Lake and/or Ocean Lake for the freshwater pipeline to supply the Project.

Facility Construction

The proponent is committed to avoiding direct impacts to fish habitat during the development of the Facility. However, there is the potential for alteration to fish habitat due to the management, collection, and resulting discharge of water onsite.

A catchment area analysis was completed to provide a baseline understanding of the movement of surficial flow within the Assessment Area and initial investigation into potential flow alterations resulting from Project development. From the investigation of drainage pathways within the Assessment Area under the Facility east of Sable Road, eight local catchments were identified associated with watercourses within the Assessment Area.

Potential impacts to fish and fish habitat from changes in contributing drainage, including areas (m^2) of predicted alterations, are summarized in Table 7.35. This analysis is limited to the extent of the Assessment Area and additional field work will need to be completed to understand water movement outside the Assessment Area and potential impacts to those watercourses within the broader LAA (e.g., WC2). Descriptions of fish species and habitats expected to be impacted (Table 7.35) are preliminary and will be further refined at the permitting stage.

Table 7.35: Impacts to Fish and Fish Habitat Through Loss of Local Catchment

Catchment #	Watercourse	% Change in Contributing Drainage Area	Anticipated Area of Impact (m^2)	Fish Species Known or Expected to be Impacted[1]	Fish Habitat Expected to be Impacted
C6	WC5	-84.2	69.84	None	Indirect*
C5	WC6	-84.8	149.60	None	Indirect*
C4	WC7	-87.3	242.20	BKT, EEL, 9SP	BKT: Foraging EEL: Foraging 9SP: full life cycle**
C3	WC8	-81.6	268.52	BKT, EEL, 9SP	BKT: Foraging EEL: Foraging 9SP: full life cycle**
C8	WC9	-87.6	150.00	None	Indirect*
C2	WC10	-87.0	110.88	BKT, EEL	BKT: Foraging EEL: Foraging**
C1	WC11	-81.7	2,150.04	**BKT, EEL**	BKT: spawning, nursery/rearing EEL: rearing, foraging, overwintering
C7	WC13	-89.7	254.24	BKT, EEL	Feeding*

[1]**Bold** fish species are known within the watercourses. BKT = brook trout; EEL = American eel.
*Watercourse unlikely to directly to support fish based on hydrological isolation noted during initial assessment. To be confirmed via detailed habitat assessments during permitting phase.
**Fish species and habitats described based on inferred connection to either WC2 or WC11 outside of the Assessment Area. To be confirmed with detailed habitat assessments during permitting phase.

All eight local catchments associated with watercourses (C1 through C8) are expected to experience a loss in local catchment that will result in a considerable change in flow throughout the watercourses identified. This change in local catchment area is expected to result in a flow reduction that exceeds DFO's Ecological Flow Framework (> 10% change in flow) and without appropriate mitigation, is expected to result in a harmful alteration of fish habitat.

WC11 has been confirmed to support both brook trout and American eel (Drawing 7.17). WC10 is expected to support similar species due to an inferred hydrological connection to WC11 outside of the Assessment Area. A connection to WC2 is also assumed for WC7 and WC8 to the east of the Assessment Area. WC13 is assumed to support similar species and habitats as WC11 due to its location within the catchment area and physical characteristics. Hydrological isolation and seasonal dryness within WC5, WC6, and WC9 would restrict fish movement into and throughout the watercourses, and as such it is assumed that these systems do not support resident fish populations but may indirectly support down-gradient habitats. Further fieldwork is needed to support these assumptions, which will be completed at the permitting stage.

Construction of the REP, primarily through blasting, can impact the supply of groundwater by altering natural flow patterns. Changes to groundwater flow patterns can further exacerbate flow reductions in watercourses that receive groundwater inputs. Should blasting be required, it will be completed in accordance with provincial legislation and subject to the terms and conditions of applicable permits. Proposed mitigation and monitoring of groundwater is discussed in Section 7.2.

At this stage, a conservative estimate of 3,395.32 m^2 of fish habitat has been calculated as being potentially altered by Project activities. Of this total, 369.44 m^2 is currently considered to indirectly support fish habitat but is included to be conservatively inclusive. It should be reiterated that a WBA and further field work will be needed to fully understand effects to fish and fish habitat within and beyond the Assessment Area. Impacts to fish and fish habitat are being assessed only in terms of changes to local catchment areas. In addition, a detailed Stormwater Water Management Plan has not yet been developed to fully understand on-site water management, particularly stormwater capture and flow. Standard design concepts indicate that stormwater will be collected on site, directed through ditches to multiple retention ponds (Drawing 2.2A), and discharged back into surrounding watercourses. During the detailed design phase, discharge points will be microsited to minimize impacts to fish and fish habitat within the Assessment Area. This will include strategically increasing flow in select watercourses expected to lose catchment area and flow, provided all applicable water quality guidelines are met prior to discharge.

Facility Operation: Water Withdrawal

The Facility will require an estimated 586 m^3 per hr through water withdrawal (subject to refinement during engineering design). Currently, Meadow Lake and Ocean Lake are subject to an on-going detailed hydrological assessment and water balance assessment to determine safe yields. The full effects of the water withdrawal will be evaluated through a regulatory pathway separate from the EA and assessed as part of the permitting and approvals process for water withdrawals.

Changes in lake water levels can greatly impact fish habitats by reducing the availability of shallow areas essential for spawning, feeding, rearing, and providing valuable shelter. Lower water levels often lead to warmer temperatures and decreased oxygen level which can harm fish health and increase pollutant concentrations. These changes can also disrupt food sources, create barriers to upstream and downstream habitat and crowd fish into smaller spaces, increasing competition and predation.

Under the *Environment Act,* S.N.S 1994-95, c. 1, a water withdrawal approval is required if withdrawal exceeds 23,000 litres per day, as specified in the Activities Designation Regulations N.S. Reg. 47/95 (Division I). An application will be submitted to NSECC prior to construction of the pipeline which will consider all potential impacts to fish and fish habitat.

Changes in Surface Water Quality

Changes in the quality of surface water can arise from alterations to the surrounding environment and can include an increase in water temperature due to decreased shade, an increase in pollutants through releases of deleterious substances from machinery and infrastructure, and the mobilization of sediments (MTO, 2009). Given the dynamic nature of channeling water, effects upon water quality can quickly spread throughout different reaches of the respective watershed. There is a small risk of accidental SAF, naphtha, and/or diesel spill or release due to leaking storage tanks and pipelines, as well as spills or releases during dispensing activities at the offloading location.

The mobilization of sediment within aquatic environments can cause shifts in ecological integrity, including changes to the plant species composition, the distribution of primary and secondary producers, and the habitat suitability for vulnerable species (Tilman et al., 1997). Legacy contamination in WC11 (mine tailings) can also impact water quality should sediments be re-mobilized. Erosion and sedimentation can occur throughout the lifecycle of the Project, including during construction efforts, routine road maintenance, and daily traffic.

Facility Construction

The highest potential for effects to surface water quality is through Facility construction and associated activities, such as clearing, grubbing, and infrastructure placement. The alteration or removal of riparian vegetation can also result in bank instability and erosion, further exasperating these effects (MTO, 2009). The removal of overhanging vegetation from stream banks and riparian areas decreases shade/cover for fish and can result in increased water temperatures and vulnerability of fish to overhead predators.

The proponent is committed to avoiding direct impacts to fish habitat during the development of the Facility, which in turn will mitigate potential effects to surface water quality by maintaining riparian buffers to the maximum extents possible, maintaining bank stability, and limiting in-water work. Potential sources contaminants and sedimentation during construction can be mitigated through widely accepted BMPs and standards for ESC control.

Facility Operation: Water Treatment, Stormwater Management, and Discharge

Treated effluent will be discharged either to retention ponds for release to the freshwater environment or via a pipeline to the marine environment. The specific location will be evaluated during detailed design and discharge criteria will meet the CCME requirements. No impacts to water quality are predicted once CCME requirements are met. Effects to the marine environment will be discussed within a *Fisheries Act* (Canada, 1985d) Authorization specific to marine construction impacts.

Drainage of stormwater will be managed across the REP using stormwater retention ponds sized to the Project Footprint and a 1 in 100 year, 24-hour storm event. A wastewater treatment facility will remediate stormwater of on-site contaminants (size and location to be determined in a later design stage) before water is discharged. No effects to fish and fish habitat at discharge location(s) are anticipated once CCME requirements are met. Final

discharge locations will be determined upon completion of the detailed design and water balance assessment. An Effluent Management Plan will be developed to support Project design.

Mitigation

The primary mitigation measure to protect fish and fish habitat is the placement of Project Infrastructure to avoid waterbodies and watercourses. Buffers will be maintained on watercourses and wetlands supporting fish habitat, wherever possible, and removal of vegetation will be minimized. Cleared areas will be regraded and revegetated as soon as possible to reduce the likelihood of sediment releases. Additional mitigation measures will include erosion and sediment controls, site water management, adherence to timing windows to protect sensitive life cycle periods, and end-of-pipe protection for intakes.

In addition, the following mitigative measures will be implemented to avoid and mitigate any potential effects on fish and fish habitat.

Death of Fish

- Use and maintain properly sized screens on any water intakes or outlet pipes to prevent entrainment or impingement of fish (DFO, 2020).
- Limit in-water work to the greatest extent possible.
- If necessary, time in-water work, where appropriate, to occur during the summer low flow period to avoid sensitive life stages of fish (June 1 – September 30), as per DFO timing windows.
- Perform fish rescues prior to in-water work.
- Should blasting be required, follow setback recommendations and other mitigation strategies to minimize impact to fish and fish habitat from blasting activities (Wright & Hopky, 1998).

Destruction of Habitat

- Ensure watercourses and wetlands are clearly marked and avoid impacts to the area and adjacent riparian habitat to the extent possible.
- Ensure all crossings are installed by a certified Watercourse Alteration Installer/Sizer, and designed to avoid any permanent diversion, restriction or blockage of natural flow, such that the hydrologic function of the watercourse is maintained.
- Revegetate along the watercourse edge and above the ordinary high-water mark to facilitate the stabilization of the area, and restoration of fish habitat.
- Avoid impacts to wetlands to the extent possible.
    - Where unavoidable, complete wetland alterations in accordance with the NS Wetland Conservation Policy (NSECC, 2019) and the wetland alteration process during the permitting stage, which includes a requirement to compensate for lost wetland habitat and functions.
    - Design wetland crossings to occur at the narrow part of the wetland or the wetland's edges, to the extent possible.

- Conduct work between June 1 and September 30 to avoid sensitive periods in the life cycles of fish, to facilitate a better control of water flow, and to allow for a faster revegetation period (NSECC, 2015b).

Changes in Surface Water Quantity

- Complete a WBA to further analyze indirect impacts to surface water quantity.
- Integrate water management systems into the design, where appropriate, including diversion and collection ditches, roadside drainage channels, and vegetated swales.
- Fit any watercourse crossings with appropriately sized infrastructure, as prescribed by a certified Watercourse Alteration Installer/Sizer.
- Avoid impacts to wetlands to the extent possible.
    - Where unavoidable, design wetland crossings to occur at the narrow part of the wetland or the wetland's edges, to the extent possible.
- Maintain existing drainage patterns.
- Develop a Stormwater Management Plan
- Develop an Effluent Management Plan

Changes in Surface Water Quality

- Leave riparian vegetation as intact as Project developments allow.
- Integrate outlet protection features to dissipate flow velocities and decrease erosion at the outflow.
- Complete site kick-off meetings with relevant staff/contractors to educate and confirm policies related to working around fish habitats.
- Avoid refueling, fuel storage, and servicing equipment within 30 m of a watercourse or waterbody. Ensure all such activities are undertaken with appropriately sized spill response equipment nearby.
- Maintain Project Infrastructure to avoid accidental leaks.
- Develop a spill prevention, preparedness, and response plan to limit accidental release of deleterious substances and communicate said plan to all relevant personnel.
- Complete in-stream works only where approved.
- Ensure water discharges from stormwater retention ponds to the natural environment are sampled to ensure water quality conforms to applicable guidelines and recommendations.
- Maintain soil stockpiles away from watercourses and wetlands to prevent runoff and reduce the risk of elevated turbidity.
- Develop a site-specific erosion and sedimentation control (ESC) plan during the detailed design phase.
- Limit the area of exposed soil and the length of time soil is exposed without mitigation (e.g., mulching, seeding, rock cover).
- Limit the slope and gradient of disturbed areas to minimize the velocity of surface water runoff.
- Ensure surface run-off containing suspended materials or other harmful substances is minimized and directed to retention ponds.
- Direct run-off from construction activities away from wetlands and watercourses.

- Avoid removal of vegetation where possible and re-vegetate disturbed areas.
- Create stable flow conveyance pathways to mitigate erosion potential.
- Provide sediment controls along the pathways of water flow (e.g., check dams, swales) to intercept/remove suspended sediment in the stormwater.
- Provide end-of-pipe controls (e.g., sediment ponds, sediment traps) for sediment removal, detention, and control of peak flows, which reduces potential of sedimentation and flooding risk in water resources.
- Consider ceasing work prior to a storm event. Check ESC measures are in place before and after heavy rainfall events.
- Slow runoff using flow interrupters (e.g., flow checks) and erosion controls (e.g., rolled erosion control blankets, turf reinforcement blankets, hydroseeding, vegetation).

Monitoring

A Surface Water Monitoring Plan will be developed as part of the permitting process after a detailed WBA is completed to fully understand impacts to surface water. The Surface Water Monitoring Plan will be employed to ensure water quality meets regulatory requirements and include monitoring locations for water quantity. Data collected on actual conditions will be compared to the predicted stream flow reductions. Monitoring will verify the predictions made and ensure potential harmful alterations or disruptions to fish habitat outside of the predicted effects does not occur. Baseline water quality samples will be collected prior to Facility development for comparison against samples collected during Facility development. A Groundwater Monitoring Plan will be developed as part of the EMP, which will include baseline monitoring prior to commencement.

Conclusion

After mitigations, residual effects on fish and fish habitat are characterized as follows:

- Magnitude: Moderate magnitude such that a moderate loss of fish habitat or impacts to fish behaviour is expected to occur, but these impacts will only be experienced by individuals rather than entire populations and can be managed with routine measures.
- Geographic Extent: Within the LAA, as direct impacts will occur only within the LAA and indirect impacts are expected to be minimized through the implementation of effect-specific management and mitigation measures.
- Frequency: Continuous as some effects due to altered hydrology will persist until decommissioning (surface water management); however, other effects related to construction (habitat destruction) will be a single event, or intermittent during operations (vegetation management).
- Duration: Medium duration as the residual effects will continue through to decommissioning.
- Reversibility: Reversible, as the effect will terminate at the end of the Project lifespan.
- Significance: Not significant

7.3.3 Wetlands

7.3.3.1 Overview

Wetland assessments were conducted to identify and delineate wetland habitat so that impacts to wetland area and function could be avoided and minimized, to the extent possible. This was achieved by using the following approach:

- Identify wetland habitat in the Assessment Area using desktop resources.
- Ground-truth and delineate wetland habitat within the Assessment Area.
- Complete functional assessments for delineated wetlands identified within the Assessment Area.
- Identify the potential for, and confirm the presence of, Wetlands of Special Significance (WSS) within the Assessment Area.
- Use the findings of the desktop and field studies to design the Project (i.e., avoid/minimize impacts to wetlands).

7.3.3.2 Regulatory Context

The Nova Scotia Wetland Conservation Policy outlines a policy goal of no loss of WSS and no net loss in area and function for other wetlands (NSECC, 2019). The classification of a WSS is determined by a wetland having significant species or species assemblages, high levels of biodiversity, significant hydrological value, or high social or cultural importance. Under this policy, the following are considered WSS:

- All salt marshes.
- Portions of wetlands that are within, or partially within, a designated Ramsar site, Provincial Wildlife Management Area (Crown and Provincial lands only), Provincial Park, Nature Reserve, Wilderness Area, or lands owned or legally protected by non-government charitable conservation land trusts.
- Intact or restored wetlands that are project sites under the North American Waterfowl Management Plan and secured for conservation through the Nova Scotia Eastern Habitat Joint Venture program.
- Wetlands known to support at-risk species as designated under SARA or the ESA.
    - This applies to portions of wetlands that directly support species designated as “Threatened” and/or “Endangered” (Gorman, 2023).
- Wetlands in designated protected water areas as described within Section 106 of the *Environment Act,* S.N.S 1994-95.

As per Section 5 of the *Environment Act*, S.N.S 1994-95, approval from NSECC is required to alter a wetland. NS considers a wetland alteration to be any activity that may affect wetland function and habitat. Such activities include, but are not limited to, excavating, flooding, infilling, or draining (NSECC, 2019).

7.3.3.3 Desktop Review

A desktop review of the location and extent of potential wetland habitat across the Assessment Area was completed using the following information sources:

- Wetlands Inventory (NSNR, 2021i)
- WSS Database (NSECC, 2020c)
- NS Topographic Database – Water Features (GeoNOVA, 2025)
- Wet Area Mapping (WAM) (NSECC, 2022b)
- Satellite and aerial imagery

A total of 32 wetlands in the NSNR Wetlands Inventory (NSNR, 2021i) intersect with the Assessment Area, including: 14 swamps, 1 marsh, 13 bogs or fens, and 4 fens (Drawing 7.18). The wetlands ranged in size from 0.57 to 80.39 ha.

According to the NSECC WSS database (2020c), one large wetland (a fen) that overlaps with the Assessment Area is a potential WSS (Drawing 7.18). This determination was due to a historic short-eared owl (*Asio flammeus*) observation. As short-eared owl is listed as 'Special Concern' under SARA, the wetland no longer qualifies as WSS.

The NS Topographic Database – Water Features (GeoNOVA, 2025) was used in conjunction with the Nova Scotia WAM (NSECC, 2022b) to further assess the distribution of confirmed and potential wetland habitat within the Assessment Area. The depth-to-water estimates ranged from 0 m to > 10 m below the surface across the Assessment Area, with the majority of the Assessment Area being rapidly to moderately-well drained. Although these sources overlapped with the NSECC wetland inventory in some cases, they identified additional potential wet areas and predicted flow based on the assumed depth-to-water generated from digital elevation data. These results, as well as satellite and aerial imagery, assisted in scoping wetland field studies.

7.3.3.4 Field Assessment Methodology

General

Wetland field assessments were completed in conjunction with watercourse surveys in the Assessment Area in 2024 and 2025. The field surveys included a high-level assessment of hydrology, complimented by in-depth wetland delineations and functional assessments. One objective of the field component was to minimize the need for wetland alteration associated with the Project by establishing areas to be avoided during scoping for the Project Footprint. This approach resulted in several layout modifications as the Project Footprint was optimized to minimize interactions with wetlands. All wetland surveys (determinations and functional assessments) were completed in 2024 and 2025 within the approved growing season of June 1 to September 30.

To accompany wetland field surveys, a list of SAR and SOCI known to occur within the general area of the Project was compiled to help with incidental identification. Throughout the wetland surveys all incidental observations of SAR and SOCI were noted; details of these observations

are captured within the EA under their respective reporting sections, as applicable to the species observed.

Field Delineations

Field crews surveyed the Assessment Area, delineating and characterizing each wetland identified. Wetland boundaries were determined by confirming the following:

- Presence of hydrophytic vegetation.
- Presence of hydrologic conditions which result in periods of flooding, ponding, or saturation during the growing season.
- Presence of hydric soils.

A positive indicator must typically be present for all three parameters to definitively identify a given site as a wetland (Environmental Laboratory, 1987).

Identification of Hydrophytic Vegetation

Hydrophytic vegetation is defined as “the sum of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanent or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present” (Environmental Laboratory, 1987). A defining characteristic of wetland habitat is that hydrophytic vegetation is the dominant plant type.

The dominant plant species observed in each wetland in the Assessment Area were classified according to their indicator status (probability of occurrence in wetlands), in accordance with the U.S. Fish and Wildlife Service National List of Vascular Plant Species that Occur in Wetlands: Northeastern (NE) Region (Region 1) (US FWS, 1988) (Table 7.36). Indicators for the NE Region were used, as the flora and climate regime of this region is most similar to NS. The Flora of Nova Scotia (Zinck, 1998) was also reviewed for further information about plant associations with wetlands.

Table 7.36: Classification of Wetland-Associated Plant Species[1]

Plant Indicator Status	Abbreviation[2]	Probability of Occurring in Wetland
Obligate	OBL	> 99%
Facultative Wetland	FACW	66 to 99%
Facultative	FAC	33 to 66%
Facultative Upland	FACU	1 to 33%
Upland	UPL	< 1%
No indicator status	NI	Insufficient information to determine status
Not listed (assumed upland species)	NL	Does not occur in wetlands in any region.

[1] Source: (US FWS, 1988)
[2] A ‘+’ or ‘-’ symbol can be added to the classification to indicate greater or lesser probability, respectively, of occurrence in a wetland.

If the majority (greater than 50%) of the dominant vegetation at a data point is classified as obligate (OBL), facultative wetland (FACW), or facultative (FAC), then the location of the data point is considered to be dominated by hydrophytic vegetation.

Identification of Hydric Soils

A hydric soil is formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper layer (USDA NRCS, 2003). Indicators of the presence of hydric soils include soil colour (gleyed soils and soils with bright mottles and/or low matrix chroma), aquic or preaquic moisture regimes, reducing soil conditions, sulfidic material (odour), soils listed on the hydric soils list, iron and manganese concretions, organic soils (histosols), histic epipedons, high organic content in the surface layer of sandy soils, and organic streaking in sandy soils.

During field surveys, soil pits were excavated to a maximum depth of 40 cm or until (auger) refusal. The soil in each pit was then examined for hydric soil indicators. The matrix colour and mottle colour (if present) of the soil were determined using Munsell Soil Colour Charts.

Identification of Wetland Hydrology

Wetland habitat, by definition, has a water table either periodically or permanently at, near, or above the land surface. To be classified as a wetland, an area must have at least one primary indicator or two secondary indicators of wetland hydrology (Table 7.37). Wetland habitat is assessed for signs of hydrology through visual observations of the area and through the assessment of soil pits.

Table 7.37: Indicators of Wetland Hydrology

Examples of Primary Indicators	Examples of Secondary Indicators
Surface water	Oxidized root channels in the upper 30 cm
Saturation	Local soil survey data
Sediment deposition	Dry season water table
Drainage patterns	Stunted or stressed plants
Water-stained leaves	Drainage patterns
Sparsely vegetated concave surfaces	Surface soil cracks
Hydrogen sulfide odour	Moss trim lines

Source: (Environmental Laboratory, 1987)

Functional Assessments

Wetland functional assessments were completed for all wetlands identified within the Assessment Area during the 2024 and 2025 growing seasons. Functional assessments were completed using the Wetland Ecosystem Services Protocol - Atlantic Canada (WESP-AC) evaluation technique Version 2 (2024 surveys) and 3.4 (2025 surveys) (Adamus, 2021, 2025). The WESP-AC process involves the completion of three forms; a desktop review portion (office form) that examines the landscape context within which the wetland is situated, and two field forms to identify biophysical characteristics (field form) and stressors to the wetland (stressor form), if any. The process serves as a rapid method for assessing individual wetland functions and values. WESP-AC addresses 17 specific functions that wetlands may provide (Table 7.38).

Specific wetland functions are individually allocated into grouped wetland functions and measured for “function” and “benefit” scores. Wetland function relates the wetland’s natural ability (e.g., water storage), whereas wetland benefits are beneficial aspects of these functions, whether it is ecological, social, or economic. The highest functioning wetlands are those that have both high function and benefit scores for a given function. WESP-AC enables a comparison to be made between individual wetlands within a province to gain a sense of the importance each has in providing ecosystem services.

Table 7.38: WESP-AC Function Parameters

Grouped Wetland Function	Specific Wetland Functions
Hydrologic function	Surface water storage
Aquatic support	Aquatic invertebrate habitat
	Stream flow support
	Organic nutrient export
	Water cooling
Water quality	Sediment retention and stabilization
	Phosphorus retention
	Nitrate removal and retention
	Carbon sequestration
Aquatic habitat	Anadromous fish habitat
	Resident fish habitat
	Waterbird feeding habitat
	Waterbird nesting habitat
	Amphibian and turtle habitat
Terrestrial habitat	Songbird, raptor, and mammal habitat
	Pollinator habitat
	Native plant habitat

In addition to the grouped wetland functions above, WESP-AC also measures the following specific wetland functions; however, these are only evaluated by their benefit scores:

- Wetland condition
- Wetland risk (i.e., sensitivity to potential impacts)

The following individual functions are assessed to determine the benefit scores associated with each wetland:

- Public use and recognition
- Wetland sensitivity
- Wetland ecological condition
- Wetland stressors

For each wetland evaluated, the WESP-AC process calculates the overall score for the seven grouped wetland functions and the 17 specific wetland functions listed in Table 7.33. One score each is provided for function and benefit. Scores are ranked as “lower”, “moderate”, or “higher”, allowing for analysis of the wetland as compared to calibrated baseline wetland scores in NS to date. A WESP-AC score of “higher” means that the wetland has a greater capacity to support those processes as compared to other wetlands in the province. A WESP-AC score of “higher” in both the function and benefits category means the wetland supports the natural ecosystem functions and provides services of potential societal importance.

Additionally, the WESP-AC process assesses wetlands for a determination of WSS based on the functional results. The grouped functions outlined in Table 7.38 are further combined into “supergroups” for habitat (aquatic habitat and transition habitat) and support (hydrologic support, water quality support and aquatic support) functions. WSS designation is dependant on a certain combination of “moderate” and “high” scores within these groups.

The WESP-AC functional evaluation technique recognizes that, in many cases, delineation of entire wetlands where they extend beyond an Assessment Area is not always feasible (e.g., access restrictions) or required to complete an appropriate assessment using this tool (Adamus, 2018b). Instead, WESP-AC permits the delimitation of an assessed area, defined as the wetland or portion of wetland physically assessed in the field, while the office form considers the broader landscape characteristics and functions that extend beyond the assessed area and/or Assessment Area.

7.3.3.5 Field Assessment Results

General

Field surveys identified 83 wetlands that overlap with the Assessment Area (Drawings 7.15A-D). Detailed results and representative photos for all wetlands assessed in-season are found in Appendix J. Many of the wetlands identified within the footprint of the Facility showed evidence of disturbance or are the result of past activities on site, and many had been cleared as part of site development activities for the Goldboro LNG Facility. Additionally, high levels of contamination were noted in soils, sediments and water as a result of historic mining activities, as outlined in Section 3.4.1.2.

The most prominent wetland type identified was swamps, with 70 identified, including complexes made up of swamp components. The Canadian Wetland Classification System (NWWG, 1997) defines a swamp as a wetland characterized by the dominance of woody vegetation in which the water table is typically at or near the surface or inundates the soil for a significant portion of the growing season. Swamps are often associated with poorly drained or saturated soils and provide important habitat for various plant and animal species adapted to wet conditions. Swamps can be further sub-divided into treed swamps or shrub swamps, depending on their physiological makeup.

Of the identified swamps, 47 were classified as treed swamps (or treed swamp complexes). Treed swamps are characterized by an environment that is not as waterlogged as other wetland types, such as shrub swamps or marshes, and typically experience their highest hydroperiod during spring and fall precipitation events (NSNR, 2018b). As a result, treed swamps provide deciduous trees (e.g., red maple and yellow birch) and coniferous trees (e.g., black spruce and balsam fir) the opportunity to establish and adapt to the inconsistent inundation periods (NSNR, 2018b). Species typical of treed swamps within the Assessment Area were cinnamon fern (*Osmundastrum cinnamomeum*), bristly dewberry (*Rubus hispidus*), soft rush (*Juncus effusus*), goldthread (*Coptis trifolia*), northern wild raisin (*Viburnum cassinoides*), black spruce (*Picea mariana*), balsam fir (*Abies balsamea*), and red maple (*Acer rubrum*). Surface water was observed relatively equally in treed swamps and in shrub swamps. Hydrological indicators such as saturation and a high table were often present during soil pit assessments.

A total of 34 wetlands identified within the Assessment Area were shrub swamps (or shrub swamp complexes). Shrub swamps tend to form in permanently or seasonally flooded areas where the surface is moist from ground saturation. The species typically observed in shrub swamps within the Assessment Area included common Labrador tea (*Rhododendron groenlandicum*), sweet gale (*Myrica gale*), sheep laurel (*Kalmia angustifolia*), northern wild raisin, mountain holly (*Ilex mucronata*), and alders (*Alnus* spp.).

In many cases, shrub swamps eventually transition into treed swamps via succession (NSNR, 2018b). This process may result in wetland complexes comprised of areas of treed swamp and shrub swamp within one contiguous wetland. Within the Assessment Area, eight such treed swamp/shrub swamp wetland complexes were identified.

Seven bogs were observed within the Assessment Area. Bogs are characterized by their poor drainage, accumulation of peat, and dense coverage of either sphagnum moss or grass-like sedges (NSNR, 2018b). Additionally, one wetland complex containing a bog component and a treed/shrub swamp component was identified. Species typical of bogs in the Assessment Area included tawny cotttongrass (*Eriophorum virginicum),* sheep laurel, small cranberry (*Vaccinium oxycoccos*), bog rosemary (*Andromeda polifolia*), and black spruce.

Four fens were observed within the Assessment Area. Fens are characterized by an accumulation of peat and are ground or surface water-fed. Typically, where the water table is at the surface, sedges and moses are the dominant vegetation, whereas shrubby trees such as tamarack and willow are dominant in drier areas (NSNR, 2018b). Four wetland complexes containing a fen and swamp component were also identified. Species observed in fens included fowl manna grass (*Glyceria striata*), three-seeded sedge (*Carex trisperma*), common woolly bulrush (*Scirpus cyperinus*), tawny cottongrass, and speckled alder (*Alnus incana*),

Two marshes were observed within the Assessment Area. Marshes are characterized by fluctuating water levels and high nutrient levels, which result in high vascular plant productivity and high decomposition rates. Emergent aquatic plants are the dominant vegetation type

(NSNR, 2018b). Species typical of marshes in the Assessment Area included jointed rush (*Juncus articulatus*), common woolly bulrush (*Scirpus cyperinus*), broad-leaved cattail (*Typha latifolia*), and bog aster (*Oclemena nemoralis*).

Functional Assessments

Functional assessments were completed in-season by Strum wetland specialists for 83 wetlands within the Assessment Area. Results for each wetland are summarized in Table 7.39 and further detailed in Appendix J (raw WESP-AC files can be provided to NSECC upon request). None of the field-delineated wetlands met the criteria for WSS, as dictated by the "Functional WSS Interpretation Results" within the WESP-AC spreadsheet calculator. The results of the wetland field assessments were also cross-referenced with breeding bird, vegetation, and lichen survey results to further identify the potential for a WSS designation.

Table 7.39: Summary of WESP-AC Version 2.0 and 3.4 for Wetlands within the Assessment Area

Wetland ID	Wetland Type	Ratings for Grouped Functions (Function; Benefit)				
		Hydrologic	Water Quality Support	Aquatic Support	Aquatic Habitat	Transition Habitat
WL1	Treed swamp	Lower; Moderate	Moderate; Moderate	Higher; Moderate	Moderate; Moderate	Higher; Lower
WL2	Treed swamp	Higher; Lower	Higher; Moderate	Higher; Lower	Lower; Lower	Higher; Lower
WL3	Treed swamp	Higher; Moderate	Higher; Lower	Higher; Lower	Lower; Lower	Higher; Lower
WL4	Treed swamp	Higher; Lower	Higher; Lower	Higher; Lower	Lower; Lower	Higher; Lower
WL5	Treed swamp	Higher; Moderate	Higher; Lower	Higher; Lower	Lower; Lower	Moderate; Lower
WL6	Bog	Lower; Moderate	Moderate; Lower	Higher; Moderate	Moderate; Moderate	Higher; Lower
WL7	Treed swamp; Shrub swamp	Lower; Moderate	Moderate; Lower	Higher; Moderate	Moderate; Moderate	Higher; Lower
WL8	Shrub swamp	Lower; Moderate	Moderate; Lower	Higher; Moderate	Moderate; Moderate	Higher; Lower
WL9	Shrub swamp; Treed swamp	Moderate; Lower	Moderate; Moderate	Higher; Moderate	Lower; Lower	Higher; Lower
WL10	Treed swamp	Higher; Lower	Higher; Moderate	Higher; Lower	Lower; Lower	Higher; Lower
WL11	Shrub swamp; Fen; Treed swamp	Lower; Lower	Moderate; Moderate	Higher; Moderate	Moderate; Moderate	Higher; Lower
WL12	Shrub swamp	Higher; Lower	Higher; Lower	Higher; Lower	Lower; Lower	Higher; Lower
WL13	Shrub swamp	Lower; Lower	Moderate; Moderate	Higher; Moderate	Moderate; Moderate	Higher; Lower
WL14	Shrub swamp	Higher; Lower	Higher; Lower	Higher; Lower	Lower; Lower	Higher; Lower

Wetland ID	Wetland Type	Ratings for Grouped Functions (Function; Benefit)				
		Hydrologic	Water Quality Support	Aquatic Support	Aquatic Habitat	Transition Habitat
WL15	Treed swamp; Shrub swamp	Higher; Lower	Higher; Lower	Higher; Lower	Lower; Lower	Higher; Lower
WL16	Shrub swamp; Treed swamp	Moderate; Lower	Higher; Moderate	Moderate; Lower	Moderate; Moderate	Moderate; Lower
WL17	Treed swamp; Shrub swamp; Bog	Moderate; Lower	Higher; Lower	Higher; Lower	Moderate; Moderate	Higher; Lower
WL18	Bog	Lower; Lower	Moderate; Lower	Higher; Lower	Moderate; Moderate	Moderate; Lower
WL19	Marsh	Lower; Moderate	Moderate; Moderate	Higher; Moderate	Higher; Moderate	Higher; Lower
WL20	Shrub swamp	Moderate; Moderate	Higher; Moderate	Higher; Lower	Moderate; Moderate	Higher; Lower
WL21	Treed swamp; Shrub swamp	Lower; Lower	Higher; Moderate	Higher; Lower	Lower; Lower	Higher; Lower
WL22	Shrub swamp	Higher; Lower	Higher; Lower	Higher; Lower	Lower; Lower	Higher; Lower
WL23	Marsh	Moderate; Lower	Higher; Lower	Higher; Lower	Moderate; Moderate	Higher; Lower
WL24	Fen	Lower; Moderate	Moderate; Moderate	Higher; Moderate	Moderate; Moderate	Higher; Lower
WL25	Shrub swamp	Lower; Lower	Moderate; Lower	Higher; Moderate	Higher; Moderate	Higher; Lower
WL26	Shrub swamp	Lower; Lower	Lower; Moderate	Moderate; Moderate	Moderate; Moderate	Moderate; Lower
WL27	Shrub swamp; Treed swamp	Higher; Lower	Higher; Lower	Higher; Lower	Lower; Lower	Moderate; Lower
WL28	Shrub swamp	Lower; Lower	Moderate; Lower	Higher; Moderate	Moderate; Moderate	Higher; Lower
WL29	Fen	Lower; Lower	Moderate; Moderate	Higher; Lower	Moderate; Moderate	Moderate; Lower
WL30	Shrub swamp	Higher; Lower	Higher; Lower	Higher; Lower	Lower; Lower	Higher; Lower
WL31	Shrub swamp	Moderate; Lower	Higher; Moderate	Moderate; Lower	Moderate; Moderate	Moderate; Lower
WL32	Shrub swamp	Moderate; Lower	Higher; Moderate	Moderate; Lower	Moderate; Moderate	Higher; Lower
WL33	Treed swamp	Higher; Moderate	Higher; Moderate	Moderate; Lower	Lower; Lower	Moderate; Lower
WL34	Treed swamp; Shrub swamp	Higher; Moderate	Higher; Moderate	Higher; Lower	Moderate; Lower	Moderate; Lower
WL35	Bog	Higher; Moderate	Higher; Lower	Moderate; Lower	Lower; Lower	Moderate; Lower

Wetland ID	Wetland Type	Ratings for Grouped Functions (Function; Benefit)				
		Hydrologic	Water Quality Support	Aquatic Support	Aquatic Habitat	Transition Habitat
WL36	Shrub swamp	Moderate; Lower	Higher; Moderate	Higher; Lower	Moderate; Moderate	Moderate; Lower
WL37	Shrub swamp; Fen	Lower; Higher	Higher; Moderate	Higher; Moderate	Higher; Moderate	Higher; Lower
WL38	Shrub swamp	Higher; Lower	Higher; Lower	Higher; Lower	Lower; Lower	Moderate; Lower
WL39	Fen	Moderate; Moderate	Higher; Moderate	Moderate; Lower	Moderate; Moderate	Moderate; Lower
WL40	Treed swamp	Lower; Lower	Moderate; Moderate	Higher; Lower	Moderate; Moderate	Higher; Lower
WL41	Fen	Lower; Lower	Moderate; Higher	Higher; Moderate	Higher; Moderate	Moderate; Lower
WL42	Shrub swamp; Fen	Moderate; Lower	Higher; Moderate	Moderate; Lower	Lower; Lower	Higher; Lower
WL43	Shrub swamp	Lower; Lower	Moderate; Higher	Higher; Lower	Lower; Lower	Higher; Lower
WL44	Treed swamp; Shrub swamp	Higher; Lower	Higher; Moderate	Higher; Lower	Lower; Lower	Higher; Lower
WL45	Treed swamp	Higher; Moderate	Higher; Moderate	Higher; Lower	Moderate; Lower	Higher; Lower
WL46	Treed swamp	Higher; Moderate	Higher; Moderate	Higher; Lower	Moderate; Lower	Moderate; Lower
WL47	Shrub swamp	Higher; Lower	Higher; Moderate	Higher; Lower	Lower; Lower	Higher; Lower
WL48	Shrub swamp; Treed swamp; Fen	Lower; Lower	Moderate; Lower	Higher; Higher	Higher; Moderate	Higher; Lower
WL49	Treed swamp	Lower; Lower	Moderate; Higher	Higher; Moderate	Higher; Moderate	Higher; Lower
WL50	Treed swamp	Higher; Lower	Higher; Moderate	Higher; Lower	Lower; Lower	Moderate; Lower
WL51	Treed swamp	Moderate; Lower	Higher; Moderate	Higher; Lower	Lower; Lower	Moderate; Lower
WL52*	Treed swamp	Moderate; Lower	Higher; Moderate	Moderate; Lower	Higher; Higher	Higher; Higher
WL53*	Treed swamp	Moderate; Lower	Higher; Lower	Lower; Lower	Moderate; Higher	Higher; Higher
WL54*	Bog	Higher; Lower	Higher; Lower	Lower; Lower	Moderate; Moderate	Higher; Higher
WL55*	Treed Swamp	Higher; Lower	Higher; Lower	Moderate; Lower	Moderate; Lower	Moderate; Higher
WL56*	Treed Swamp	Higher; Higher	Higher; Moderate	Lower; Higher	Higher; Moderate	Moderate; Higher

Wetland ID	Wetland Type	Ratings for Grouped Functions (Function; Benefit)				
		Hydrologic	Water Quality Support	Aquatic Support	Aquatic Habitat	Transition Habitat
WL57*	Treed swamp	Higher; Lower	Higher; Lower	Lower; Lower	Moderate; Lower	Higher; Higher
WL58*	Treed swamp	Higher; Lower	Higher; Lower	Lower; Lower	Moderate; Lower	Higher; Higher
WL59*	Treed Swamp	Higher; Moderate	Higher; Lower	Lower; Lower	Moderate; Lower	Moderate; Higher
WL60*	Treed Swamp	Moderate; Lower	Higher; Lower	Moderate; Moderate	Higher; Lower	Moderate; Higher
WL61*	Treed Swamp	Moderate; Moderate	Higher; Lower	Moderate; Moderate	Moderate; Lower	Moderate; Higher
WL62*	Shrub Swamp	Lower; Moderate	Moderate; Lower	Higher; Moderate	Higher; Higher	Higher; Higher
WL63*	Shrub Swamp	Moderate; Moderate	Higher; Lower	Moderate; Moderate	Higher; Lower	Moderate; Higher
WL64*	Shrub Swamp	Moderate; Moderate	Higher; Lower	Moderate; Moderate	Moderate; Lower	Moderate; Higher
WL65*	Treed Swamp	Higher; Higher	Higher; Lower	Lower; Moderate	Moderate; Moderate	Higher; Higher
WL66	Shrub swamp	Lower; Lower	Moderate; Lower	Higher; Lower	Moderate; Moderate	Higher; Lower
WL67*	Treed Swamp	Higher; Higher	Higher; Lower	Lower; Moderate	Higher; Moderate	Higher; Higher
WL68*	Treed Swamp	Higher; Higher	Higher; Lower	Lower; Moderate	Moderate; Moderate	Higher; Higher
WL69*	Treed Swamp	Higher; Higher	Higher; Lower	Lower; Moderate	Moderate; Moderate	Higher; Higher
WL70*	Bog	Higher; Higher	Higher; Lower	Lower; Moderate	Moderate; Moderate	Higher; Higher
WL71*	Treed Swamp	Higher; Lower	Higher; Lower	Lower; Lower	Moderate; Moderate	Higher; Higher
WL72*	Treed swamp	Higher; Lower	Higher; Lower	Lower; Lower	Moderate; Moderate	Higher; Higher
WL73*	Bog	Higher; Moderate	Higher; Lower	Lower; Moderate	Moderate; Lower	Moderate; Higher
WL74*	Bog	Higher; Moderate	Higher; Lower	Lower; Moderate	Moderate; Lower	Moderate; Higher
WL75*	Treed Swamp	Higher; Moderate	Higher; Lower	Lower; Lower	Moderate; Moderate	Higher; Higher
WL76*	Treed Swamp	Higher; Moderate	Higher; Lower	Lower; Lower	Moderate; Moderate	Higher; Higher
WL77*	Treed Swamp	Higher; Moderate	Higher; Lower	Lower; Lower	Higher; Moderate	Higher; Higher
WL78*	Treed Swamp	Higher; Moderate	Higher; Lower	Lower; Lower	Higher; Moderate	Higher; Higher

Wetland ID	Wetland Type	Ratings for Grouped Functions (Function; Benefit)				
		Hydrologic	Water Quality Support	Aquatic Support	Aquatic Habitat	Transition Habitat
WL79*	Shrub Swamp	Higher; Moderate	Higher; Lower	Lower; Lower	Higher; Moderate	Higher; Higher
WL80*	Treed swamp	Higher; Moderate	Higher; Lower	Lower; Lower	Moderate; Moderate	Higher; Higher
WL81*	Treed swamp	Higher; Moderate	Higher; Lower	Lower; Lower	Higher; Moderate	Higher; Higher
WL82*	Treed swamp	Higher; Moderate	Higher; Lower	Lower; Lower	Moderate; Moderate	Higher; Higher
WL83*	Treed swamp	Higher; Moderate	Higher; Lower	Lower; Lower	Moderate; Lower	Higher; Higher

* Indicates WESP-AC Version 3.4

Hydrological Group

The hydrologic group evaluates the effectiveness of a wetland to store or delay the downslope movement of surface water. However, the model does not account for wetland size, and in turn, the ability of larger wetlands to store more water than smaller wetlands. Wetlands that have the highest function scores within this group tend to lack surface water outlets, and instead, are isolated from flowing surface water, whereas high benefit scores may be associated with developed areas where water storage is more valuable to reduce flood risks.

Most wetlands in the Assessment Area had a higher function score (53%) and a lower benefit score (54%). Although 44 (53%) wetlands had a higher function score, only seven wetlands had a higher benefit score. This indicates that although the functionality of some wetlands is generally high, this is not unique as compared to other wetlands on the broader landscape.

Water Quality Group

The water quality group is compiled from four different functions: sediment retention and stabilization; phosphorus retention; nitrate removal; carbon sequestration. The main function of this group is to evaluate the wetland's potential to intercept, retain, and filter sediments, particulates, and organic matter. Similar to the hydrologic group, the wetlands that have the higher function score in this regard include those that do not have a surface water outlet and instead are isolated from flowing surface water. This model also does not account for wetland size and as such, larger wetlands do not necessarily score higher than small wetlands, although size may factor into this function.

The majority of wetlands in the Assessment Area had a higher (75%) function score, and a lower (60%) benefit score. The higher function scores are likely associated with wetlands that lack a connection to flowing surface water, while the lower benefit scores may be attributable to the small size of the wetlands compared to their catchment sizes, which limits the potential benefits of the water purification function within this group. The lower benefit score indicates that these wetlands, although highly functioning, are not unique when compared to others on the broader landscape.

Aquatic Support Group

The aquatic support group comprises four individual functions: stream flow support; aquatic invertebrate habitat; organic nutrient export; and water cooling. The main function of this group is to determine the wetland's ability to support ecological stream functions that promote habitat health. Wetlands lying adjacent to or containing flowing water score higher than those that do not (e.g., isolated wetlands). Additionally, headwater wetlands are crucial for supporting stream flow during the dry season by contributing to water flow via groundwater input and storage capacity. Headwater wetlands provide stream flow and cooling functions due to their typically limited exposed surface water, insulating properties and groundwater water storage and retention time. Treed swamps can also provide aquatic support through groundwater discharge (e.g., seeps) and vegetation shading.

The majority of wetlands within the Assessment Area had a higher function score (54%), which may be associated with the high proportion of wetlands with a swamp component (84%). The majority of wetlands; however, had a lower benefit score (65%), likely due to the isolated nature of wetlands and/or the presence of other high functioning wetlands on the landscape.

Aquatic Habitat Group

The aquatic habitat group is compiled from five different functions: anadromous fish habitat, resident fish habitat, amphibian and turtle habitat, waterbird feeding habitat, and waterbird nesting habitat. Wetlands that have the higher functions within this group include those that are adjacent to or contain water features with potential habitat characteristics (e.g., in-stream cover, aquatic vegetation, etc.).

The majority of wetlands received moderate function scores (55%) and benefit scores (53%), whereas only 18% of wetlands received a higher function score. Although the majority of wetlands were isolated from surface water, these results may be skewed slightly negatively; aquatic habitat appeared to be relatively poor in many wetlands during field assessments, however it was later determined that some of these wetlands are connected to fish-bearing streams (see Section 7.3.2 Fish and Fish Habitat).

Transition Habitat Group

The transition habitat group comprises three different functions: songbird, raptor, and mammal habitat; native plant habitat; and pollinator habitat. The main function of the collective group is to evaluate the wetland's ability to support healthy habitat for birds, mammals, and native plants.

All wetlands received a moderate (31%) or higher (69%) function score. In general, the wetlands assessed provide habitats that support a variety of flora and fauna, including downed wood, prevalent ground cover, varied microtopography, tree and shrub cover in and around the wetlands, and naturally vegetated buffer zones. However, due to the relatively disturbed and fragmented habitat present within the Assessment Area, many wetlands received a lower benefit score (63%) for the transitional habitat group. This indicates that these wetlands are not unique when compared to others across the broader landscape.

Wetland Condition and Risk

In addition to function and benefit scores for grouped wetland functions, wetland condition and risk scores are also available for the 52 wetlands assessed using WESP-AC Version 2.0 (i.e., wetlands assessed in 2024). These wetlands include WL1 to WL51, and WL66, most of which are located in the central portion of the Assessment Area where the Facility will be located.

Wetland condition refers to the integrity or health of a wetland as defined by its vegetative composition and richness of native species. Scores are derived from the similarity between the wetland being evaluated and reference wetlands of the same type and landscape setting (Adamus, 2021). Wetlands scoring moderate to higher carry a relatively good range of vegetative community health and natural functions. Higher scoring wetlands may have greater ecological integrity, microhabitats, species diversity, etc., while lower scoring wetlands may have lost their function and integrity due to historical natural or anthropogenic impacts.

Most wetlands assessed with WESP-AC Version 2.0 scored moderate or higher for wetland condition (Table 7.40).

Table 7.40: Summary of Wetland Condition Benefit Scores for Wetlands Assessed in 2024

Benefit		
Lower	**Moderate**	**Higher**
n = 14 (27%)	n = 17 (33%)	n = 21 (40%)

Note: The numbers presented in this table indicate the total number of wetlands, not the wetland IDs
Only wetland benefits, not functions are scored in this group.

Wetland risk accounts for sensitivity and stressors by averaging conditions of the two characteristics. Sensitivity refers to a wetlands' lack of intrinsic resistance and resilience to human or naturally caused stress (Niemi et al., 1990). Stress relates to the degree to which a wetland is or has recently been anthropogenically altered in a way that degrades natural condition and/or function. The functional assessment tool uses five metrics to measure sensitivity: abiotic resistance, biotic resistance, site fertility, availability of colonizers, and growth rate. The model applies four stress groups: hydrologic stress, water quality stress, fragmentation stress, and general disturbance stress. Wetlands that are highly resilient may have lower risk scores despite their exposure to multiple stressors. Additionally, wetlands exposed to fewer threats, but with low resilience may have higher risk scores. Wetland resilience is tied to multiple factors, such as size, proximity to natural land cover, and presence of invasive species.

Most of the wetlands assessed with WESP-AC Version 2.0 scored moderate (42% of wetlands) or higher (54% of wetlands) for wetland risk (Table 7.41), indicating they have greater resilience and are not highly susceptible to change. Two wetlands scored lower, indicating they have greater risk and susceptibility to anthropogenic impacts.

Table 7.41: Summary of Wetland Risk Benefit Scores

Benefit		
Lower	**Moderate**	**Higher**
n = 2 (4%)	n = 22 (42%)	n = 28 (54%)

Note: The numbers presented in this table indicate the total number of wetlands, not the wetland IDs
Only wetland benefits, not functions are scored in this group.

Wetlands of Special Significance (WSS)

A review of SAR identified through plant, lichen and avifauna surveys was completed and compared to field delineated wetlands to identified potential Wetlands of Special Significance based on the presence of SAR.

No wetlands were flagged as WSS based on the results of field surveys or the Functional WSS Interpretation Results in WESP-AC.

7.3.3.6 Effects Assessment

Project-Wetland Interactions

Project activities, primarily those that involve earth moving or vegetation removal, have the potential to impact wetlands through habitat removal, disruptions to hydrology, and/or displacement of sediment (Table 7.42).

Table 7.42: Potential Project-Wetland Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Water Pipeline and Roadway Construction	X
Facility Foundation Construction	X
Transportation of Facility Components	-
Facility Assembly	-
Utility Connections	X
Removal of Temporary Works and Site Restoration	X
Operations and Maintenance	
Commissioning	-
Handling of Biomass	-
Production of SAF and Other Products	-
Product Storage	-
Vegetation Management	X
Decommissioning and Rehabilitation	
Infrastructure Removal	-
Site Reclamation	X

Assessment Boundaries

The LAA for wetlands is 5 km of the Assessment Area and extends into the secondary watersheds containing the Project (Drawing 7.18). The RAA for wetlands is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for wetlands. The VC-specific definition for magnitude is as follows:

- Negligible: No direct loss of wetland habitat or alteration to wetland functions expected.
- Low: Direct loss of wetland habitat, but overall wetland functions remain intact.
- Moderate: Direct loss of wetland habitat and impact to wetland functions, but wetland area loss will not impact the hydrology of the wetland's watershed and/or the impacted wetland areas are not part of a WSS.
- High: Direct loss of wetland habitat and impact to wetland functions; and wetland area loss will affect the hydrology of the wetland's watershed and/or the impacted wetland areas are part of a WSS.

Direct/Indirect Effects

Effects to wetlands include both habitat loss and changes in wetland functionality and can occur throughout the life of the Project. Effects may be direct (e.g. habitat loss through infilling) or indirect (e.g. changes to functionality due to hydrologic shifts). Effect-specific active management, mitigation, and monitoring are required to eliminate, mitigate, or otherwise manage the magnitude of direct effects.

Habitat Loss

Habitat loss may occur both directly (i.e., excavation or infilling) and indirectly (i.e., altered hydrology or canopy cover) as a result of the Project (Trombulak & Frissell, 2000). Loss of habitat can fragment wildlife corridors, potentially isolating species and lowering species richness. Habitat loss can also disrupt vital habitat characteristics that support vulnerable species, including rare lichens. Further, the removal or infilling of wetland habitat can impact the hydroperiod of neighbouring wet areas, resulting in farther reaching impacts on habitat characteristics (Mitsch & Gosselink, 2000).

Direct Loss

Direct loss is most likely to occur during Project construction through infilling or excavation of wetland habitat. Of the 83 wetlands that were identified either within or overlapping with the Assessment Area, 72 may require direct impacts as a result of Project construction activities. The Project Footprint was designed to optimize the placement of Project Infrastructure to avoid and minimize loss of wetland area and function, to the greatest extent possible. A summary of the wetlands identified within the Assessment Area and how they may be affected by the Project is provided in Table 7.43 and shown on Drawings 7.15A-D. The estimate of potential alteration was evaluated by the Project Footprint boundary.

Table 7.43: Habitat Alteration for Wetlands within the Assessment Area

ID	Wetland Type	Delineated Area (m^2)	Estimated Area of Potential Alteration (m^2)[1]	% Impact	Activity
WL1	Treed swamp	343,900	6,032	2	Facility
WL2	Treed swamp	3,875	0	0	Facility
WL3	Treed swamp	2,711	0	0	Facility
WL4	Treed swamp	5,362	0	0	Facility
WL5	Treed swamp	3,670	0	0	Facility
WL6	Bog	561	0	0	Facility
WL7	Treed swamp; Shrub swamp	2,812	0	0	Facility
WL8	Shrub swamp	917	0	0	Facility
WL9	Shrub swamp; Treed swamp	2,198	0	0	Facility
WL10	Treed swamp	3,244	3,238	100	Facility
WL11	Shrub swamp; Fen; Treed swamp	48,302	48,246	100	Facility
WL12	Shrub swamp	483	483	100	Facility
WL13	Shrub swamp	2,467	2,221	90	Facility
WL14	Shrub swamp	1,586	1,586	100	Facility
WL15	Treed swamp; Shrub swamp	465	465	100	Facility
WL16	Shrub swamp; Treed swamp	7,228	6,304	87	Facility
WL17	Treed swamp; Shrub swamp; Bog	5,2386	43,199	82	Facility
WL18	Marsh	2,987	2,592	87	Facility
WL19	Marsh	3,791	2,452	67	Facility
WL20	Shrub swamp	684	684	100	Facility
WL21	Treed swamp; Shrub swamp	156	57	36	Facility
WL22	Shrub swamp	202	201	99	Facility
WL23	Marsh	436	436	100	Facility
WL24	Fen	1,881	1,343	71	Facility
WL25	Shrub swamp	2,699	158	6	Facility
WL26	Shrub swamp	2,007	1,013	62	Facility
WL27	Shrub swamp; Treed swamp	1,217	1,217	100	Facility
WL28	Shrub swamp	2,519	1,875	74	Facility
WL29	Fen	3,718	0	0	Facility

ID	Wetland Type	Delineated Area (m^2)	Estimated Area of Potential Alteration (m^2)[1]	% Impact	Activity
WL30	Shrub swamp	1,820	1,820	100	Facility
WL31	Shrub swamp	4,289	4,289	100	Facility
WL32	Shrub swamp	2,144	2,144	100	Facility
WL33	Treed swamp	380	380	100	Facility
WL34	Treed swamp; Shrub swamp	7,879	7,878	100	Facility
WL35	Bog	3,799	3,798	100	Facility
WL36	Shrub swamp	3,573	3,573	100	Facility
WL37	Shrub swamp; Fen	10,452	8,751	84	Facility
WL38	Shrub swamp	1,381	1,381	100	Facility
WL39	Fen	2293.93	415	18	Facility
WL40	Treed swamp	1,682	1,682	100	Facility
WL41	Treed swamp	461	147	32	Facility
WL42	Shrub swamp	304	303	99	Facility
WL43	Shrub swamp	1,130	54	5	Facility
WL44	Treed swamp; Shrub swamp	22,281	13,808	62	Facility
WL45	Treed swamp	3,824	3,824	100	Facility
WL46	Treed swamp	483	483	100	Facility
WL47	Shrub swamp	1,899	1,899	100	Facility
WL48	Shrub swamp; Treed swamp; Fen	210	209	100	Pipeline
WL49	Treed swamp	435	0	0	Pipeline
WL50	Treed swamp	490	490	100	Pipeline
WL51	Treed swamp	169	169	100	Pipeline
WL52	Treed Swamp	1,458	1,108	76	Pipeline
WL53	Treed Swamp	511	506	99	Pipeline
WL54	Bog	1,886	1,886	100	Pipeline
WL55	Treed Swamp	1,009	1,009	100	Pipeline
WL56	Treed Swamp	68	68	100	Pipeline
WL57	Treed swamp	1,109	1,109	100	Pipeline
WL58	Treed swamp	641	641	100	Pipeline
WL59	Treed Swamp	502	502	100	Pipeline
WL60	Treed Swamp	733	733	100	Pipeline
WL61	Treed Swamp	458	458	100	Pipeline
WL62	Shrub Swamp	6,496	4,662	72	Pipeline

ID	Wetland Type	Delineated Area (m^2)	Estimated Area of Potential Alteration (m^2)[1]	% Impact	Activity
WL63	Shrub Swamp	3,871	3,871	100	Pipeline
WL64	Shrub Swamp	1,002	1,002	100	Pipeline
WL65	Treed Swamp	5,626	5,626	100	Pipeline
WL66	Shrub swamp	354	354	100	Pipeline
WL67	Treed Swamp	808	808	100	Pipeline
WL68	Treed Swamp	707	707	100	Pipeline
WL69	Treed Swamp	8,418	6,224	74	Pipeline
WL70	Shrub bog	4,963	4,963	100	Pipeline
WL71	Treed Swamp	10,275	10,275	100	Pipeline
WL72	Treed swamp	7,353	7,352	100	Pipeline
WL73	Bog	22117	2,117	100	Pipeline
WL74	Bog	2,106	2,082	99	Pipeline
WL75	Treed Swamp	3,982	3,982	100	Pipeline
WL76	Treed Swamp	2,609	2,609	100	Pipeline
WL77	Treed Swamp	3,236	3,236	100	Pipeline
WL78	Treed Swamp	426	426	100	Pipeline
WL79	Shrub Swamp	1,807	1,807	100	Pipeline
WL80	Treed swamp	1,082	0	0	Pipeline
WL81	Treed swamp	4,752	4,752	100	Pipeline
WL82	Treed swamp	669	669	100	Pipeline
WL83	Treed swamp	2,310	2,281	99	Pipeline

[1] The area of potential alteration was calculated using the Project Footprint. As the detailed design is completed, the actual area of alteration required to upgrade or construct the Project will be used to determine the precise area of alteration, which is expected to be smaller than the estimates presented here.

The results of the field assessments indicate that there is a potential for 72 project-wetland interactions comprising partial and complete infills to facilitate Project developments for a total impact area of 25.91 ha. The Facility's area is focused to be placed in previously disturbed, cut areas and avoids large wetland complexes. This site has been clearcut and has had mineral exploration and mining completed in the past leaving majority of the proposed Facility area disturbed. Wetlands within the cut areas are younger wetlands where the majority have been created or expanded within the past 50 years. In addition, historic mining activities on the site have resulted in extensive contamination of the area.

During the detailed design phase, efforts will be made to microsite the Facility, associated infrastructure, and the pipeline further away from wetlands to avoid impacts, as is practicable.

Provincial wetland data supplied by NSNR (2021i) was used to estimate the total amount of wetland habitat within the 27,516.30 ha LAA. An estimated 3,011.50 ha of wetland habitat was

identified, which equates to 10.94% of the LAA. As such, field delineated wetland habitat that may be directly impacted by the Project comprises 0.09% of the total area within the LAA and 0.86% of the estimated potential wetland habitat within the LAA.

The largest portion of wetland loss is expected to occur within the Facility footprint (17.14 ha of wetland loss, or 66.15% of the total wetland alteration area), which contains contaminated soils and sediment. Construction activities will allow for the removal and/or containment of contaminants on site, potentially decreasing the distribution of contaminants to nearby ecological receptors.

The remaining wetland alteration is expected to occur along the pipeline route and consists predominantly of partial infills. Current design intentions are to bury the freshwater pipeline. The placement of pipelines through wetlands may block hydrologic connection between wetlands, or result in changes to soil compaction and soil moisture that impact wetland function but may not result in complete wetland loss (Olson & Doherty, 2012; Yu et al., 2010). Although there would be an initial impact to wetland habitat during construction activities, over time, the hydrologic regime of the surrounding soils may result in natural wetland rehabilitation within the pipeline corridor. Methods to maintain that hydrologic connection will be explored during detailed design, including the use of porous materials or changing the depth of pipeline installation in the vicinity of wetlands.

Indirect Loss

Indirect wetland loss generally occurs as a result of construction, but the effects become noticeable during the operation of the Project. Indirect loss of wetland habitat occurs through disruption of the hydrology of a wetland through the redirection of surface and subsurface water to a wetland. The hydrology of a wetland is one of the most important aspects of its overall structure and function. Project Infrastructure within or near a wetland can result in changes in the timing and quantity of flow, potentially impacting species composition, water treatment capabilities, and nutrient export (Mitsch & Gosselink, 2000). Further, disruption to the hydrology of one area may hinder the hydrological connectivity to other areas, thus resulting in impacts to neighbouring wet areas.

Indirect loss may be mitigated through surface water management to ensure that pre-existing hydrologic sources are continuing to feed into a wetland. Based on the area of wetland infilling proposed within the Facility footprint, there is potential for significant shifts in surface water runoff to unimpacted wetlands. Particularly, to the riparian wetlands surrounding WC2 (Betty's Brook), grading and earth works have the potential to redirect water away from this watershed impacting both Betty's Brook (discussed in Section 7.3.1) and hydrologically connected wetlands. Surface water management will consider potential impacts to downstream wetlands and the importance of maintaining hydrologic connectivity within detailed design. As hydrologic impacts are not immediately identified, long-term monitoring is required to evaluate wetland changes post-alteration and are included within the wetland alteration approval process. Often shifts in hydrology on a project site does not result in direct loss, but rather a change in the wetland type and function.

Withdrawal of water from Meadow and Ocean lakes may impact the hydrology of wetlands that are contiguous with the lake itself. The level of impacts to these wetlands are dependent upon the magnitude of water removed from the lakes and the associated changes in surface water levels. If lake water is a significant hydrologic source for the wetlands, lowering water levels in those lakes may result in partial loss of habitat with contiguous wetlands or may result in a shift in wetland type and functionality. Once wetland delineation and hydrologic studies on the lakes are complete and the level of water withdrawal impacts are known, documentation of wetland types will occur, and a thorough assessment of impacts can be evaluated as part of the water withdrawal approval process.

Changes to Wetland Functionality

Changes to wetland functionality may be caused through habitat loss and hydrologic changes, as discussed above, or through other Project activities that may release contamination, dust, sediment or invasive species into the wetland, thus shifting its ecological, chemical and hydrological profiles. The temporal and spatial extent of indirect effects such as erosion and sedimentation, dust, invasive species, and compaction can impact wetlands both directly adjacent to the project as well as further afield. These effects however are often foreseeable, and research based, standardized BMPs can be implemented to mitigate the resulting outcomes. Changes to wetland functionality can be assessed through long-term wetland monitoring to identify biological, hydrologic and physical shifts within a wetland.

Erosion and Sedimentation

Erosion and sedimentation can occur throughout the lifecycle of the Project, including during construction efforts, industrial operations, routine road maintenance, and daily traffic. The accumulation of sediment within wetland environments can cause shifts in ecological integrity, including the plant species composition and subsequent nutrient retention potential, hydrological storage capabilities, and habitat suitability for vulnerable species (Tilman et al., 1997).

Dust

The potential for dust deposition will likely be highest during the construction phase, though the risk will be present throughout the Project's lifecycle. Dust primarily impacts vegetative health, with particle size influencing the scale of the impact (Farmer, 1993). Smaller particulate matter can result in clogged pores, hindering vital biochemical processes including photosynthesis, respiration, and transpiration; and larger particulates can result in lacerations in plant tissues, thus jeopardizing the health of the plant (Farmer, 1993).

Invasive Species

The colonization of invasive species can result in detrimental impacts on wetland environments, including alterations to evapotranspiration rates, infilling from reduced decomposition rates, and ultimately a reduction in the complexity of the wetland and its subsequent species richness (Zedler & Kercher, 2004). The movement of vehicles on site can act as a vector for invasive species, with the potential for seed dispersal increasing with both vehicular and animal traffic. Further, with many invasive species being partial to disturbed soils,

routine maintenance of cleared areas can provide ideal conditions for their establishment (Trombulak & Frissell, 2000).

Compaction

Compaction can hinder both the vegetative and hydrological structure of a wetland, with a loss of pore space restricting root growth and groundwater infiltration (Duiker, 2004). This impacts the absorption of moisture and nutrients, thus impacting the ecological integrity of the wetland and the ecosystem services it provides. Further, compaction can decrease percolation rates, resulting in prolonged periods of saturation, and increasing the potential for flooding (Duiker, 2004).

Contamination

The Project site has high levels of contaminants within both surface soils and aquatic sediments. Construction activities have the potential to release these contaminants through runoff or dust into wetland habitats. Contamination as a result of gold mining can have negative impacts on wetland ecosystem functions, resulting in a decrease in soil nutrients, soil carbon levels, microbial diversity and species richness (Munford et al., 2023). On-site development of the Project footprint will remove or contain contaminants, reducing the release of contaminants into surrounding wetlands and habitat.

Mitigation

To manage the contamination on site, the Risk Management Plan (Wood, 2021) for the Goldboro LNG Project will be updated to reflect the current state of the Assessment Area and proposed activities to be undertaken. Further contaminant related mitigation measures are provided in Section 7.2. A site-specific EMP will be developed to further inform mitigation measures. This EMP will act as a "living document" that incorporates an adaptive management approach to environmental protection and mitigation. Additionally, the following specific mitigative measures will be implemented to avoid and mitigate any potential effects on wetlands.

Habitat Loss

- Flag wetlands to avoid interference with wetland habitat to the extent possible.
- Avoid impacts to wetlands to the extent possible.
    - Where unavoidable, complete wetland alterations in accordance with the NS Wetland Conservation Policy and the wetland alteration process during the permitting stage, which includes a requirement to compensate for lost wetland habitat and functions.
    - Design wetland crossings to occur at the narrow part of the wetland or the wetland's edges, to the extent possible.

Hydrology

- Design wetland crossings to avoid permanent diversion, restriction, or blockage of natural flow, such that hydrologic function of wetlands will be maintained.

- Utilize materials that allow for the flow of water during construction activities where possible.
- Incorporate wetlands within surface water management to maintain hydrologic sources to unimpacted wetlands.

Erosion and Sedimentation

- Develop a site-specific erosion and sedimentation plan during the detail design phase.
    - The plan will address the type of control structures, proper installation techniques, grading, maintenance and inspection, timing of installation, and revegetation.
- Limit the area of exposed soil and the length of time soil is exposed without mitigation (e.g., mulching, seeding, rock cover).
- Avoid travel through wetlands. If travel through wetlands is required:
    - Use anti-rutting mitigation (e.g., mud mats), as appropriate.
    - Cross the wetland at the narrowest portion, where possible.
    - Time work to occur during frozen ground conditions, where possible.
- Avoid surface run-off containing suspended materials or other harmful substances.
- Direct run-off from construction activities away from wetlands.
- Maintain existing vegetation cover, where possible.

Dust Deposition

- Use water or an approved dust suppressant to control dust on roads, as required.
- Enforce site speed limits to minimize dust generation.

Invasive Species

- Use quarried, crushed materials for construction to reduce the introduction of invasive vascular plant species, where possible.
- Prior to arrival on-site equipment will be cleaned and inspected to prevent the introduction of invasive/non-native species.
- Revegetate cleared areas using native seed mixes.

Compaction

- Delineate and flag wetlands to avoid unnecessary compaction within wetlands.
- Train staff on the requirements for work in and around wetlands.

Monitoring

A site-specific post-construction wetland monitoring plan will be developed to facilitate adaptive management and contribute to the safeguarding of ecological integrity and environmental stability. The plan will be provided to NSECC as part of the wetland alteration permitting process and will consist of detailed monitoring and general spot checks. Detailed monitoring will include vegetative, hydrological, and soil assessments within the wetland habitat adjacent to Project. Spot checks will involve a general overview of vegetative, hydrological, and soil conditions, focusing on evidence of significant hydrologic alterations and sedimentation.

Conclusion

Following mitigation, residual effects to wetland habitat and functionality are characterized as follows:

After mitigations, residual effects on wetlands are characterized as follows:

- Magnitude: Moderate as direct loss of wetland habitat will occur throughout the Assessment Area; however, watershed sized shifts are not expected.
- Geographic extent: Within the LAA.
- Frequency: Single event, as the direct activities that will result in potential impacts will occur only during construction activities. Indirect effects related to shift in hydrology will be continuous.
- Duration: Medium-term, as although direct impacts will not extend beyond the duration of the construction phase, indirect effects may be noticeable through the operation phase.
- Reversibility: Partially reversible, as many of the wetlands may naturally rehabilitate upon decommissioning, however, there is expected to be long-term changes to the structure and composition of wetlands.
- Significance: Not significant.

7.4 Terrestrial Environment

7.4.1 Terrestrial Vegetation Communities and Flora

7.4.1.1 Overview

The vegetation community and flora assessment was completed using a combination of desktop and field studies to achieve the following objectives:

- Develop a preliminary understanding of the landscape features, vegetation communities, and flora species within and near the Assessment Area using desktop resources.
- Undertake field surveys to document the range of vegetation communities and flora present within the Assessment Area, with a focus on sensitive and/or uncommon communities and flora SAR and SOCI (and their supporting habitat).
- Use the information collected during field studies to iteratively update the Project design to avoid or minimize interactions between priority vegetation communities / flora and Project components (defined in Section 7.4.1.6).
- Apply mitigation, construction, and operational management practices to minimize the effects of the Project on priority vegetation communities and flora (and their supporting habitat).

7.4.1.2 Regulatory Context

Several laws and regulations provide protection for vegetation communities and rare flora in Nova Scotia. The Silvicultural Guide for the Ecological Matrix (McGrath et al., 2021) and An

Old-Growth Forest Policy for Nova Scotia (NSNR, 2022a) recommend and regulate forestry and forest management practices on provincial Crown land and offer best management practices for forests on private land. The publications provide direction for maintaining forest ecological integrity and identifying and preserving old-growth forests. Old-growth forest stands hold high ecological value and are defined in NS as “area(s) where 20% or more of the basal area is in trees greater than or equal to the reference age for that forest (ecosystem classification vegetation) type” (NSNR, 2022a). The Old-Growth Forest Policy requires no net loss of old-growth forests on Crown land and stipulates development limitations within 100 m of a confirmed old-growth stand.

Flora species that are listed as “Endangered” or “Threatened” receive individual protection from harm and destruction under SARA and/or ESA (including their “habitually occupied spaces”). Protection of SAR habitat is granted through the designation of Critical Habitat and/or Core Habitat. Critical Habitat under SARA refers to specific geographic areas that are identified as essential for the survival or recovery of a species. It is designated for federally Endangered or Threatened species and is enforceable on federal lands. Core Habitat under ESA refers to areas of habitat essential for the long-term survival and recovery of a species. It may be designated on public land (and/or private land where it is deemed that insufficient habitat is available on public land) for provincially Endangered or Threatened species. Restrictions on development are imposed in areas designated as Core or Critical Habitat. Best management practices for SAR are described in federal and provincial species recovery documents, as applicable.

For certain rare and sensitive lichen species, special management practices have been established to limit disturbance to individuals and their supporting habitat on provincial Crown land, as outlined in the At-Risk Lichens–Special Management Practices (NSNR, 2018a). For example, limitations to the type and extent of land development are prescribed within protected and/or restricted zones around the occurrence of certain rare lichens. Additional regulations aim to protect important landscape features such as wetlands (described in Section 7.3.3) that support many plant and lichen SAR and SOCI in Nova Scotia.

Finally, the *Environment Act,* S.N.S. 1994-95, c 1 supports and promotes the protection, enhancement, and use of the provincial environment while maintaining ecosystem integrity and sustainable development. The *Biodiversity Act*, 2021, c. 3, s. 1 provides for the stewardship, conservation, sustainable use, and governance of biodiversity in Nova Scotia.

7.4.1.3 Desktop Review

Several databases were referenced as part of the desktop review to provide an initial understanding of the landscape characteristics, vegetation communities, and flora species present within and near the Assessment Area. The following references were included in the desktop review:

- Ecological Land Classification for Nova Scotia (Neily et al., 2017)
- Provincial Landscape Viewer (NSNR, 2024d)

- Nova Scotia Forest Inventory (NSNR, 2021g)
- Wet Areas Mapping (WAM) (NSECC, 2022b)
- Canopy Height Model (GeoNOVA, 2024a)
- Old-Growth Policy Layer (NSNR, 2024c)
- Old-Growth Potential Index (NSNR, 2023)
- Significant Species and Habitat Database (NSNR, 2024e)
- ACCDC Data Report (ACCDC, 2024a, 2024b)
- Boreal Felt Lichen Habitat Layer (NSNR, 2012b)
- Mersey Tobeatic Research Institute (MTRI) Vole Ears (*Erioderma mollissimum*) and Extant Boreal Felt Lichen (*Erioderma pedicellatum*) GIS Databases (MTRI, 2019a, 2019b)
- SARA Critical Habitat Layers (ECCC, 2025c)

Landscape Characteristics

The Assessment Area falls within the Atlantic and Eastern Coastal Ecoregions of Nova Scotia (Drawing 7.1). The Atlantic Coastal Ecoregion, which includes most of the Assessment Area, is a thin stretch of land along the eastern coast of NS that covers 8.5% of the province. It is highly influenced by its proximity to the cold Atlantic Ocean which leads to a moderate climate, abundant brackish lakes and ponds, and Maritime Boreal ecosites dominated by balsam fir (*Abies balsamea*), black spruce (*Picea mariana*), and white spruce (*Picea glauca*) (Neily et al., 2017). The Eastern Ecoregion covers 11.6% of the province and is characterized by rolling plains of glacial till, granite uplands, large chains of lakes, and streams susceptible to acidification (Neily et al., 2017). Acadian softwood forests in the ecoregion are influenced by stand-level disturbances such as hurricanes and fires.

The majority of the Assessment Area lies within the Eastern Shore Ecodistrict (820) (Drawing 7.1), which flanks the eastern shore of NS from Chedabucto Bay to St. Margaret's Bay. This narrow ecological landscape is highly exposed along the eastern shore and experiences strong winds, extended periods of fog, and a cold climate. Exposed headlands may support conditions associated with Maritime Boreal ecosites as the oceanic influence extends inland until topographical features restrict further penetration. About one fifth of the land area includes sparsely vegetated exposed bedrock occupied by lichens and/or mosses (Neily et al., 2017). Hydric soil is common due to hummocky terrain, shallow soil profiles, and abundant moisture. Even-aged forests are common along the eastern shore, where strong winds and disturbance from insects and disease create opportunities for advanced tree regeneration and limit the potential for old forest development. Natural senescence further promotes the development of even-aged forests, with both softwood and hardwood stands restricted to ages of 100 to 125 years. Maritime Boreal coastal forests dominate this ecodistrict, which are typified by balsam fir, black spruce, and white spruce trees and a shrub layer dominated by regenerating balsam fir, lambkill (*Kalmia angustifolia*), wild raisin (*Viburnum cassinoides*), and American mountain ash (*Sorbus americana*) (Neily et al., 2017).

The northwestern portion of the Assessment Area, including Meadow and Ocean lakes and a portion of the freshwater pipeline corridor, lies within the Eastern Interior Ecodistrict (440)

(Drawing 7.1). The Eastern Interior Ecodistrict is the largest in NS and has an average elevation of only 95 m with gradually rolling topography throughout. Forested areas within this ecodistrict are influenced by the depth of underlying soils. Soil profiles include impoverished shallow soils, deep well-drained soils, and imperfectly to poorly drained soils. The Spruce Pine Forest Group is widely dispersed along nutrient-poor soils in Eastern Interior Ecodistrict; the potential development of old-growth characteristics within this forest group is limited by the natural disturbance regime (e.g., hurricanes, insects, fire). Even-aged black spruce forests with an understory dominated by ericaceous shrubs are common on imperfectly drained soils with hummocky to level terrain, whereas wet open woodlands with limited stocking of trees may occur on poorly drained soils. Non-forested uplands are largely composed of low heathlands with lambkill, rhodora (*Rhododendron canadense*), huckleberry species, and blueberry species most dominant (Neily et al., 2017).

Vegetation Communities

The desktop assessment of vegetation communities included the use of geospatial data to identify the land cover types in the Assessment Area with the goal of understanding the abundance and distribution of major vegetation communities and disturbed areas. Data from the Nova Scotia Forest Inventory (NSNR, 2021g), WAM database (NSECC, 2022b), and Canopy Height Model (GeoNOVA, 2024a) were reclassified, combined, and reviewed for accuracy against high-resolution aerial imagery (July 2022). The resulting layer depicts polygons of generalized land cover types within and near the Assessment Area (Table 7.39; Drawing 7.19A-C).

Much of the Assessment Area has been previously disturbed by land development, including recent vegetation clearing for the construction of the proposed Goldboro LNG Facility. The disturbance history of the area is reflected in the results of land cover modelling that indicates approximately 20% of the Assessment Area consists of disturbed or open cover (sum of the cutover, cutover wetland, open areas, and urban/developed cover classes). Water is the most abundant cover type within the Assessment Area (534.89 ha), with Meadow and Ocean lakes making up much of this area. Softwood forest with the most abundant forest cover type in the Assessment Area. Overall, the proportions of landcover classes within the Assessment Area are comparable to the surrounding region (e.g., within 5 km) with the exception of water (i.e., Meadow and Ocean lakes make up nearly half of the Assessment Area).

Within the Project Footprint (the clearing limits for the Project), land cover consists mainly of open (54.86%) and cutover areas (16.69%). Softwood forest is the main forest cover type (12.54% of the Project Footprint).

Table 7.44: Percent Cover of Predicted Land Cover Types within the Assessment Area

Predicted Land Cover Type	Project Footprint		Assessment Area		Within 5 km of the Assessment Area	
	Hectares	Percent	Hectares	Percent	Hectares	Percent
Cutover[1]	39.64	16.07	44.59	4.33	1,668.98	6.07
Cutover[1] Wetland	1.54	0.62	2.91	0.28	125.1	0.45
Hardwood Forest	0.5	0.2	1.18	0.11	1,521.11	5.53
Hardwood Wet Forest	0	0	0.16	0.02	53.26	0.19
Mixedwood Forest	12.02	4.87	45.38	4.40	2,197.62	7.99
Mixedwood Wet Forest	1.07	0.43	3.55	0.34	164.8	0.60
Open Areas[2]	135.35	54.86	157.67	15.30	3,343.37	12.15
Open Wetland	6.5	2.63	48.39	4.70	2,668.04	9.70
Shrub/Alders	6.33	2.57	20.68	2.01	952.18	3.46
Softwood Forest	30.94	12.54	140.86	13.67	7,796.09	28.33
Softwood Wet Forest	5.5	2.23	24.48	2.38	1,410.87	5.13
Urban/Developed	4.81	1.95	5.55	0.54	510.56	1.86
Water	2.54	1.03	534.89	51.92	5,104.32	18.54
TOTAL	**246.74**	**100.00**	**1030.29**	**100.00**	**27,516.3**	**100.00**

[1]Cutover class represents harvested and/or windthrow/dead forest areas as identified in the provincial Forest Inventory database.
[2]Open areas can include barrens, harvests, wetlands, and other non-forested cover. A review of the land cover classification against aerial imagery indicates that open areas within the Project Footprint almost exclusively include cleared/disturbed areas.

The Old-Growth Policy layer (NSNR, 2024c) and an Old-Growth Potential Index (OGPI) layer provided by NSNR (2023) were reviewed to assess the likelihood of encountering old-growth forests within the Assessment Area. The Old-Growth Forest Policy layer is a database of stands protected under the Old-Growth Forest Policy, whereas the OGPI is a desktop tool intended to guide forest management and land use decisions. The OGPI ranks forest stands from 0 to 11 based on their height in comparison to stands with the same tree cover and ecological site conditions. Stands ranking seven or higher are included in the resulting layer due to their elevated potential to be old growth.

No forest stands protected under the Old-Growth Forest Policy were identified within the Assessment Area. The nearest protected old-growth stands are located north (outside) of the 50 m buffers around Meadow and Ocean lakes. Three forest polygons with an old-growth potential rank ≥ 9 were identified in the OGPI layer as overlapping the Assessment Area on Crown land. Two of these were located along the freshwater pipeline corridor with the third polygon overlapping the Assessment Area in the buffer around Ocean Lake.

A review of the NSNR Significant Species and Habitat Database (NSNR, 2024e) identified no feature records associated with “Significant Areas” within 5 km of the Assessment Area.

Flora Species

Two ACCDC reports (ACCDC, 2024b, 2024a) were prepared for the Project to identify known occurrences of SAR and SOCI within and near the Assessment Area. Data included in the reports are from the combined 5 km areas around the freshwater pipelines, which includes the entire Assessment Area. This area is hereafter referred to as the “ACCDC Study Area”. A total of 16 records of seven vascular flora SOCI, 9 records of two lichen SAR, and 17 records of eight lichen SOCI were identified in the ACCDC Study Area (Drawing 7.20; Table 7.45; Appendix H). The records associated with lichen SAR included: six records of blue felt lichen (*Pectenia plumbea*; SARA “Special Concern” and ESA “Vulnerable”) and three records of boreal felt lichen (*Erioderma pedicellatum,* Atlantic population; SARA and ESA “Endangered”). No records of vascular flora SAR were identified.

The blue felt lichen records in the ACCDC Study Area occurred near Gold Brook Lake and south of the freshwater pipeline to Meadow Lake (> 400 m from the Assessment Area), and on the west side of Meadow Lake (immediately adjacent to the Assessment Area). The three records of boreal felt lichen were associated with species occurrences on the west side of Meadow Lake (> 100 m from the Assessment Area).

Of the flora SOCI records within the ACCDC Study Area, two records are in the Assessment Area: an observation of tree pelt lichen (*Peltigera Collina*; S-Rank “S3”) along the edge of an existing roadway, and a record of Salted Shell Lichen (*Coccocarpia palmicola*; S-Rank “S3S4”) on the western side of Meadow Lake.

Complete ACCDC data reports for the Project, which include species records within 100 km of the Assessment area, are provided in Appendix H.

Table 7.45: ACCDC Plant and Lichen SAR and SOCI Identified within the ACCDC Study Area

Scientific Name	Common Name	COSEWIC	SARA	ESA	NS S-Rank[1]
Vascular Plants					
Agalinis purpurea var. parviflora	Small-flowered purple false foxglove	-	-	-	S2S3
Betula michauxii	Michaux's dwarf birch	-	-	-	S3
Eriophorum gracile	Slender cottongrass	-	-	-	S3
Geocaulon lividum	Northern comandra	-	-	-	S3S4
Polygala sanguinea	Blood milkwort	-	-	-	S3

Scientific Name	Common Name	COSEWIC	SARA	ESA	NS S-Rank[1]
Sparganium hyperboreum	Northern burreed	-	-	-	S2
Spiranthes ochroleuca	Yellow ladies'-tresses	-	-	-	S3?
Lichens					
Cetraria muricata	Spiny heath lichen	-	-	-	S2S3
Coccocarpia palmicola	Salted shell lichen	-	-	-	S3S4
Erioderma pedicellatum (Atlantic pop.)	Boreal felt lichen - Atlantic population	Endangered	Endangered	Endangered	S1
Fuscopannaria ahlneri	Roughened shingle lichen	-	-	-	S3
Fuscopannaria sorediata	A lichen	-	-	-	S2S3
Moelleropsis nebulosa	Blue-gray moss shingle lichen	-	-	-	S2S3
Pectenia plumbea	Blue felt lichen	Special Concern	Special Concern	Vulnerable	S3
Peltigera collina	Tree pelt lichen	-	-	-	S3
Scytinium tenuissimum	Birdnest jellyskin lichen	-	-	-	S2S3
Usnea rubicunda	Red beard lichen	-	-	-	S2S3

[1] Source: (ACCDC, 2025).

Several geospatial resources were reviewed to further assess the potential for encountering rare lichens within and near the Assessment Area and inform the approach for field surveys. Following the direction of the At-risk Lichens - Special Management Practices (NSNR, 2018a) a boreal felt lichen habitat layer provided by NSNR (2012b) was reviewed for areas within 100 m of the Assessment Area identified as having high potential for boreal felt lichen occurrence. The habitat layer for the species was derived from a geospatial model that considered known boreal felt lichen occurrences alongside the species' habitat preferences [e.g., occurrence on balsam fir trees within or adjacent to peatlands that are in close proximity (< 30 km) to the Atlantic Ocean (Cameron & Neily, 2008)]. A total of 30 potential boreal felt lichen habitat features are within 100 m of the Assessment Area, 14 of which are on Crown land. Four records associated with boreal felt lichen were identified in the boreal felt lichen database maintained by MTRI within 5 km of the Assessment Area (MTRI, 2019a). One record is located on the west side of Meadow Lake and represents the same species occurrence described in the ACCDC data reports described above. The remaining records occur near Black Lakes, approximately 5 km from the Assessment Area. No records of vole ears lichens (*Erioderma mollissimum*; SARA and ESA "Endangered") were identified in MTRI database within 5 km of the Assessment Area (MTRI, 2019b).

Finally, the review of federal Critical Habitat layers for flora SAR (ECCC, 2025c) identified Critical Habitat for boreal felt lichen within the Assessment Area, on the west side of Meadow Lake on provincial Crown land. This Critical Habitat area is presumed to be associated with the occurrences of boreal felt lichen identified in the ACCDC data reports (ACCDC, 2024b, 2024a) and MTRI database (MTRI, 2019a). The substrates (trees) the lichens occur upon, as well as a critical function zone (a 500 m area around the occurrences as well as their associated wetland, buffered by 50 m) is considered Critical Habitat (ECCC, 2020a). NS adopted the federal amended recovery strategy for boreal felt lichen in 2020; this Critical Habitat area is also considered to be Core Habitat (NSNR, 2020a), but is not currently designated under ESA. An additional Critical/Core Habitat area for boreal felt lichen is located within 5 km of the Assessment Area, near Black Lakes (approximately 4.3 km from the Assessment Area). No other Critical Habitat for flora species was identified within 5 km of the Assessment Area.

7.4.1.4 Field Assessment Methodology

Vegetation Community Assessments

An inventory of terrestrial vegetation communities was completed during various field studies in 2024 (terrestrial flora surveys, old-growth assessments, and pellet group surveys; Photo log in Appendix K). Vegetation communities were classified according to the Forest Ecosystem Classification (FEC) for Nova Scotia (Neily et al., 2023) or, for some non-forested vegetation types, the Natural Landscapes of Maine (NLM) classification system (Gawler & Cutko, 2018), as applicable. The NLM classification is an appropriate supplement to the FEC as the proximity and geographic/climatic similarities with Maine are such that many of the community types described in the NLM also occur in Nova Scotia. Observations of the following were recorded if encountered: landscape features such as watercourses, wetlands, and caves/mine shafts; forest stands noted as having old-growth potential; and vegetation communities known to serve as habitat for rare flora or that provide important lifecycle functions for moose, birds, and bats. Wetland characteristics and terrestrial habitat for fauna are described in Sections 7.3.3, 7.4.2, 7.4.3, and 7.4.4, as applicable.

Old-growth forest assessments were conducted in November 2024 in two of three forest stands identified in the desktop review as occurring on Crown land, overlapping the Assessment Area and having an OGPI rank $\geq$ 9. Surveys were not completed in the third forest stand (located in the 50 m buffer around Ocean Lake); however, no land development associated with this EA or with freshwater withdrawal is expected to occur within 1 km of this area.

Field biologists with demonstrated experience conducting old-growth forest assessments travelled to three pre-determined sample plots within the two selected forest stands to conduct a rapid assessment for old-growth conditions. Rapid assessments included confirming the presence of long-lived intermediate-tolerant (LIT) or late-successional (LT) tree species (an attribute of old-growth forests) and collecting evidence of human or natural disturbances resulting in drastically altered stand composition (e.g., harvesting, blowdown; indicating that the stand is not old growth). Where a rapid assessment was inconclusive or indicated potential for

old-growth conditions, Part 1 of the old-growth scoring procedure, as defined by NSNR (2024f), was employed. At each plot, a tree core was collected from one LIT/LT tree representative of the top 20% basal area for the plot. Tree cores were processed and analyzed to determine the ages of the sampled trees which were then used to determine if stands met the criteria for old-growth status.

Flora Surveys

Plant and lichen surveys were completed in 2024 within a preliminary version of the Project Assessment Area, with surveys conducted over two rounds to capture early and late flowering periods. The results of initial flora surveys lead to modifications to the proposed route of the freshwater pipelines (i.e., for avoidance of rare lichens) before the Assessment Area was finalized for the EA, and additional surveys for black ash (ESA "Threatened") and rare lichens were completed within the gap area associated with the new location of the pipelines. Flora surveys were completed during the following periods:

- Early botany: July 17 to 19
- Late botany: August 26 to 30, September 26, October 15 and 16, 2024
- Lichen surveys: August 26 and 27, September 3, and November 13, 14, and 25
- Pipeline gap area (black ash and lichens): and April 16 and 17, 2025

The field assessment strategy for plants and lichens was informed by a review of land cover data and aerial imagery. Meandering transects were completed on foot within all major land cover types, including wetlands, upland forests, open areas, and forestry trails to develop a list of flora species. More time was spent surveying in areas more likely to support SAR and SOCI, including mature forests, wetlands, and flooded areas. Targeted lichen surveys were conducted in areas of suitable habitat up to 100 m outside of the Assessment Area, including 11 of the 14 boreal felt lichen potential habitat features identified on Crown land in the desktop review (NSNR, 2012b). The three remaining habitat features are located within the 50 m buffers around Meadow and Ocean lakes. Separate rare plant and lichen surveys will be conducted in this area as part of the permitting and approvals process for water withdrawal, as required.

Upon encountering flora SAR or SOCI, specimens were georeferenced, counted (when possible), photographed, and a description of their habitat was recorded. When unknown species were encountered, surveyors took photos and samples (when appropriate) to verify identification with guidebooks and/or experts as required. Incidental observations of flora SAR and SOCI were also recorded during other biophysical surveys (e.g., wetland determinations, fauna surveys), if observed.

7.4.1.5 Field Assessment Results

Vegetation Communities

Each of the land cover types identified through desktop review (Table 7.39) were observed within the Assessment Area during field studies in 2024. Historic and ongoing development

projects in the Assessment Area have resulted in extensive modification to the terrestrial environment (including approximately 70% of the Project Footprint; historic disturbance described further in Section 3). As a result, there are relatively few areas that have gone untouched by industrial activities.

A total of 18 vegetation community assessment points were collected within the Assessment Area. Four upland forest groups were identified, comprised of eight different vegetation types (Table 7.46). Two wet forest groups were also identified, comprised of four wet coniferous vegetation types and one wet mixedwood vegetation type. Two open wetland types, as well as a barren site, an abandoned mine site, and a previously harvested open field were also identified. Disturbed vegetated areas were largely composed of young, dense monocultural softwood stands, regenerating shrublands, and harvested wetlands. Representative points for these vegetation communities are displayed in Drawing 7.21 (photo log is in Appendix K).

Table 7.46: Vegetation Communities Identified within the Assessment Area

Land Cover Type	Forest Group[1]	Vegetation Types/Community	Representative Survey Point
Mixedwood Forest	Mixedwood	MW2 (Red spruce – Red maple – White birch / Goldthread)	HP13
		MW4 (Hemlock – Red maple / Wood fern – Starflower)	HP17
		MW7 (Balsam fir – Red maple / Wood-sorrel – Goldthread)	HP7
		MW8 (White birch – Balsam fir / Starflower)	HP5
Mixedwood Wet Forest	Wet Mixedwood	WM3 (Red maple / Black spruce / Lambkill / Cinnamon fern / Sphagnum)	HP3
Softwood Forest	Coastal Boreal	CB1 (Black spruce – Balsam fir / Foxberry / Plume moss)	HP15
	Spruce Hemlock	SH5b (Red spruce – Balsam fir / Schreber's moss – Stair-step moss – Balsam fir variant)	HP1
	Spruce Pine	SP4a (White pine / Blueberry / Bracken – Black spruce variant)	HP14
		SP6 (Black spruce – Balsam fir / Blueberry)	HP2
Softwood Wet Forest	Wet Coniferous	WC1 (Black spruce / Cinnamon fern / Sphagnum)	HP6
		WC5 (Red spruce – Balsam fir / Cinnamon fern / Sphagnum	HP9
		WC6 (Balsam fir / Cinnamon fern – Three seeded sedge / Sphagnum)	HP4
		WC7 (Tamarack – Black spruce / Lambkill / Sphagnum)	HP18
Open Wetland	-	Leatherleaf Bog[2]	HP8
		Maritime Huckleberry Bog[2]	HP16
Open Areas/ Harvests	-	Barrens	HP10
	-	Previously harvested open field	HP11

Land Cover Type	Forest Group[1]	Vegetation Types/Community	Representative Survey Point
Urban/Developed	-	Abandoned mine site	HP12

Source: [1]Forest Ecosystem Classification (Neily et al., 2023); [2]Natural Landscapes of Maine (Gawler & Cutko, 2018).

The forest groups and vegetation types identified within the Assessment Area are described in detail within the following subsections.

Mixedwood (MW) Forest Group

The mixedwood forest group is a diverse group of closed canopy forests that include early to late successional vegetation types. Early successional forests often include red maple (*Acer rubrum*), white and gray birch (*Betula papyrifera* and *Betula populifolia*), aspen(s), and/or balsam fir. Overstory structure, soil attributes, and disturbance history influence the formation of the shrub and herbaceous layer, which is often well developed in areas of deciduous tree cover. Although few fauna occur exclusively in mixedwood forests, their diverse structure and composition creates a range of habitat features for wildlife (Neily et al., 2023). Four vegetation types belonging to the mixedwood forest group were identified in the Assessment Area: MW2, MW4, MW7, and MW8.

Wet Mixedwood (WM) Forest Group

This vegetation group occurs in areas where water is present at or near the ground surface during most of the growing season. Canopies are partly open to closed, and dominated by red maple, spruce and balsam fir, with the presence of white ash increasing alongside nutrient availability. The shrub layer generally contains regenerating tree species, winterberry (*Ilex verticillata*), mountain holly (*Ilex mucronata*), and speckled alder (*Alnus incana*) (Neily et al., 2023). Several uncommon flora and bird species, as well as a variety of amphibians, find suitable habitat conditions within this forest group. One vegetation type belonging to the wet mixedwood forest group was identified in the Assessment Area: WM3.

Coastal Boreal (CB) Forest Group

Black and white spruce and balsam fir are the primary species in this partial/closed canopy forest group. Coastal winds have a role in shaping forests through disturbance and through the formation of krummholz vegetation. Coastal forests provide habitat for many species of birds, particularly during migration (Neily et al., 2023). One vegetation type belonging to this forest group was identified in the Assessment Area: CB1.

Spruce Hemlock (SH) Forest Group

This vegetation group is widespread throughout NS and consists of mid to late successional vegetation types. The canopies of this group are dominated by shade tolerant softwoods such as balsam fir, red spruce (*Picea rubens*), and eastern hemlock (*Tsuga canadensis*). The shrub layer often consists of regenerating conifers and soils are often derived from glacial till. The SH group provides habitat for a diverse community of birds and mammals (Neily et al., 2023). One vegetation type belonging to this forest group was identified in the Assessment Area: SH5b.

Spruce Pine (SP) Forest Group

Vegetation types within the spruce pine forest group are dominated by black spruce and pine species with an understory often composed of ericaceous shrubs. This group frequently occurs in areas of shallow, nutrient-poor soils. Whereas wildlife diversity in the spruce pine group tends to be low due to emergent conditions of the forest floor (e.g., acidic soils, thick duff layers, and allelopathic properties), raptors and flying squirrels may establish long-term nesting sites in persistent, white pine “super-canopies” (*Pinus strobus*) (Neily et al., 2023). Two vegetation types belonging to the spruce pine forest group were identified within the Assessment Area: SP4a and SP6.

Wet Coniferous (WC) Forest Group

This forest group has partial to closed canopies dominated by softwood species, and well-developed understories composed of ericaceous shrubs (e.g., mountain holly, winterberry). Sphagnum moss is generally abundant, and herbaceous species include cinnamon fern (*Osmundastrum cinnamomeum*), creeping snowberry (*Gaultheria hispidula*), and sedges. In addition to serving important landscape functions (e.g., carbon and water storage, nutrient cycling), forests in the wet coniferous group provide habitat for many flora and fauna species, including rare lichens, moose, and birds (Neily et al., 2023). Four vegetation types belonging to the wet coniferous forest group were identified in the Assessment Area: WC1, WC5, WC6, and WC7.

Open Wetlands

Two open wetland types were identified during vegetation community assessments and classified according to Natural Landscape of Maine (Gawler & Cutko, 2018): leatherleaf bog and Maritime huckleberry bog. Leatherleaf bogs tend to be dominated by leatherleaf (*Chamaedaphne calyculata*) and low heath shrubs, with dominant vegetation < 1 m in height. It often occurs where groundwater contact is maintained. Maritime huckleberry bogs are also characterized by low heath shrubs (< 60 m in height), are saturated during the growing season and are highly acidic.

Anthropogenic

A substantial portion of the Assessment Area (approximately 186 ha) has been subject to human disturbance and land development, including industrial development and forestry. Specific areas highlighted during vegetation communities included a heavily disturbed mine site with abandoned pits and harvested areas undergoing regeneration. Plant species encountered in these areas included wild raisin, red raspberry (*Rubus idaeus*), and aster species.

Summary of Vegetation Types

The Assessment Area is comprised of several vegetation types within the SH, SP, WC, MW, WM, and CB forest groups (Table 7.46). Provincial rankings for vegetation communities currently do not exist within Nova Scotia, and not all communities found in NS have been described and researched. The vegetative communities identified within the Assessment Area are common in the surrounding landscape and the province and are not known to have

elevated potential for rare flora species or high biodiversity. Wetlands, which are known to support rare flora species, are considered separately in Section 7.3.3.

Old-Growth Forest Assessments

The two forest stands assessed for old-growth status (Drawing 7.22) were within the Atlantic Coastal ecoregion and had predominantly coniferous canopies comprised of black spruce, balsam fir, and tamarack, with lesser amounts of paper birch and red maple. Vegetation types in two of six plots contained early to mid-successional vegetation types (CB4 and SP9), and it was therefore necessary to core non-LT species [per the Nova Scotia Old Forest Assessment Procedures, (NSNR, 2024f), Table 7.47; photo log in Appendix L]. Based on the results of the tree-ring analysis, neither of the assessed stands meet the requirements to be considered old growth.

Table 7.47: Results of Old-Growth Forest Assessments

Stand ID	Stand Size (ha)	Potential Old Growth Rank	Plot #	Species Cored[1]	DBH[2] (cm)	Height (m)	Age (years)	NS FEC[3] VT[4]	Old Growth Reference Age (years)	Average Age of Cored Trees (years)	Old Growth Status
C026-09274	3.62	9	1	WB	27.2	12.0	112	CB4	100	81.3	Not old growth
			2	BF	23.9	18.0	55	CB3			
			3	BF	21.2	12.0	77	CB3			
C026-08595	5.03	10	1	BS	13.9	13.0	48	SP7	125	78	Not old growth
			2	BS	22.6	16.0	90	SP7			
			3	TL	20.8	14.5	96	SP9			

[1]WB = paper birch; BF = balsam fir; BS = black spruce; TL = tamarack
[2]DBH = Diameter at Breast Height
[3]NS FEC = Nova Scotia Forest Ecosystem Classification
[4]VT = Vegetation Type; CB = Coastal Boreal; SP = Spruce/Pine

Flora Surveys

A total of 193 vascular plant, 32 non-vascular plant, and 107 lichen species were identified during field surveys. Of these, two vascular plant and two lichen SOCI, as well as one lichen SAR (blue felt lichen), were identified in the Assessment Area (Drawings 7.23A-D; Table 7.48). As described previously, additional lichen SAR (blue felt lichen) and SOCI were identified outside of the Assessment Area and the Project layout was previously updated to avoid these occurrences. A complete list of field-observed plant and lichen species is provided in Appendix K.

Table 7.48: Flora SAR and SOCI Observed in Assessment Area

Scientific Name	Common Name	COSEWIC[1]	SARA[1]	ESA[2]	NS S-Rank[3]	No. of Occurrences within the AA	No. of Individuals within the AA
Vascular Plants							
Geocaulon lividum	Northern comandra	-	-	-	S3S4	2	> 100 stems
Vaccinium cespitosum	Dwarf bilberry	-	-	-	S3S4	1	10 stems
Lichens							
Cladonia stygia	Black-footed reindeer lichen	-	-	-	S3?	3	> 20 thalli
Heterodermia neglecta	Fringe lichen	-	-	-	S3S4	1	10 thalli
Pectenia plumbea	Blue felt lichen	Special Concern	Special Concern	Vulnerable	S3	6	40 thalli

Source: [1](ECCC, 2024c); [2](NSNR, n.d.); [3](ACCDC, 2025)

Non-native Flora

There were 22 non-native plant species encountered during field surveys (Table 7.49). Of these, five species are considered invasive in NS (NSECC, 2012); black knapweed (*Centaurea nigra*), creeping thistle (*Cirsium arvense*), common St. John's wort (*Hypericum perforatum),* large-leaved lupine (*Lupinus polyphyllus*), and creeping buttercup (*Ranunculus repens*).

Table 7.49: Non-Native Flora Encountered During Field Surveys

Scientific Name	Common Name	Distribution[1]	Invasive[1] (Yes/No)
Achillea millefolium	Common yarrow	N/A	No
Agrostis capillaris	Colonial bent grass	Widespread	No
Centaurea nigra	Black knapweed	Uncommon	Yes
Cirsium arvense	Creeping thistle	Widespread	Yes
Daucus carota	Wild carrot	Widespread	No
Euphrasia nemorosa	Common eyebright	N/A	No
Hypericum perforatum	Common St. John's-wort	Widespread	Yes
Leucanthemum vulgare	Oxeye daisy	Widespread	No

Scientific Name	Common Name	Distribution[1]	Invasive[1] (Yes/No)
Lotus corniculatus	Birdsfoot trefoil	Widespread	No
Lupinus polyphyllus	Large-leaved lupine	Widespread	Yes
Nuttallanthus canadensis	Old-field toadflax	Locally common	No
Phleum pratense	Meadow timothy	Widespread	No
Poa compressa	Canada bluegrass	Widespread	No
Potentilla reptans	Creeping cinquefoil	Rare	No
Ranunculus repens	Creeping buttercup	Widespread	Yes
Rudbeckia hirta	Black-eyed Susan	Widespread	No
Sorbus aucuparia	European mountain-ash	Widespread	No
Taraxacum officinale	Common dandelion	Widespread	No
Trifolium aureum	Yellow clover	Widespread	No
Trifolium pratense	Red clover	Widespread	No
Trifolium repens	White clover	Widespread	No
Viccia cacca	Tufted vetch	Widespread	No

[1]As presented in the WESP-AC guide supplementary information (Adamus, 2018a)

7.4.1.6 Effects Assessment

Project-Terrestrial Vegetation Community and Flora Species Interactions

Project activities, primarily those that involve earth moving or vegetation removal, have the potential to impact terrestrial vegetation communities and flora (Table 7.50). These activities could result in the loss of plant or lichen SAR and SOCI, loss of vegetation communities or habitat used by SAR and SOCI, and/or the introduction of non-native species that may become invasive in the environment.

Table 7.50: Potential Project Interactions with Terrestrial Vegetation Communities and Flora Species

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	X
Water Pipeline and Roadway Construction	X
Facility Foundation Construction	X
Transportation of Facility Components	-
Facility Assembly	-
Utility Connections	-
Removal of Temporary Works and Site Restoration	X
Operations and Maintenance	
Commissioning	-

Project Phase	Potential for Interaction
Handling of Biomass	-
Production of SAF and Other Products	-
Product Storage	-
Vegetation Management	X
Decommissioning and Rehabilitation	
Infrastructure Removal	-
Site Reclamation	X

Assessment Boundaries

The LAA for terrestrial flora is 5 km from the Assessment Area. This distance was selected for the LAA to contextualize the potential impacts of vegetation clearing within the broader landscape (e.g., edge effects, dispersal distances). The RAA is not applicable (Drawing 7.24).

Assessment Criteria

Assessment criteria provided in Section 4.6 apply for terrestrial vegetation communities and flora species. The VC-specific definition for magnitude is as follows:

- Negligible: No loss of priority vegetation communities or priority flora individuals, or alteration to habitat supporting flora priority species.
- Low: Small loss of habitat supporting priority flora species, but no loss of priority flora species individuals or priority vegetation communities.
- Moderate: Small loss of flora priority species individuals (and associated habitat), but populations remain largely intact, and no loss of priority vegetation communities.
- High: High loss of the habitat supporting flora priority species and/or loss of an entire population of flora priority species, and/or any loss of priority vegetation communities.

Priority Terrestrial Vegetation Communities and Flora Species

For the purposes of the effects assessment, priority terrestrial vegetation communities are defined as old-growth forest stands and Critical or Core Habitat for flora SAR (Critical and Core Habitat for terrestrial fauna, bats, and avifauna are addressed in Sections 7.4.2, 7.4.3, and 7.4.4, respectively). Based on the results of the desktop review and old-growth forest assessments, no forest stands exhibiting characteristics of old-growth forests were identified in the Assessment Area. The desktop review indicated that an area of Critical and Core Habitat for boreal felt lichen overlaps with the Assessment Area near Meadow Lake.

All flora SAR and SOCI observed within the Assessment Area, as well as boreal felt lichen (whose Critical and Core Habitat overlap the Assessment Area) are considered priority flora species for the assessment. Priority flora species for the Project include:

Vascular Plants

- Dwarf bilberry (S-Rank “S3S4”)
- Northern comandra (S-Rank “S3”)

Lichens

- Black-footed reindeer lichen (S-Rank “S3S4”)
- Blue felt lichen (SARA “Special Concern”, ESA “Vulnerable”, S-Rank “S3”)
- Boreal felt lichen (SARA “Endangered”, ESA “Endangered”, S-Rank “S1”)
- Fringe lichen (S-Rank “S3S4”)

Descriptions of Flora Priority Species

Dwarf Bilberry (Vaccinium caespitosum)

Dwarf bilberry is a low-lying shrub that primarily grows along rocky shores, ledge crevices, and in clearings, but may also grow in meadows and fields (Hinds, 2000). The species has woody stems, simple leaves, and reaches a height of 10 to 20 cm. Flowers bloom from May to June and are nodding pink-white (Minnesota Wildflowers, 2024). There were 10 stems counted in a small patch where the species was observed on sphagnum hummocks in the open bog portion of WL1 (near the center of the Assessment Area; Drawing 7.23A).

Northern Comandra (Geocaulon lividum)

The uncommon northern comandra is a small (7 to 30 cm), simple-leaved plant that grows in sphagnum bogs and sandy coniferous woods in Atlantic Canada (Hinds, 2000). This species produces small, greenish flowers without petals that mature into conspicuous orange-red fruits. Two occurrences of northern comandra (100+ stems total) were recorded in the large open bog section of a wetland complex (WL1, near the center of the Assessment Area; Drawing 7.23A). The wetland was dominated by *Cladonia* and *Sphagnum* spp., and scattered tamarack and black spruce.

Black-footed Reindeer Lichen (Cladonia stygia)

This species most commonly occurs in bogs or wet open areas. Black-footed reindeer lichen have a distinct, dark brown to black base, and pink pycnidial jelly, a feature that differentiates the species from true reindeer lichen (Brodo et al., 2001). Two occurrences of black-footed reindeer lichen were recorded within WL1 (a large wetland complex near the center of the Assessment Area), and a third near the Facility in WL17 (Drawings 7.23A-D).

Blue Felt Lichen (Pectenia plumbea)

Blue felt lichen is a large foliose (leafy) lichen with a prominent black-blue fungal mat and red-brown fruiting bodies (COSEWIC, 2010b). The species prefers cool, humid woodlands with mixed coniferous/hardwood or deciduous dominant swamps where it typically grows on the trunks of mature hardwood trees (particularly red maple). Blue felt lichen is considered to be a rare and sensitive lichen species in Nova Scotia, and the At-Risk Lichens – Special Management Practices (NSNR, 2018a), which applies on Crown land, recommends a 100 m buffer around species occurrences in which no forest harvesting or road construction is to occur. Six of occurrences of blue felt lichen were identified within the Assessment Area with an additional four observed within 100 m of the Assessment Area (the area managed for minimal disturbance by NSNR). Due to their protected status, their locations have been provided to NSECC (Drawings 7.23A-D).

Boreal Felt Lichen (Erioderma pedicellatum)

Boreal felt lichen is a foliose lichen that is greenish (when wet) or grey (when dry) in colour, with a felt-like upper surface and white underside (COSEWIC, 2014). Mature thalli range from about 2 to 5 cm in size, with thalli less frequently growing up to 12 cm. Its reddish-brown fruiting bodies and lack of vegetative propagules (COSEWIC, 2014) distinguish boreal felt lichen from other *Erioderma* species in Nova Scotia. The species requires cool and humid conditions and is most frequently found in coastal forests dominated by balsam fir. The trunks and branches of balsam fir trees are themselves the most common substrate for boreal felt lichen thalli.

A known occurrence of boreal felt lichen is located adjacent to the Assessment Area west of Meadow Lake. The Critical and Core Habitat defined for this occurrence overlap with the Assessment Area in the 50 m buffer around Meadow Lake (ECCC, 2020a; NSNR, 2020a). Additional records of boreal felt lichen and associated Critical and Core Habitat occur within the LAA (approximately 4.8 km from the Assessment Area). No occurrences of boreal felt lichen individuals were identified in the Assessment Area during the desktop review or during field assessment (including targeted rare lichen surveys in boreal felt lichen polygons).

Fringe Lichen (Heterodermia neglecta)

Fringe lichen has distinctive light gray-green lobes with long, dark rhizines on the edges of the lobes (McMullin & Anderson, 2014). Soralia of this species can be found on the recurved lobe margins, often labriform. This species also has a distinctly orange-spotted ecorticate underside (Lendermer, 2009). It is typically found on mature, deciduous trees in moist habitats (McMullin & Anderson, 2014). One occurrence of fringe lichen was identified within the Assessment Area along the pipeline corridor to Meadow Lake (Drawings 7.23C).

Effects

Loss of Priority Species

As described in Section 7.4.3.1, the results of initial flora surveys were used to update the Project layout to avoid field-observed rare lichens. Most instances of known overlap between the priority flora species and the final Project Footprint have been avoided; however, direct loss of priority species may occur through Project activities requiring vegetation clearing. Two vascular plant and two lichen SOCI, as well as one lichen SAR, were identified within the Assessment Area during field assessments. Of these, all occurrences of northern comandra (2), dwarf bilberry (1) and most occurrences of black-footed reindeer lichen (2 of 3) were within or immediately adjacent to a large, treed swamp, in the main portion of the Assessment Area (WL1). This area, where evidence of previous harvesting has been observed, is outside of the Project Footprint (> 60 m to planned infrastructure) and will not be developed as part of the Project

The six occurrences of blue felt lichen made within the Assessment Area occurred within or adjacent to a treed swamp (5; WL1) and a small field-delineated wetland (1; WL2) near the center of the Assessment Area. These occurrences are located > 100 m from planned Project

Infrastructure. Four additional occurrences of blue felt lichen were identified on Crown land within 100 m of the Assessment Area (during flora surveys for an earlier Project layout and during wetland surveys) near the freshwater pipeline. Although individual thalli and host trees will be avoided, the minimal disturbance zone associated with these four occurrences (100 m buffer, outlined in the At Risk Lichens – Special Management Practices (NSNR, 2018a)) overlap with the Assessment Area. The Proponent is committed to working with NSNR during the Crown land permitting process to limit impacts of the Project on rare lichens and associated buffers.

The remaining occurrences of priority flora species, relating to fringe lichen (1) and black-footed reindeer lichen (1) were within or immediately adjacent to small wetlands delineated during field assessments (WL69 and WL17, respectively). The observation of fringe lichen (10 thalli) was along the freshwater pipeline corridor to Meadow Lake and its location will be incorporated into the detailed design to minimize impacts as much as possible. The occurrence of black-footed reindeer lichen is in a wetland that overlaps with the Project Footprint (WL17) and that will be partially altered; however, the identified individual is > 100 m from planned Project Infrastructure and its location will be considered during detailed design.

No occurrences of boreal felt lichen were identified during the field assessment, including targeted rare lichen surveys. Although no direct impacts to individuals are expected in relation to the activities included in this EARD, it is possible that water withdrawal from Meadow Lake could impact boreal felt lichen individuals or Critical / Core Habitat (e.g., through changes to hydrology). If Meadow Lake is selected for freshwater withdrawal, further studies will be conducted to assess the potential impacts to rare lichens and their habitat.

To date, the Project has undergone various layout changes, including several changes to the routing of the freshwater pipelines to avoid occurrences of blue felt lichen. Disturbance of new areas will be minimized by locating Project Infrastructure within previously developed lands, as practicable. Overall, impacts to priority flora individuals are expected to be low as no known occurrences of vascular plant or lichen SAR or SOCI are expected to be lost due to the Project, but a small loss of supporting habitat will occur.

Loss of Priority Vegetation Communities and Habitat Supporting Priority Species

Vegetation communities and flora habitat will be impacted by land clearing for Project Infrastructure and other activities requiring earth moving. The major landcover types within the Project Footprint, Assessment Area, and LAA (5 km of the Assessment Area) are described in Table 7.39. Overall, it is expected that approximately 247 ha will be cleared for the Project (i.e., the Project Footprint), with approximately 70% of this area having been recently disturbed [including open (previously cleared) and cutover areas]. The main undisturbed cover type within the Project Footprint is softwood forest, approximately 31 ha of which will be cleared for the Project Infrastructure. Softwood forest is the most abundant cover type in the Assessment Area and LAA, with the amount cleared for the Project representing 21.97% and 0.40% of the amount available within the Assessment Area and LAA, respectively. Overall, the amount of undisturbed habitat cleared for the Project is small relative to the amount available within the LAA.

As described above, the priority vegetation communities for the effects assessment include old-growth forest and Critical and Core Habitat for flora SAR. No confirmed areas of old-growth forest were identified during field assessments, and no impacts to this priority vegetation community type are expected to occur. The desktop review revealed that a portion of the Assessment Area near Meadow Lake coincides with a Critical and Core Habitat area identified for boreal felt lichen. No land development or direct disturbance will take place in the overlapping area; however further study is recommended if Meadow Lake is selected for freshwater withdrawal following the hydrological assessment.

Most of the habitat supporting priority flora species in the Assessment Area is located within or near WL1, a large wetland complex outside of the Project Footprint that will be avoided during development. A small loss of habitat supporting priority flora species is expected, however, during the construction of the freshwater pipeline and clearing for the Facility. These areas are associated with an occurrence of fringe lichen within the Assessment Area (WL69; partially impacted), four occurrences of blue felt lichen adjacent to the Assessment Area (buffer zones overlap with the Assessment Area), and an occurrence of black footed reindeer lichen (WL17; partially impacted). The effects of the Project on wetlands, including avoidance and mitigations, are described in further detail in Section 7.3.3.

As no old-growth forest stands were identified in the Assessment Area, and no direct impacts to boreal felt lichen Critical/Core Habitat are expected to result from Project activities (impacts of water withdrawal to be assessed following the hydrological assessment), it is expected that the effects of the project on priority vegetation communities will be negligible.

The effects of the Project on habitat for priority species are expected to be of low magnitude, as some habitat will be lost due to vegetation clearing. The extent of land clearing for the Project will be minimized by siting infrastructure in previously disturbed areas and avoiding priority species habitat during the detail design phase, as much as practicable.

Introduction of Invasive Species

Non-native plant species, which can become invasive and pose a threat to rare flora [e.g., by outcompeting native species for space and resources (Rutledge et al., 2024)], may be inadvertently introduced to the Assessment Area by the presence of humans. For example, non-native species are known to be introduced during industrial project developments via:

- Increased access to remote areas with equipment carrying seeds, spores, or other reproductive materials from non-native species.
- Revegetation of cleared land with non-native seed mixes.

Land clearing resulting in soil disturbance may also increase opportunities for non-native species to become invasive as many are well-adapted to colonize open/disturbed areas (Jauni et al., 2015).

There were 22 non-native plant species observed during field surveys. Most portions of the Assessment Area are not considered remote, as access throughout the Assessment Area is already widespread, including the proposed freshwater pipeline routes (e.g., forestry activity, road and industrial development). The effects of the Project regarding the introduction of invasive species are therefore expected to be negligible to low and will be managed using mitigation strategies to minimize the risk of introducing and/or spreading non-native species across the Assessment Area (provided below).

Mitigation

To minimize potential effects to terrestrial vegetation communities and flora, the following mitigation measures will be implemented:

Vegetation Communities

- Maximize the use of previously disturbed areas where possible during the detailed detail design phase and construction.
- Minimize (through avoidance) the loss of important habitat that supports terrestrial flora SAR and SOCI during the detailed design phase.
- Restore cleared areas where possible after construction to reduce loss of vegetated areas, primarily through revegetation of road right-of-ways (ROWs) and the freshwater pipeline using native seed mixes.

Flora Species

- Avoid areas with known flora SAR and SOCI occurrences during the detail design phase.
- Educate Project personnel about the potential for plant or lichen SAR and SOCI during construction.
    - Guidance will be provided to Project personnel about terrestrial flora SAR and SOCI that are known to be present within the Assessment Area.
- Consult with NSNR during Crown land permitting to determine appropriate mitigations for priority species where it is expected that construction will impact the 100 m minimal disturbance zone for blue felt lichen.
- Consult with NSNR and NSECC if an unexpected flora SAR is encountered during construction activities.

Invasive Species

- Use native seed mixes when revegetating cleared areas.
- Ensure equipment is as clean as possible to prevent the introduction and spread of non-native species.
    - Non-native species are already present within the Assessment Area, therefore, added care will be taken when travelling from heavily developed to more intact areas so that plant material (e.g., propagules) is not transferred between locations.

Monitoring

No monitoring programs specific to terrestrial vegetation communities and flora are recommended.

Conclusion

The effects of the Project on terrestrial vegetation communities and flora have been assessed through desktop review and augmented through field assessments. After mitigations are applied, residual effects associated with the Project are characterized as follows:

- Magnitude: Low, as no known occurrences of priority species are expected to be lost, but a small amount of habitat supporting priority species will be lost/altered during clearing for Project Infrastructure.
- Geographic Extent: LAA, as the loss of supporting habitat will occur within the Project Footprint.
- Frequency: Single event, as vegetation clearing in the area known to support priority species will occur once during the construction phase.
- Duration: Long term, as cleared vegetation will be maintained through the construction to decommissioning phases.
- Reversibility: Irreversible, as supporting habitat will be cleared/lost.
- Significance: Not significant.

7.4.2 Terrestrial Fauna

7.4.2.1 Overview

The terrestrial fauna assessment was completed using a combination of desktop and field studies to achieve the following objectives:

- Identify SAR and SOCI species and their supporting habitat that are likely to occur within/near the Assessment Area using desktop resources.
- Undertake targeted surveys for groups of terrestrial fauna to document the species present within the Assessment Area, with a focus on SAR and SOCI.
- Use the information collected through field studies to iteratively update the Project design to avoid or minimize interactions between terrestrial fauna SAR and SOCI and/or their supporting habitats.
- Apply mitigation, construction, and operational management practices to minimize the effects of the Project on SAR and SOCI fauna and their supporting habitat.

7.4.2.2 Regulatory Context

Several laws and regulations provide protection for terrestrial fauna [i.e., mammals, herpetofauna, lepidopterans (butterflies and moths), and odonates (dragonflies and damselflies)] in Nova Scotia, including the following:

- SARA
- ESA

- *Canada Wildlife Act* (Canada, 1985a)
- *Wildlife Act*, R.S.N.S. 1989, c. 504
- *Biodiversity Act,* 2021, c. 3, s. 1.
- CEPA
- *Environment Act,* S.N.S. 1994-95, c. 1

Fauna species that are listed as “Endangered” or “Threatened” receive individual protection from harm and destruction under SARA and/or ESA (including their habitually occupied spaces). Protection of SAR habitat is granted through the designation of Critical Habitat and/or Core Habitat. Critical Habitat under SARA refers to specific geographic areas that are identified as essential for the survival or recovery of a species. It is designated for federally Endangered and Threatened species and, for most fauna, is enforceable on federal lands (designation of Critical Habitat for migratory birds and aquatic species differs, and is described in Section 7.4.4 and 7.3.2, respectively). Core Habitat under ESA refers to areas of habitat essential for the long-term survival and recovery of a species. It may be designated on public land (and/or private land where it is deemed that insufficient habitat is available on public land) for provincially Endangered and Threatened species. Development restrictions are imposed in areas designated as Core and/or Critical Habitat. Best management practices are described in federal and provincial species recovery documents, as applicable.

The *Canada Wildlife Act* (Canada, 1985a) provides a framework for the creation of protected wildlife areas, and the *Wildlife Act,* R.S.N.S. 1989, c. 504, provides policies and programs to maintain the diversity of wildlife species at levels of abundance required to meet specific management objectives. The *Wildlife Act,* R.S.N.S. 1989, c. 504, includes a clause for the protection of den/habitation of a furbearer [48(3)].

The *Biodiversity Act,* 2021, c. 3, s. 1. provides a framework for the creation of Biodiversity Management Zones used for conservation and sustainable biodiversity values. Lastly, CEPA and the *Environment Act,* S.N.S. 1994-95, c. 1 both provide measures for the protection of the environment and pollution prevention.

7.4.2.3 Desktop Review

A variety of terrestrial fauna are common to Guysborough County where the Project is located, including white-tailed deer (*Odocoileus virginianus*), snowshoe hare (*Lepus americanus*), American black bear (*Ursus americanus*), coyote (*Canis latrans*), and bobcat (*Lynx rufus*) (iNaturalist, 2025). Small mammals common to the region include American red squirrel (*Tamiasciurus hudsonicus)*, eastern chipmunk (*Tamias striatus*), and northern flying squirrel (*Glaucomys sabrinus*), as well as species of mice, voles, and shrews. Herpetofauna (reptiles and amphibians) may include the common snapping turtle (*Chelydra serpentina*), American toad (*Anaxyrus americanus*), wood frog (*Lithobates sylvaticus*), and species of snake, among others.

The desktop review included referencing the NSNR Significant Species and Habitat Database (2024e), ACCDC data reports, and the NS Special Management Practice Zones (SMPZ). A review of Core Habitat and concentration areas, as well as habitat classification, was

conducted for mainland moose, a mammal SAR (*Alces alces americanus*, ESA "Endangered"), to characterize its habitat within the Assessment Area and the surrounding region.

Mammals

The Significant Species and Habitats Database (NSNR, 2024e) contained 27 unique species and/or habitat records pertaining to terrestrial mammals within 5 km of the Assessment Area (Drawing 7.25). These include:

- Records of "Species at Risk" (24) relating to signs of mainland moose.
- Records of "Deer Wintering" (three) relating to white-tailed deer.

Of the records relating to signs of mainland moose, 21 coincide with a habitat polygon that overlap with the Assessment Area (observations recorded between 2013 to 2020, Drawing 7.25). Observed moose signs include pellet piles, browse, and tracks. A large habitat polygon corresponding to deer wintering habitat also coincides with the Assessment Area.

Two ACCDC reports (ACCDC, 2024a, 2024b) were prepared for the Project to identify known occurrences of SOCI (including SAR) within and near the Assessment Area. Data included in the reports are from the 5 km areas around the Meadow Lake and Ocean Lake freshwater pipelines, which includes the entire Assessment Area; this area is hereafter referred to as the "ACCDC Study Area". Records of mainland moose were identified in the ACCDC Study Area (Table 7.51); as it is a location-sensitive species, it is unknown where the observations of mainland moose were recorded in relation to the Assessment Area. No other records of terrestrial mammal SAR or SOCI were identified in the ACCDC Study Area.

Table 7.51: ACCDC Terrestrial Mammal SAR and SOCI Identified within the ACCDC Study Area

Scientific Name	Common Name	COSEWIC	SARA	ESA	NS S-Rank
Alces alces americana	Mainland moose	-	-	Endangered	S1

A review of mapping data for mainland moose indicated that the Assessment Area coincides with Core Habitat for mainland moose and that a portion (excluding the Facility) coincides with a population concentration area (Drawing 7.25) (NSNR, 2021h). Concentration areas are broad geographic areas known to have concentrated numbers of mainland moose. Core Habitat represents areas that meet the habitat and landscape connectivity requirements of mainland moose, and that are essential for the long-term survival and recovery of the species (NSNR, 2021h). Priority areas have been identified within Core Habitat that are of importance for connectivity within and between localized groups of mainland moose and that are expected to maintain habitat suitability criteria over the period 2021 to 2051. Approximately 22,300 km^2 of Core Habitat for mainland moose has been identified in NS, of which approximately 10,500 km^2 is priority area. These lands are not currently designated under the ESA.

Mainland Moose Habitat Modelling

Strum developed a geospatial habitat model to gain a more detailed understanding of the abundance and distribution of suitable habitat for mainland moose within and near the Assessment Area (and to guide field surveys). The habitat modelling exercise followed the approach used in the Recovery Plan for the Moose in Mainland Nova Scotia (NSNR, 2021h), and was completed using the following data sources:

- Provincial Forest Inventory database (NSNR, 2021g)
- Provincial Roads and Railroads database (GeoNOVA, 2024b)
- Provincial Wet Area Mapping database (NSECC, 2022b)

The above databases were reclassified and integrated to reflect the habitat requirements of mainland moose (e.g., cover and forage types, calving areas, and identification of wetlands) as well as their negative associations with land developments (urban/industrial development, linear features such as roads). The model output was a grid of 5 ha hexagons expressing a habitat suitability index (HSI) ranging from -3 to 5 (the lowest and highest habitat suitability scores). For descriptive purposes, this range was divided into discrete bins that describe habitat on a scale from “poor” to “best”. In the HSI, areas classified as “fair” or better provide at least one habitat type requirement for the mainland moose. Habitat designated as “best” provides multiple habitat types for the species while being minimally impacted by negative factors such as roads or conflicting land-uses. Scores greater than 4.01, while mathematically possible, are ecologically infeasible due to the unique characteristics of different mainland moose habitat types.

Information about the specific criteria and characteristics of mainland moose habitat types is available in the Recovery Plan for the Moose in Mainland Nova Scotia (NSNR, 2021h), Section 8.2, Attributes of Core Habitat.

A limited amount of suitable habitat for mainland moose was identified within the Assessment Area, likely owing to historical land disturbance. The HSI of the majority of the Assessment Area was classified as “fair” (42.94%) or “neutral” (28.48%), with only 2.06% of the Assessment Area having habitat classified as “better” or “best” (Table 7.52). Much of the area identified as “neutral” and “fair” occurs within the Assessment Area around Meadow and Ocean lakes, with most of the area planned for the Facility, as well as Red Head Peninsula), consisting of “poor” or “neutral” habitat. Overall, the habitat suitability of the Assessment Area is proportionally comparable to the surrounding 5 km.

Within the Project Footprint (the area to be cleared for the Project), most areas are withing the “poor” (81.38%) HSI category, with a limited amount of “better” (2.31%) or “best” (0.00%) habitat.

Overall, the habitat suitability of the Assessment Area is proportionally comparable to the surrounding 5 km.

Table 7.52: Results of Habitat Suitability Modelling for Mainland Moose

HSI Range	HSI Category	Project Footprint		Assessment Area		Within 5 km of the Assessment Area[1]	
		Hectares	Percent	Hectares	Percent	Hectares	Percent
< 0	Poor	200.80	81.38	273.11	26.51	6570.63	29.41
0	Neutral	11.32	4.59	293.46	28.48	6231.71	27.90
0 to 1.35	Fair	28.71	11.64	442.44	42.94	8671.53	38.82
1.36 to 2.68	Better	5.69	2.31	20.65	2.00	834.26	3.73
2.69 to 4.01	Best	0.00	0.00	0.63	0.06	29.98	0.13

[1]Not including lands separated by Country Harbour

Herpetofauna

The Significant Species and Habitat Database (NSNR, 2024e) contained no records relating to herpetofauna within 5 km of the Assessment Area. The nearest herpetofauna records are associated with observations of wood turtle (13 records) approximately 13 km north of the Assessment Area.

The ACCDC data reports (2024a, 2024b) also identified no records of herpetofauna SAR and SOCI within the ACCDC Study Area.

Lepidopterans and Odonates

The Significant Species and Habitats database (NSNR, 2024e) identified no records relating to lepidopterans or odonates within 5 km of the Study Area.

The ACCDC data reports (2024b, 2024a) also identified no records of lepidopterans or odonate SAR and SOCI within the ACCDC Study Area.

A complete list of species identified within 100 km of the ACCDC Study Area is provided in Appendix H.

7.4.2.4 Field Assessment Methodology

The objective of the field assessment was to identify the fauna species present within and near the Assessment Area, with an emphasis on identifying SAR and SOCI. Direct observations of terrestrial fauna, or signs thereof, were recorded and photographed during targeted surveys as well as during non-target biophysical surveys. Incidental observations are reported in addition to dedicated wildlife surveys as they provide broad spatial and temporal coverage of the Assessment Area. Signs of terrestrial fauna include features such as dens, nests, scat, tracks, and evidence of foraging.

Mammals

Winter tracking and pellet group inventory surveys were conducted following methods adapted from the NSNR Wildlife Division (2022c, 2022d). Surveys occurred along four pre-determined transects (approximately 1 km in length; Table 7.53; Drawing 7.26) to cover a range of representative habitats. Priority was given to habitat where mainland moose were expected to

be active during the winter, if present. The same transects were used for winter tracking and pellet surveys.

Winter tracking surveys were completed over one round in February 2025; a lack of adequate conditions prevented a second round of winter tracking from being completed. Recent, intact tracks in fresh snow allow for the most accurate track identification, and surveys were therefore completed within seven days of the most recent snowfall of 10 cm or more, and when possible, within two to three days of the most recent snowfall. This timeline is sufficient to allow animals to leave their tracks while limiting opportunities for tracks to deteriorate or disappear due to excessive snowfall, melting, or rain. Care was also taken to ensure surveys were not completed during rain or snow events. Pellet group inventory surveys were completed in April 2024, after snow had melted completely, revealing animal droppings that had been preserved in the snow over the winter.

Table 7.53: Mammal Assessment Survey Information

Survey Type	Transect / Trail Camera ID	Dates Completed/Deployed	Transect Length (km) / Camera Location
Winter Tracking	T1	February 3, 2025	1.0
	T2	February 3, 2025	1.1
	T3	February 5, 2025	1.0
	T4	February 3, 2025	1.2
Pellet Group Inventory	T1	April 2, 2024	1.0
	T2	April 2, 2024	1.1
	T3	April 2, 2024	1.0
	T4	April 1, 2024	1.2
Trail Cameras	TC-9	April 1, 2024, to February 11, 2025	Riparian area
	TC-72	April 1, 2024, to February 11, 2025	Cleared wet area
	TC-85	April 1, 2024, to February 11, 2025	Riparian area
	TC-86	April 1, 2024, to February 11, 2025	Cleared area/trail

During winter tracking and pellet group surveys, transects were travelled slowly by foot. While moving along a transect, a 4 m area centered on the transect line was scanned for any sign of animal activity, including tracks, pellets/scat, browse, dens, or animal sightings. Detailed notes and photographs relating to habitat and animal signs were recorded whenever activity of white-tailed deer, or any terrestrial mammal SAR and SOCI, was observed. Additional observations of interest, such as evidence of predator and prey interactions, were also recorded. Activity of non-SAR and SOCI mammals was recorded only if the observation was found to be particularly unusual. All observations were recorded and georeferenced in the field. Upon completing a transect, a general description of the transect including overall tracking conditions, different habitats encountered, and species abundance (SAR and SOCI as well as non-SAR and SOCI mammals) was recorded. All survey tracks and observations were recorded on iPads equipped with ArcGIS FieldMaps and Survey123, and any deviations from predetermined transects in the field were such that the new course was similar in length to the planned transect and covered similar or improved habitat types.

Concurrent to terrestrial mammal surveys, four trail cameras were deployed from April 2024 to February 2025 (Table 7.48) to capture wildlife activity in the absence of human observers. Cameras were placed along roads, trails, and riparian zones as large mammals are known to use these features while they travel throughout a landscape. Riparian zones in particular were expected to be preferred by large mammals as these areas represent some of the only remaining intact forest within the Assessment Area. Trail cameras were visited regularly to replace storage cards and batteries, and all photos/videos were assessed for signs of wildlife.

Herpetofauna

No dedicated herpetofauna surveys were conducted as no records of herpetofauna SAR or SOCI were identified within 5 km of the Assessment Area during the desktop review (the closest record of herpetofauna pertained to wood turtle observations approximately 13 km north of the Assessment Area). Incidental observations of wood turtles or suitable wood turtle habitat (i.e., overwintering or nesting habitat) were noted during other field surveys, if observed. Overwintering habitat for wood turtles includes watercourses with sufficient flow and depth to provide access to well-oxygenated, ice-free water throughout the winter (ECCC, 2020b). Wood turtles tend to hibernate within the main channel of a watercourse where adequate protective cover is available (pers. comm., M. Pulsifer, January 2021). Ideal nesting habitat includes well-drained, gravelly soil along the banks of watercourses in areas clear of vegetation (ECCC, 2020b).

Lepidopterans and Odonates

Targeted surveys for lepidopteran and odonate species were not conducted as no records of lepidopteran and odonate SAR or SOCI were identified within 5 km of the Assessment Area during the desktop review. Incidental observations of lepidopteran and odonate SAR and SOCI during other field surveys were documented, if observed.

7.4.2.5 Field Assessment Results

Mammals

Four terrestrial mammal species were identified during field assessments either by sighting individuals or signs thereof (Table 7.54). Observations were made during targeted surveys and as incidental observations within or near the Assessment Area. No SAR or SOCI species were identified, with all mammals having a NS S-Rank of S5 (“secure”). No mainland moose or signs thereof were observed during field assessments.

Table 7.54: Summary of Terrestrial Mammal Field Assessment Results

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank[1]
Red squirrel	*Tamiasciurus hudsonicus*	---	---	---	S5
Snowshoe hare	*Lepus americanus*	---	---	---	S5
White-tailed deer	*Odocoileus virginianus*	---	---	---	S5
Red fox	*Vulpes vulpes*	---	---	---	S5

Source: (1)Species Ranks (ACCDC, 2025)

A total of 96 unique sightings of white-tailed deer were captured by trail cameras (Table 7.55, Photo log provided in Appendix M). The majority of observations were recorded by camera TC-72 (Drawing 7.26), in a cleared wet area near the portion of the Assessment Area associated with the Facility. No other fauna species were recorded.

Table 7.55: Summary of Trail Camera Observations

Trail Camera Location	Animals Observed	Number of Observations*
TC-9	None	---
TC-72	White-tailed deer	79
TC-85	White-tailed deer	1
TC-86	White-tailed deer	16

*Number of observations adjusted based on the likelihood of photos belonging to the same animal; a general rule of one hour between photos was applied to consider photos of the same species as separate observations.

Herpetofauna

There were no incidental observations of herpetofauna SAR or SOCI, and no habitat supporting wood turtles (i.e., overwintering or nesting habitat) was noted during field surveys.

Lepidopterans and Odonates

There were no incidental observations of lepidopteran or odonate SAR or SOCI during field surveys.

7.4.2.6 Effects Assessment

Project-terrestrial Fauna Interactions

Project activities, primarily those that involve earth moving or vegetation removal, have the potential to impact terrestrial fauna (Table 7.56). These activities could result in habitat removal, alterations to wildlife corridors, and/or reductions in food availability. Other Project-related activities, including increased traffic and noise during construction and operation, may impact terrestrial fauna behaviours.

Table 7.56: Potential Project-Terrestrial Fauna Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	X
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Water Pipeline and Roadway Construction	X
Facility Foundation Construction	X
Transportation of Facility Components	X
Facility Assembly	X
Utility Connections	X
Removal of Temporary Works and Site Restoration	X

Project Phase	Potential for Interaction
Operations and Maintenance	
Commissioning	X
Handling of Biomass	X
Production of SAF and Other Products	X
Product Storage	X
Vegetation Management	X
Decommissioning and Rehabilitation	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

For the purposes of this assessment, the LAA for terrestrial fauna is 5 km from the Assessment Area. This distance was selected as the boundary within which to assess the direct and indirect effects of the Project on terrestrial fauna based on the home ranges and short distance migrations of species between habitat types. The RAA for terrestrial fauna is not applicable.

Assessment Criteria

The assessment criteria described in Section 4.5 apply to terrestrial fauna. The VC-specific definition of magnitude is as follows:

- Negligible: No reduction in the amount or quality of priority fauna habitat or impacts to priority fauna behaviours.
- Low: A small reduction in the amount or quality of priority fauna habitat, but no impacts to priority fauna behaviours.
- Moderate: A moderate reduction in the amount or quality of priority fauna habitat, or moderate impacts to priority fauna behaviours, but these impacts will only be experienced by individuals rather than entire populations.
- High: A large reduction in the amount or quality of priority fauna habitat, or high impact to priority fauna behaviours on a population scale.

Priority Species

Using the results of the desktop review and field surveys, terrestrial fauna (mammals, herpetofauna, lepidopterans, and odonates) that were observed or are likely to occur within the Assessment Area were screened against the criteria outlined in the Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009) to identify priority species for the assessment. Due to prior observations of moose signs and the overlap of Core Habitat and a population concentration area (identified by NSNR) within the Assessment Area, mainland moose was identified as a priority species. Effects of the Project that are relevant to terrestrial fauna more generally are also briefly discussed.

Mainland Moose

Mainland moose are a SAR listed as “Endangered” under the ESA with a subnational ranking of S1 (“critically imperiled”; highest priority) (ACCDC, 2025). A species recovery plan released

by NSNR in 2021 assigned the common name “mainland moose” to the subpopulations of moose present on mainland Nova Scotia, which are a different subspecies from moose on Cape Breton (NSNR, 2021h). The primary threats to mainland moose include habitat loss, conversion, and degradation, and loss of habitat connectivity (particularly through increased placement and density of roads) (NSNR, 2021h). The Assessment Area has been and continues to be subject to these threats as a result of historical land-uses, including extensive industrial development and forestry activity.

The distribution of mainland moose includes localized areas within the province (concentration areas) as well as scattered areas along the Atlantic coast (NSNR, 2021h). Three localized subgroups of mainland moose have been identified (Cumberland/Colchester, Pictou/Antigonish/Guysborough, Tobeatic; total population of approximately 700 to 1,000 individuals), with the Pictou/Antigonish/Guysborough group being closest to the Project. The Assessment Area for the Project coincides with a mainland moose concentration area and Core Habitat outlined in the species’ Recovery Plan (NSNR, 2021h).

Core Habitat possess several biophysical attributes that satisfy the habitat requirements of mainland moose across different seasons and life stages. These include but are not limited to:

- Winter cover area: Composed of mature softwood stands or mature mixed wood stands dominated by softwood trees.
- Summer cover area: Composed of mature hardwood, mixed wood, or softwood stands.
- Summer foraging area: Composed of either regenerating forest that is within close proximity of winter or summer cover, or mature mixed or hardwood stands.
- Winter foraging area: Composed of either regenerating forest; mixed or hardwood forest within close proximity of winter cover; or mixed wood forest dominated by softwood trees.
- Calving area: Open water or wetlands in close proximity to both foraging and cover areas.

Core Habitat is also intended to support landscape connectivity between areas of mainland moose concentration (NSNR, 2021h). The species’ recovery plan identified activities that result in land conversion (e.g., residential, commercial, and industrial development) and the development of linear features (e.g., roads, railways, utility corridors) as having potential to reduce the abundance, quality, and connectivity of moose habitat (NSNR, 2021h).

No evidence of mainland moose (e.g., tracks, pellets, browsing) was observed during winter tracking or pellet surveys, non-target field surveys, or in trail camera photographs. However, records of mainland moose were identified in the LAA in the review of the Significant Species and Habitats database (NSNR, 2024e), the ACCDC data reports (ACCDC, 2024a, 2024b) and the Assessment Area and LAA intersect with Core Habitat and population concentration areas identified for the species. Based on these factors, it is reasonable to assume that mainland moose may use available habitat within the Assessment Area.

Effects on Mainland Moose

Habitat Loss and Fragmentation

Vegetation clearing will be required for the construction of Project Infrastructure, and there is some potential for the Project to result in habitat loss or fragmentation for mainland moose. Habitat quality, abundance, and connectivity has been identified as a primary threat to the recovery of mainland moose, and portions of the Assessment Area coincide with a population concentration area identified in the species' recovery plan (NSNR, 2021h). The effects of the Project on habitat loss and fragmentation were considered by referencing habitat modelling for the Assessment Area and surrounding region, which allows for a more detailed consideration of the habitat quality.

The output of the habitat model indicates that the Project Footprint and Assessment Area offer very little suitable habitat for mainland moose (excluding Meadow and Ocean lakes, which were generally classified as "neutral" or "fair" habitat). The HSI is influenced by factors such as landscape intactness, vegetation cover, and land development, and the low suitability of the Assessment Area is therefore likely related to its history of disturbance (e.g., industrial development, forestry activity). Habitat suitability within the LAA is higher overall than the Assessment Area, with concentrated areas of suitable habitat in occurring inland from the coast (i.e., further from roads and other human developments). Although a small amount of suitable habitat (e.g., in the "fair" or better HSI categories) will be cleared for the Project (34.40 ha; Table 7.47), this represents a small portion (< 1%) of the suitable habitat available within the LAA (9,535.77 ha).

Development within the main portion of the Assessment Area (associated with the Facility) is unlikely to result in the fragmentation of mainland moose habitat as the area has low suitability and has already been developed. The effects of the Project on habitat fragmentation are therefore considered in relation to the proposed freshwater pipelines from Meadow and Ocean lakes. Together, the pipelines routes are approximately 15 km long, and pass through softwood and mixedwood stands, as well as open areas. The portion of the Assessment Area associated with the freshwater pipelines has undergone less industrial development than the area of the Facility; however, very little intact forest is present along the pipeline routes as a result of extensive forestry activity. As much of the area surrounding the freshwater pipeline has low habitat suitability (based on modelling results), and/or has been previously disturbed, the development of the freshwater pipeline for the Project is unlikely to interrupt concentration areas of suitable habitat (i.e., to cause habitat fragmentation). Effects will be further minimized by the small size of the pipeline (approximately 44 cm diameter), burial of the pipeline so that it will not pose a physical barrier to mainland moose, and by limiting the area to be cleared for the pipeline to the minimum required (an approximate 5 m corridor).

Disease

Mainland moose have the potential to be affected by Project activities that increase the density of white-tailed deer within the Assessment Area (e.g., increased access through road development and vegetation clearing). Co-existence with white-tailed deer has been identified

as a pervasive threat to mainland moose due to the potential for deer to spread debilitating disease. White-tailed deer, which are not native to Nova Scotia, are hosts for brainworm (*Parelaphostrongylus tenuis*) and winter tick (*Dermacentor albipictus*), both of which cause mortality in mainland moose and are thought to be regulators of population abundance and distribution (NSNR, 2021h). Enhanced access for white-tailed deer can indirectly affect mainland moose by increasing opportunities for disease to spread.

The desktop and field assessments indicate that white-tailed deer have been and are currently present within the Assessment Area (signs of white-tailed deer were observed during biophysical surveys and captured by trail cameras). The area is already highly accessible to white-tailed deer due to historical land uses (e.g., industrial development, forest harvesting; areas potentially frequented by deer for foraging and ease of travel), and the Project is not likely to meaninfully increase access to white-tailed deer within the Assessment Area or LAA. However, it is possible that the coexistence of white-tailed deer and mainland moose could increase within the freshwater pipeline corridor as newly cleared areas may offer easier travel routes and opportunities for both species to browse on regenerating vegetation. However, the effects on mainland moose from disease due to the Project are expected to be low.

Poaching

Land clearing and road/trail development for the Project may indirectly impact mainland moose by making the landscape more accessible to poachers. It is difficult to quantify the threat posed by poaching due to the nature of the activity; however, any amount of illegal harvesting poses a substantive risk to mainland moose due to the low population size of the species (NSNR, 2021h).

As described in relation to white-tailed deer, much of the Assessment Area has undergone past industrial development (including 70% of the Project Footprint) and is highly accessible. Maximizing the use of disturbed areas was an important consideration during the development of the Project layout (including the routes of the freshwater pipelines). Importantly, security measures throughout the REP (including fencing), as well as the presence of Project staff, may be effective deterrents to poachers. Overall, it is expected that the effects of poaching related to the Project will be negligible.

Sensory Disturbance and Disruption of Life History

It is possible that mainland moose may experience sensory disturbance and stress associated with the construction and operation of the REP, with potential for inducing behavioural changes. Sources of disturbance may include anthropogenic noise and light, the use of which will span all of phases of the Project. Indirect effects on life history are also possible through the loss of important habitat features.

Moose have been shown to respond to acoustic stimuli through changes in their behaviour, including the amount of time spent in a state of vigilance and time spent feeding (Bhardwaj et al., 2022). Anthropogenic noise is known to have a range of effects on wildlife, including avoidance behaviour (Ware et al., 2015), stress (Kight & Swaddle, 2011), and altered wildlife

communication (Duquette et al., 2021). Noise will be generated by the Project during the construction phase (associated with construction equipment and heavy machinery), operations (facility components and vehicular traffic), and decommissioning (equipment and heavy machinery), and may elicit a behavioural response in mainland moose within the LAA.

Although little information is available about the effects of lighting on moose, in general terms artificial lighting has the potential to impact wildlife by causing disorientation or altering attraction/avoidance of an area (Longcore & Rich, 2004). During construction, operation, and decommissioning, light will be sourced from heavy equipment and the REP Project components.

Indirect effects to mainland moose life history may also stem from a loss of vegetative cover due to clearing to support project-related infrastructure. For example, impacts to calving habitat could result from clearing areas with enough seclusion or cover to protect calves from predators (NSNR, 2021h). Clearing of secluded areas for the Project will be limited due to much of the Assessment Area having undergone recent development (i.e., few secluded/undisturbed areas are present within the Assessment Area).

Climate Change

Climate change has been identified as a direct and indirect threat to mainland moose (NSNR, 2021h). For example, climate change may impact habitat characteristics, improve conditions for disease and problematic species, and alter behavioural and competitive dynamics. On a broad scale, it is expected that the Project will have a net positive impact on climate change (for further details see Section 7.1.2), thus the Project is not expected to contribute to the threat posed by climate change.

Effects on Other Terrestrial Fauna

Road Traffic

The Project will result in increased road traffic within the Assessment Area and LAA. Both small and large terrestrial mammals are known to use the roadways within the Assessment Area, as evidenced by observations during field surveys and trail cameras. An increase in road traffic will likewise increase the chances of collision and mortality for animals using the roadways. Primary roads within the LAA are currently used by the public, and secondary roads are used by the public (e.g., hunting) and forestry/industrial users.

Traffic count and analysis data from the NSPW for the segment of Highway 316 that passes through the Assessment Area suggests traffic volumes are low in this area, with annual average daily traffic estimates of 250 to 260 vehicles per day from 2014 to 2023 (NSPW, 2024). During the site preparation and construction phase, increased traffic within the Assessment Area and LAA will occur as a result of increased personnel at the Project site as well as the presence of construction vehicles. During the operations phase, biomass will be delivered to the REP by truck (and potentially by marine vessel) from locations across NS. It is expected that overland deliveries will approximate 60 truckloads per day, which represents a moderate increase in traffic volumes (NSPW, 2024)

Trucks will also be used to transport wood chips between the marine berth and offloading facility and the biomass handling facility where biomass is delivered by marine vessel (i.e., within the Project site but crossing Highway 316). This source of truck traffic will be reduced during later stages of Project following the construction of a conveyor system between the marine berth and offloading facility and biomass handling facility. Trucking estimates for product off-take (e.g., land-based shipping of co-products) will be determined during later phases of Project design.

Overall, it is anticipated that road traffic in the LAA and Assessment Area will increase above current levels during all phases of the Project, but that traffic volumes will remain low. Mitigation measures to reduce the effects of road traffic related to the Project on terrestrial fauna are described below.

Habitat Loss and Fragmentation

Several non-priority species were observed within the Assessment Area and LAA during field surveys that make use of various habitat types across the area. Land clearing and development can impact wildlife habitat in several ways, including its quality, abundance, distribution, and connectivity. Specific impacts may include loss of wildlife refugia, changes in forage availability, and altered patterns of movement/migration.

As described in relation to effects of the Project on habitat loss and fragmentation for mainland moose, the majority of the Project Footprint, much of the Assessment Area, and large portions of the LAA have already undergone disturbance by historical industrial operations, and a limited amount of newly disturbed area will be required for the Project (approximately 65 ha; land cover within the Project Footprint described in Section 7.4.1.3). Mitigation measures to further reduce the effects of the Project on terrestrial fauna habitat are described below.

Sensory Disturbance

The behaviour of terrestrial fauna has the potential to be directly or indirectly impacted by sound generated by the Project. Although the auditory capabilities of fauna species vary (Shannon, McKenna, et al., 2016), changes to ambient sound levels have the potential to adversely affect fauna. Sound can cause avoidance behaviour (Ware et al., 2015), stress (Kight & Swaddle, 2011), and alter wildlife communication (Duquette et al., 2021). Combined, these effects can negatively impact the overall population health of a particular species (Ware et al., 2015).

The effects of noise related to the Project will be greatest during the construction and decommissioning phases, when intermittent sound will be generated from the operation of heavy machinery and transportation vehicles (described in Section 10.2). During the operations phase, reduced (i.e., below regulated levels) but continuous sound will be generated by operation of facility components, and intermittent sound will be generated from vehicular traffic. Overall, sound has the potential to result in localized wildlife avoidance of the Project Footprint/Assessment Area, particularly during the construction and decommissioning phases.

Site Contamination

Historical operations within and near the Assessment Area have resulted in the presence of legacy contamination (e.g., mercury, arsenic) on the Project site (described in Sections 7.1, 7.2, and 7.3). The effects of existing contamination on wildlife health are largely unknown; however, there is potential for contaminants to become mobilized during the construction phase, with potential effects on wildlife. Mitigation measures will be required to ensure that potential sources of contaminants (fugitive dust, stormwater, grubbed/excavated material) are controlled. With appropriate measures in place, the effects of the Project on wildlife relating to contamination are expected to be negligible, or positive (as the development of the Project will result in an overall reduction in the levels of site contamination).

Mitigation

To address the abovementioned effects to terrestrial fauna, including mainland moose, the following mitigation measures will be implemented:

Habitat Loss and Fragmentation

- Limit the overall area to be cleared by maximizing use of existing roads/trails and situating Project components within previously developed areas, where feasible.
- Trench and bury the freshwater pipeline, where feasible, such that it does not pose a physical barrier to wildlife movement.
- Revegetate roadsides and cleared areas to minimize lost/fragmented habitat as much as possible while maintaining visibility of approaching animals.
- Support landscape connectivity by maintaining vegetated buffers around wetlands and watercourses, where possible.
- Continue to review results of habitat models, field surveys, and guidance from NSNR through the detail design phase.

Disease

- Use native seed mixes that do not contain clover to avoid attracting white-trailed deer (which carry ticks) to the area when revegetating road ROWs and other cleared areas requiring revegetation.

Road Traffic

- Educate Project staff about wildlife potential on roads.
- Install traffic signs to alert road users of speed limits and the presence of wildlife in the area.
- Inform all Project-related staff working on the site of dangers to wildlife and create awareness around wildlife hotspots on the site.
- Impose restrictions to site access if deemed necessary due to a substantial increase in wildlife collisions and mortality.

Sensory Disturbance and Disruption of Life History

- Avoid removal of vegetation/habitat alteration in key habitat areas during sensitive windows for priority species (i.e., mainland moose), where possible, including:
    - Late May to early June – calving season
    - September to October – breeding season
- Minimize loss of important habitat required by mainland moose for reproduction when possible, including:
    - Wetlands
    - Isolated islands/peninsulas
- Maintain refugia and cover for protection from predators by minimizing the overall area to be cleared.
- Maintain all equipment and machinery on site to reduce sound and vibration associated with malfunctions. Where practical, install vehicles and machinery with noise muffling equipment to limit disturbance.
- Restrict on-site lighting, especially at night, to limit disturbance.
- Use good waste management practices to reduce attractants to opportunistic wildlife species, where applicable.
- Prohibit harassment and feeding of wildlife by Project personnel.

Site Contamination

- Mitigation measures will be required to control sources of possible contaminants, including fugitive dust, stormwater, and excavated material. These measures are outlined in Section 7.1, 7.2, and 7.3 in relation to the atmospheric, geophysical, and freshwater environment, respectively.

Monitoring

A site-specific post-construction Wildlife Management Plan will be developed to inform monitoring activities to ensure continued protection of terrestrial fauna priority species in the Assessment Area and LAA.

Conclusion

The effects of the Project on terrestrial fauna have been assessed through desktop review and augmented through field assessments. After mitigations are applied, residual effects associated with the Project are characterized as follows:

- Magnitude: The magnitude of residual effects is low. The project has been designed to maximize the use of disturbed areas to limit habitat loss and fragmentation for priority species, and disturbance to individuals will be limited by implementing mitigation measures.
- Geographic Extent: Effects will be limited to the LAA.
- Frequency: Habitat loss and fragmentation will occur once during the construction phase of the Project and sensory disturbance with be continuous throughout operations. Overall, frequency is considered continuous.

- Duration: Habitat loss and fragmentation and sensory disturbance are long-term as they continue through the operational and maintenance phase until after decommissioning.
- Reversibility: Partially reversible as new disturbed areas will revegetate during decommissioning, and the effects of sensory disturbance are expected to cease following decommissioning.
- Significance: Not significant.

7.4.3 Bats

7.4.3.1 Overview

A desktop review and field studies were undertaken to gather information on bat species and associated habitat within the Assessment Area. Objectives were as follows:

- Assess and characterize potential significant bat habitat (i.e., hibernacula) within the Assessment Area.
- Use the information collected to inform and refine the Project design (i.e., avoid impacts to SOCI and their habitats).
- Use the information collected to inform mitigation and management practices.

7.4.3.2 Regulatory Context

There are seven species of bats documented in Nova Scotia, of which four are resident species that reside in the province year-round, and three are migratory species that overwinter in the southern United States. Resident species consist of the little brown myotis [also known as little brown bat (*Myotis lucifugus*)], northern myotis [also known as northern long-eared bat (*Myotis septentrionalis*)], tri-colored bat [also known as eastern pipistrelle (*Perimyotis subflavus*)], and big brown bat (*Eptesicus fuscus*). Migratory species consist of the eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), and silver-haired bat (*Lasionycteris noctivagans*).

Three resident species (the little brown myotis, northern myotis, and tri-colored bat) are protected federally and provincially under SARA and the ESA. These three species were added to the ESA as “Endangered” on July 11, 2013, and were declared “Endangered” under Schedule 1 of SARA on November 26, 2014. The designation under SARA and the ESA was driven by the emergence of white-nose syndrome (a disease caused by the fungus *Geomyces destructans*), which was first detected in Canada in 2010 and led to a 90% population decline in NS by 2013 (COSEWIC, 2013). All three migratory bat species were assessed by COSEWIC in May 2023 as “Endangered” (COSEWIC, 2023). The big brown bat is not frequently observed in Nova Scotia, however its range is believed to be expanding into eastern Canada due in part to climate change and white-nose syndrome (McAlpine et al., 2024). The big brown bat is not listed under either SARA or the ESA.

7.4.3.3 Desktop Review

Databases and online resources referenced as part of this desktop review include:

- Terrestrial Habitat Mapping (Section 7.4.1)
- Locations of Known Bat Hibernacula in NS (Moseley, 2007)
- Nova Scotia Geoscience Atlas - Abandoned Mine Openings (NSNR, 2021f)
- Nova Scotia Significant Species and Habitats Database (NSNR, 2024e)
- ACCDC Data Reports (ACCDC, 2024a, 2024b)

Terrestrial Habitat Mapping

Terrestrial habitat mapping from Section 7.4.1 was used to identify locations of ideal bat foraging and over-day habitat (i.e., day roosts) within the Assessment Area. Ideal habitats for bat foraging and over-day habitat include lakes, wetlands, watercourses, forest edges, cliffs, rock outcrops, talus slopes, and mature hardwood forests.

There are three habitat features considered to be significant for bats: hibernacula for overwintering, maternity roosts for birthing and raising young, and migratory stopovers for rest periods during spring/fall migration. Hibernacula are overwintering sites that are typically located in abandoned mines or caves and can support hundreds of bats. Maternity colonies are poorly documented in Nova Scotia, with limited desktop information regarding these sites' location and use (ECCC, 2015b; NSNR, 2020b).

Migration is one of the most poorly understood components of bat biology, at both a regional (< 200 km) and long distance (> 1000 km) scale. Migratory stopovers utilized for short-term rest or sanctuary are thought to be located on islands or shorelines of large bodies of water and along geographic features such as riparian zones or mountain ranges (McGuire et al., 2012). Riparian and shoreline habitats were identified during terrestrial habitat mapping.

Locations of Known Bat Hibernacula

Mosley (2007) provides an overview of known and recorded bat hibernacula located within Nova Scotia. This research indicates four known hibernacula within a 100 km radius of the Assessment Area (Table 7.57).

Table 7.57: Known Bat Hibernacula within 100 km of the Assessment Area

Hibernaculum	Approximate Distance to Assessment Area*	Direction
Hirschefield Galena Prospect	33 km	NW
McLellan's Brook Cave	79 km	NW
New Laing Adit #1 and #2	93 km	NW

(Moseley, 2007)
*Distance measured to the nearest point of the Assessment Area.

The closest hibernaculum to the Project is the Hirschefield Galena Prospect hibernaculum, located approximately 34 km to the northwest. This hibernaculum is an abandoned adit (horizontal mine passage) with a length of 215 m that was thought to support approximately

200 to 300 bats in 2007. McLellan's Brook Cave is the next closest recorded hibernaculum at a distance of 81 km from the Assessment Area. This is a dissolutional limestone stream cave 85 m long. The only other recorded hibernaculum within 100 km of the Assessment Area is New Laing Adit #1 and #2, which consists of abandoned mine trials located 94 km from the Assessment Area. Neither McLellan's Brook Cave nor New Laing Adit #1 and #2 have records of bat observations underground (Moseley, 2007).
Also, note that these hibernacula were evaluated prior to the onset of white-nose syndrome in Nova Scotia; therefore, populations of bats using these habitats may no longer be accurate.

Abandoned Mine Openings

According to the British Columbia Ministry of Environment and Climate Change Strategy, Ecosystems Branch (BCMOE, 2016), abandoned mine openings (AMOs) may serve as overwintering bat habitat if they have a depth greater than 30 m. Mine openings must also be of a suitable type (i.e., shafts, adits, or pits) and remain accessible to bats (i.e., not flooded, filled, capped, or plugged) to provide suitable habitat.

There are 52 recorded abandoned mine openings in the NSNR database located within the Assessment Area (NSNR, 2024a) (Drawing 3.2). Of these, none are of an appropriate depth and complexity to support bat hibernation. There are an additional 256 AMOs within 5 km of the Assessment Area (NSNR, 2024a). Of these, only five meet the aforementioned criteria to be considered potential bat hibernacula. Each of these openings are gold mine shafts located between approximately 500 and 900 m from the Assessment Area along Isaacs Harbour.

Not all AMOs within the Assessment Area were captured by the Abandoned Mine Opening Database (NSNR, 2024a). A previous survey completed by Golder Associates (2014a) identified 205 AMOs within a 5 km buffer of the Assessment Area, of which 134 are located within the Assessment Area (Drawing 3.2).

Significant Species and Habitat Records

The NSNR Significant Species and Habitats Database (2024) contains 74 unique species/habitat records pertaining to bats and associated habitat within a 100 km radius of the Assessment Area:

- Six "Species of Concern" records relating to caves.
- Four "Other Habitat" records relating to caves.
- 64 "Species at Risk" records which relate to unclassified bats (23), *Myotis* species (22), little brown myotis (nine), hoary bats (five), and northern myotis (five).

Of the 74 unique species/habitat records, 31 are located within the Assessment Area. These 31 records are all "Species at Risk" records (relating to unclassified bats, hoary bats, and *Myotis* species) originating from vocalizations recorded in 2013, 2018, and 2020.

ACCDC Records

The ACCDC Data Reports (ACCDC, 2024a, 2024b) completed for this Project indicated two bat species and one genus of concern recorded within 100 km of the ACCDC Study Area (Table 7.58).

Table 7.58: Bat Species Recorded within a 100 km radius of the ACCDC Study Area

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank
Little brown myotis	*Myotis lucifugus*	Endangered	Endangered	Endangered	S1
Hoary bat	*Lasiurus cinereus*	Endangered	---	---	SUB,S1M
Bat species	*Vespertilionidae sp.*	---	---	---	S1S2

(ACCDC, 2024a, 2024b)

According to the ACCDC Reports (2024a; 2024b), a “bat hibernaculum or bat species occurrence” is known to exist within the ACCDC Study Area, which was confirmed with NSNR on August 25, 2025, to be a bat species occurrence record (and not a bat hibernaculum record).

7.4.3.4 Field Assessment Methodology

A dedicated AMO identification survey was completed within the Assessment Area (excluding the raw freshwater pipelines) in July 2024 to identify all AMOs on the site, both as part of the Project's safety evaluation and to identify AMOs/potential overwintering habitat not captured by the Abandoned Mine Opening Database (NSNR, 2021f). This survey identified 105 AMOs within the Assessment Area (excluding the proposed raw freshwater pipeline routes). Due to lack of identifying features and the lack of precision of location data, it is not possible to distinguish which of these 105 are previously identified mines. Therefore, there is potential for a total of 291 AMOs on site. However, due to lack of data for any AMOs unidentified by Strum, an evaluation of hibernacula potential is only possible on the 105 Strum identified AMOs.

For the bat hibernacula assessment, the AMO information collected (i.e., photographs, descriptions, and hazard rankings) was screened to identify AMOs that may have suitable characteristics to support overwintering bats. AMOs that were characterized as open, dry, and having a level of complexity [based on depth (> 30 m), and number of shafts] were flagged for further assessment as potential bat hibernacula, while infilled, capped, collapsed, or flooded AMOs were screened out. As the original field AMO assessment was not conducted by a trained biologist, AMOs which were identified through this process as potentially supporting bats needed to be revisited and reassessed. Based on the screening, 22 of the field-identified AMOs were flagged for further assessment (Drawing 7.27).

Each of the 22 flagged AMOs underwent a visual inspection between August 28 and 30, 2024, from a minimum distance of 3 m (as a safety precaution) to determine if they met the criteria to potentially support overwintering bats. A Survey123 (Esri, 2024) form was also completed at each visited AMO, which collected data including a description of the AMO, geospatial

information, current condition, estimated depth, geographical location, and photographs. Incidental observations of other habitat features that may support overwintering bats (e.g., natural caves) were also recorded.

7.4.3.5 Field Assessment Results

None of the AMOs that underwent visual inspection were identified as potential bat hibernacula. Each of the AMOs were characterized as less than 10 m in depth and either flooded, infilled, or caved in, making them unsuitable for bat overwintering habitat (Table 7.59). No incidental observations of potential bat overwintering habitat were recorded.

Table 7.59: Results of Bat Hibernacula Assessments Within the Assessment Area

AMO ID	Coordinates	Description	Potential Hibernacula? (Yes/No)
3	45.16725519, -61.63156526	< 10 m in depth, remainder filled and revegetated with shrubs and trees.	No
5	45.16735425, -61.63220511	< 10 m in depth, remainder filled and revegetated with shrubs and trees.	No
6	45.16724423, -61.63221587	< 10 m in depth, remainder filled and revegetated with shrubs and trees.	No
7	45.1672113, -61.63227591	Filled/collapsed.	No
16	45.16720702, -61.62881561	< 10 m in depth, remainder filled and revegetated with shrubs and trees.	No
30	45.16834359, -61.63307028	< 10 m in depth, remainder filled and revegetated with shrubs and trees.	No
32	45.16820345, -61.63314537	< 10 m in depth, remainder flooded.	No
41	45.16887819, -61.63213139	Filled/collapsed.	No
42	45.16878472, -61.63213401	Filled/collapsed.	No
43	45.16903893, -61.63236653	Filled/collapsed.	No
44	45.17043405, -61.63213114	Filled/collapsed.	No
51	45.16084577, -61.6323612	< 10 m in depth, remainder filled and revegetated with shrubs and trees.	No
53	45.16071798, -61.63274617	Filled/collapsed.	No
54	45.1606816, -61.63268214	Filled/collapsed.	No
63	45.16085027, -61.63326598	Filled/collapsed.	No
70	45.16157738, -61.62953761	< 10 m in depth, remainder filled and revegetated with shrubs and trees.	No
73	45.16090233, -61.62995208	< 10 m in depth, remainder filled and revegetated with shrubs and trees.	No
77	45.16120048, -61.63201221	< 10 m in depth, remainder filled and revegetated with shrubs and trees.	No

AMO ID	Coordinates	Description	Potential Hibernacula? (Yes/No)
78	45.16113307, -61.63198929	< 10 m in depth, remainder filled and revegetated with shrubs and trees.	No
85	45.16250825, -61.63388722	Filled/collapsed.	No
102	45.16307412, -61.6337892	Filled/collapsed.	No
103	45.16317218, -61.63371721	Filled/collapsed.	No

7.4.3.6 Effects Assessment

Project-Bat Interactions

Project activities, primarily those involving vegetation removal, have the potential to impact bats and bat habitat (Table 7.60). These activities could result in habitat removal along with accidental injury/mortality. Other Project activities during construction and operation, such as increased noise and lighting, may impact bat behaviours.

Table 7.60: Potential Project-Bat Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	X
Water Pipeline and Roadway Construction	X
Facility Foundation Construction	X
Transportation of Facility Components	-
Facility Assembly	-
Utility Connections	-
Removal of Temporary Works and Site Restoration	X
Operations and Maintenance	
Commissioning	-
Handling of Biomass	X
Production of SAF and Other Products	-
Product Storage	-
Vegetation Management	X
Decommissioning and Rehabilitation	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for bats includes a 5 km buffer around the Assessment Area (Drawing 7.27). This distance was selected as the boundary within which to assess the direct and indirect effects of

the Project on bats based on its relevance for local species movements between habitat types. The RAA is not applicable.

Assessment Criteria

The assessment criteria provided in Section 4.6 applies to bats. The VC-specific definition for magnitude is as follows:

- Negligible: No measurable loss of bat habitat or impacts to bat behaviours are expected.
- Low: Small loss of habitat supporting bats, but loss of individuals is not expected.
- Moderate: Loss of habitat supporting bats and minimal loss of individuals or impacts to bat behaviours, and these impacts will only be experienced by individuals rather than entire populations.
- High: High loss of habitat that supports bats and/or loss of individuals or impacts to bat behaviours on a population scale.

Priority Species

Bat SAR/SOCI that have been recorded within a 100 km radius of the ACCDC Study Area, or have a likelihood of occurrence based on the desktop review and habitat within the Study Area were screened against the criteria outlined in the document Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009) to develop a list of priority species. These priority species include:

- Little brown myotis
- Hoary bat

The little brown myotis is the most common species in NS and is likely ubiquitous in the province (Broders et al., 2003). During the day, the little brown myotis will congregate and roost in tight spaces under rocks and buildings, trees, wood piles, and caves (Fenton & Barclay, 1980). As a non-migratory species, little brown myotis hibernates from September to early or mid-May in abandoned mines or caves (Fenton & Barclay, 1980; Moseley, 2007). The ACCDC data reports (2024a, 2024b) indicate that the closest little brown myotis observation to the approximate center of the ACCDC Study Area is 27.0 ± 0.1 km.

Hoary bats have the widest range among all native terrestrial mammals within the Western Hemisphere and are found across Canada and the United States (COSEWIC, 2023). As a result, hoary bats travel long distances (i.e., across the continent) during migratory periods, residing in coastal regions of Mexico and the United States during winter and migrating north in the spring. Hoary bats can be found roosting in the foliage of trees or shrubs in coniferous or deciduous forests of any age, but they prefer mature stands with abundant canopy cover and open flight space below. Foraging habitat for hoary bats is associated with open areas containing patches of trees such as fields, grasslands, or wetlands, though they tend to avoid heavily disturbed habitats such as transportation corridors, urban developments, and mines. Migration is thought to occur across coastal and/or large open areas (COSEWIC, 2023). The

ACCDC data reports (2024a, 2024b) indicate that the closest hoary bat observation to the approximate center of the ACCDC Study Area is 50.0 ± 0.2 km.

Effects

Potential impacts to bat species from the Project's construction and operation include:

- Habitat fragmentation and/or removal.
- Direct and/or indirect mortality.
- Sensory disturbance (i.e., lighting, noise, human activity).

Habitat Fragmentation and Removal

Habitat fragmentation and removal will be primarily associated with the construction of the REP and raw freshwater pipeline within the Assessment Area. Vegetation clearing required for construction can result in the removal of bat habitat (snags, wetlands) or disrupt corridors between important habitat features (foraging grounds, birthing areas) (Segers & Broders, 2014). In addition, clearing and construction activities can potentially impede movement, foraging, flight activity, and habitat use (Voigt & Kingston, 2016). This can decrease the movement of individuals between populations, limiting gene flow and decreasing population-level fitness (Voigt & Kingston, 2016). However, the behavioural response of bats to landscape alteration is highly species-specific, as some species exhibit patterns of movement which are uninterrupted by anthropogenic linear features (Voigt & Kingston, 2016).

A study by Sergers and Broders (2014) also found that different species of bats respond differently to landscape alteration. Suitable habitat for the little brown myotis increased after habitat fragmentation increased the occurrence of open areas and forested edges, which are preferred foraging habitats for the species (Segers & Broders, 2014). Alternatively, suitable habitat for northern myotis bats decreased, likely due to this species' preference to forage in forested areas and around canopy-covered streams (Segers & Broders, 2014). Pregnant and lactating female bats have also been shown to be sensitive to habitat degradation as their foraging ranges are more constricted due to decreased energy and caring for young (Henry et al., 2002; Segers & Broders, 2014).

During field surveys, it was observed that the Assessment Area is already significantly fragmented and disturbed from previous industrial activities. The majority of the Assessment Area (except for the raw freshwater pipelines) has undergone extensive historical harvesting and grubbing activities, which has resulted in large open areas with little canopy cover. It is unlikely that the habitat observed during surveying supports maternity colonies, which generally occur in mature, large-diameter trees, and deep crevices (Rensel, 2013). Other significant habitat features, such as abandoned mine openings, though abundant within the Assessment Area, were assessed and found not to be suitable bat overwintering habitat.

Impacts to bats as a result of habitat fragmentation and removal are anticipated to be minimal based on the Project's maximized use of previously disturbed land.

Injury/Mortality

There is potential for accidental direct and indirect injury/mortality of bats during Project construction and/or operation. Accidental direct injury/mortality may occur during the construction phase in association with vegetation removal within the Project Footprint. Risks can be mitigated by scheduling vegetation removal to coincide with bat overwintering.

Accidental direct injury/mortality may also occur during the operation phase due to bat interactions with anthropogenic structures and vehicles. During Project operation, excessive lighting may increase the potential for direct interaction with bats (resulting in injury/mortality), as bats may take advantage of the feeding opportunity presented by insect attraction to artificial light (Voigt & Kingston, 2016). Bats, or swarms of insects which may in turn attract bats, may also be attracted to light produced by flames associated with the flare; however, no research has been published which supports or disputes this. Flaring will be conducted in a manner which minimizes impacts on fauna.

Sensory Disturbance

Sensory disturbance generated primarily by lighting and noise during the Project's construction and operation phases may impact bat behaviours and/or impede movement, foraging, flight activity, and habitat use.

Sensory disturbances associated with lighting during the Project's construction and operation phases may also impact bat behaviour. As previously discussed, light can attract bats by creating a concentrated food source. However, some species have been found to avoid artificial lighting, meaning it can reduce and fragment suitable habitat (Stone et al., 2015; Voigt & Kingston, 2016). Non-natural light can also interfere with bats' navigational abilities and disrupt the circadian rhythm of some species, leading to a variety of impacts, including delayed roost emergence, increased competition, and unnecessary energy expenditure (Stone et al., 2015; Voigt & Kingston, 2016).

Construction noise (e.g., heavy equipment, construction-related traffic, and blasting) could potentially affect bats within a localized area. However, bats are well-adapted morphologically, physiologically, and behaviourally to avoid acoustic trauma (California Department of Transportation, 2016). Since they are exposed to the exceptionally loud sounds of their own echolocation signals (e.g., 110 dB), bats have evolved protective mechanisms to prevent sensory overload and damage to their auditory systems (California Department of Transportation, 2016; Wever & Vernon, 1961). These mechanisms are very effective in achieving protection from constant noise exposure (i.e., noise associated with traffic during the construction phase), and it is speculated that they can also prevent over exposure from sudden, unexpected noises (e.g., blasting).

According to the (California Department of Transportation, 2016), bat echolocation calls are in the ultrasonic range beyond the upper-frequency limits of construction noise, meaning there is effectively no echolocation masking effect from construction noise. However, a study by (Bunkley et al., 2015) found that low frequency species [< 35 kilohertz (i.e., hoary bat, silver-

haired bat, and big brown bat in Nova Scotia)] may exhibit reduced activity or experience impacts related to prey detection at loud natural gas extraction sites compared to quiet sites. The same study found that activity levels of four species, including little brown bat, were not impacted by noise at loud sites. Additionally, the usual lack of construction activity during the active bat period (30 minutes before sunset to 30 minutes after sunrise) further limits any potential masking effects in the ultrasonic ranges and potential for reduced foraging ranges due to sensory impacts.

The impacts of necessary noise and light associated with the Project on bat behaviour and movements are anticipated to be low based on bats' morphological adaptations and behavioural patterns and the anticipated timing of activities that have the potential to cause sensory disturbances. Light disturbance will also be limited temporally and spatially, with most effects occurring during the site preparation and construction phase and no lighting being used along the water pipeline during the operations and maintenance phase.

Mitigation

To address the abovementioned effects on bat and bat habitat, the following mitigation measures will be implemented:

- Minimize the overall area to be cleared by utilizing pre-existing roads and previously altered areas (i.e., clearcuts) when possible.
- Target clearing activities outside the active bat window (April 1 to September 30).
- Avoid important bat habitat (e.g., hibernacula, old-growth forest) to the greatest extent possible.
- Minimize habitat fragmentation and isolation during the design phase.
- Minimize light pollution to the extent possible during the operation phase.
- Utilize noise controls (e.g., mufflers) on machinery, equipment, etc., during the construction phase.

Monitoring

Additional monitoring is not recommended within the Assessment Area.

Conclusion

The effects of the Project on bats and bat habitat have been assessed through desktop review and augmented through field assessments. After mitigation, residual effects associated with the Project are characterized as follows:

- Magnitude: Effects have a low magnitude. Loss of a small amount of habitat may occur, but loss of individuals is not expected.
- Geographic Extent: Effects will be limited to the LAA.
- Frequency: Effects are continuous throughout the Project lifespan.
- Duration: Effects are medium term, as they will extend throughout the operation of the Project.
- Reversibility: Effects are reversible.
- Significance: Not significant.

7.4.4 Avifauna

7.4.4.1 Overview

A desktop review and field program were undertaken to gather information on avian species and associated habitat in the Assessment Area. Objectives were as follows:

- Assess observations, species diversity, and habitat utilization of avian species, including trends in species composition, within the Assessment Area during all seasons.
- Use the information collected to inform and refine the Project design (i.e., avoid impacts to avifauna species and their habitats, with a focus on SAR and SOCI.
- Assess migratory bird activity and assess the risk that the Project poses to migratory birds.
- Use the information collected to inform mitigation and management practices.

7.4.4.2 Regulatory Context

The Project has potential to interact with avifauna species that are protected under several federal and provincial legislations, which the avifauna surveys explained herein were designed to detect. Legislation that may direct resource development and conservation of avifauna species and their habitat include:

- SARA
- *Migratory Bird Convention Act,* 1994 (MBCA)
- *Wildlife Act*, R.S.N.S. 1989, c. 504
- ESA

The MBCA protects all migratory birds while they are present in Canadian Jurisdiction, including on land, in the air, and on the water. ESA and SARA prohibit harm to SAR listed as “Threatened” or “Endangered” along with their habitually occupied spaces and Core/Critical Habitat.

The Project is also driven by policies, guidelines, and standards that provide guidance on the development of the Project and the survey design for all project types (e.g., wind, quarry, etc.). These guidance documents and policies include:

- Environment and Climate Change Canada’s Canadian Wildlife Service (Atlantic Region) – Wind Energy & Birds Environmental Assessment Guidance Update (ECCC-CWS, 2022).
- Wind Turbines and Birds - Updated Guidance for Environmental Assessment and Monitoring, Canadian Wildlife Service – Atlantic Region (2018).(ECCC-CWS, 2018)
- Wind Turbines and Birds - A Guidance Document for Environmental Assessment, Canadian Wildlife Service (ECCC-CWS, 2007b).
- Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds (ECCC-CWS, 2007a).

- NSECC Wetland Conservation Policy (NSECC, 2019).
- The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009).
- Various NSNR Special Management Practices (SMP) and ECCC Species at Risk Management Plans.

7.4.4.3 Desktop Review

Desktop information was utilized to gain insight into protected avifauna habitats, species utilization of the area, and to identify avian SAR and SOCI potentially occurring at or within the Assessment Area using the following sources:

- Landcover Mapping (Section 7.4.1)
- ACCDC
- Maritimes Breeding Bird Atlas (MBBA)
- Important Bird Areas (IBAs)
- NSNR Significant Species and Habitats
- Canadian Wildlife Service Migratory Bird Sanctuaries
- Canadian Wildlife Service Waterbird Colony Database (Atlantic Region)
- SARA Critical Habitat GIS layers
- SARA Recovery strategies
- Public databases such as eBird and iNaturalist, or other public avian data sources

The Government of Nova Scotia Provincial Landscape Viewer and Parks and Protected Areas interactive online maps were also reviewed to determine whether the Assessment Area is within, or adjacent to special features, such as protected area/parks or ecologically sensitive regions (i.e., wildlife management areas, nature reserves, wilderness areas, and provincial parks).

The Assessment Area is situated in Goldboro, NS. The Assessment Area on the mainland has been historically disturbed (i.e., historic mining activity and developed areas from the decommissioned Sable Gas Plant with existing infrastructure including an existing pipeline corridor and transmission line), harvested (i.e., newer and old clear-cut activity), and the vegetation within the Assessment Area is in various states of regeneration. The southern and western border of the Assessment Area extends along the coastline of Isaacs Harbour. Also within the Assessment Area is a small peninsula that extends from the coastline off Highway 316, which is surrounded by Webbs Cove, Dung Cove, and Bettys Cove. Most of this peninsula, besides one existing private property, is forested with a few ponded areas suitable for waterfowl species (Drawing 2.2A).

Overall, the coastline and Isaacs Harbour provide foraging and refuge areas for various types of waterfowl, seabirds, and shorebirds. Based on the CWS Waterbird Colony Database (Atlantic region), there is a known common eider (*Somateria mollissima*) colony observation from 2008 within Webbs Cove, which is immediately adjacent to the western border of the Assessment Area (i.e., within 50 m) (Wilhelm & Mahoney, 2017). There are no quantities on colony size provided in this database and there are no occurrences on Hurricane Island.

Based on land cover mapping, much of the Assessment Area consists of existing disturbance such as open areas (i.e., barrens, fields, etc.) and cutovers (harvested areas). The rest of the Assessment Area consists of softwood and mixedwood forest, as well as wetland habitat (i.e., open/treed/shrub swamps, bogs, fens, and marshes), watercourses, and ponded water. A large portion of the Assessment Area (including 70% of the Project Footprint) represents historically disturbed and developed habitat through clear-cutting, grubbing, historic mining, and existing infrastructure, which results in barren landscapes or regenerative areas with young regrowth. The diversity of habitat types, in particular the prevalence of disturbed and edge/transitional habitat, provides for the foraging, breeding, and roosting requirements of a variety of resident and migratory bird species. This includes stop-over locations for migrating birds. Areas with edge habitat or stand heterogeneity (i.e., stands with different height classes) also attract a variety of passerines and raptors for foraging and breeding requirements. Overall, much of the Assessment Area contains disturbed land and coastal barren habitat, with the surrounding area being forested.

Based on the review of various online public databases such as eBird and iNaturalist, the coastline and wide expanse of open wetlands (i.e., bogs and open swamps), barrens, and forested areas, attracts a variety of shorebirds, seabirds, waterfowl, passerines (e.g., warblers, swallows, finches, etc.), and raptors such eagles, hawks, and owls. There is an observation of a peregrine falcon (anatum/tundrius; *Falco peregrinus*; ESA “Vulnerable”, S-Rank “S1B, SUM”) along the coastline of Isaacs Harbour by Goldboro from September 2021 in the iNaturalist database (iNaturalist, 2025). Based on the NSNR Significant Species and Habitat database, Northern goshawk (*Accipiter atricapillus*; S-Rank “S3S4”) are known to nest in the area (NSNR, 2024e). The sheltered area that Isaacs Harbour provides represents a refuge for waterfowl, shorebirds, and passerines to forage and gather during migratory stopovers.

Two ACCDC reports (ACCDC, 2024b, 2024a) were prepared for the Project to identify known occurrences of SAR and SOCI within and near the Assessment Area. Data included in the reports are from the combined 5 km areas around the freshwater pipelines, which includes the entire Assessment Area. This area is hereafter referred to as the “ACCDC Study Area”.
The two ACCDC reports (2024a, 2024b) (Appendix H) both identified the same seven avian SAR and 16 avian SOCI within the ACCDC Study Area (Drawing 7.28). The records of SAR occurrences include:

- Canada warbler (*Cardellina canadensis*; SARA “Threatened”, ESA “Endangered”, S-Rank “S3B”).
- Common nighthawk (*Chordeiles minor*; SARA “Special Concern”, ESA “Threatened”, S-Rank “S3B”).
- Bank swallow (*Riparia riparia*; SARA “Threatened”, ESA “Endangered”, S-Rank “S2B”).
- Barn swallow (*Hirundo rustica*; SARA “Threatened”, ESA “Endangered”, S-Rank “S3B”).
- Evening grosbeak (*Coccothraustes vespertinus*; SARA “Special Concern”, ESA “Vulnerable”, S-Rank “S3B, S3N, S3M”).

- Olive-sided flycatcher (*Contopus cooperi*; SARA “Special Concern”, ESA “Threatened”, S-Rank “S3B”).
- Short-eared owl (*Asio flammeus*; SARA “Special Concern”, S-Rank “S1B”).

The Assessment Area provides suitable habitat for common nighthawk such as clear-cut and developed areas, as well as open wetlands. Cleared areas could also present potential habitat for olive-sided flycatchers. Various types of wetlands (e.g., treed/shrub and open swamps, bogs, marshes, and fens) are present within the Assessment Area, which could provide suitable habitat for both Canada warbler and olive-sided flycatcher. Although the Assessment Area has existing disturbance in the form of cleared and developed areas, especially in the Project Footprint, aerial imagery and habitat desktop review shows mature mixedwood and softwood forest within and surrounding the Assessment Area which may provide habitat for evening grosbeak. There is also farmland, marshes, and grasslands/meadows present within and adjacent to the Assessment Area suitable for short-eared owl. Although there is appropriate habitat for common nighthawk, evening grosbeak, and olive-sided flycatcher within the Assessment Area, none were observed during the biophysical field surveys for this Project.

Potential bank swallow nesting cavities were observed along approximately 20 m of coastline of the Assessment Area, along the banks of the east side of the peninsula and on the side surrounded by Dung Cove and Bettys Cove (Drawing 2.2), which will be further discussed in the field results section. This observation occurred during fall migration season and no activity was observed at the cavities, likely due to swallow species having migrated at the time. This area is not identified as Critical Habitat by CWS. Due to this information being sensitive, the exact location of this observation will only be shared with the Proponent, as well as regulators upon request. Although the area provides suitable foraging habitat for both barn and bank swallows, only barn swallows were observed foraging near the coastline along this peninsula, including the side bordered by Webbs Cove. The Assessment Area provides both foraging habitat in the form of coastal areas as well as open areas such as wetlands. There may also be potential for nesting habitat for barn swallow in the form of anthropogenic structures (e.g., buildings and bridges) within or near the Assessment Area.

Maritime Breeding Bird Atlas Results

One MBBA square (20PR00) encompasses the entirety of the Assessment Area (results are provided in Appendix N). Observations within this square are listed below:

- The first atlas has one possible, one probable, and one confirmed breeder. The first atlas field work was conducted from 1986 to 1990.
- The second atlas has 44 possible, 16 probable, and 21 confirmed breeders. The second atlas field work was conducted from 2006 to 2010.
- Of these breeding species, there were seven SAR (which were also identified in ACCDC data reports for the Project)”
    - Canada warbler (SARA “Threatened”, ESA “Endangered”, S-Rank “S3B”).
    - Common nighthawk (SARA “Special Concern”, ESA “Threatened”, S-Rank “S3B”).

- Bank swallow (SARA “Threatened”, ESA “Endangered”, S-Rank “S2B”).
- Barn swallow (SARA “Threatened”, ESA “Endangered”, S-Rank “S3B”).
- Evening grosbeak (SARA “Special Concern”, ESA “Vulnerable”, S-Rank “S3B”, “S3N, S3M”)
- Olive-sided flycatcher (SARA “Special Concern”, ESA “Threatened”, S-Rank “S3B”).
- Short-eared owl (SARA “Special concern”, S-Rank “S1B”).

Important Bird Area: Country Island Complex (NS028)

The Country Island Complex IBA (NS028; Drawing 7.28) is located off the southeast coast of NS, within the vicinity of Country Harbour and Tor Bay, and is composed of several islands and peninsulas. This IBA includes habitats such as native grassland, open sea, inlets, and other marine coastal features. The island complex consists of Country Island (approximately 800 m by 500 m in diameter and mostly devoid of trees) and Goose Island (forested and approximately 4 km^2 in size with, although not permanently inhabited, several buildings and an automated lighthouse; approximately 2 km northwest of Country Island) (IBA Canada, 2025 - Site Summary: NS028). There are other smaller islands (some unnamed) within this IBA complex located in Charlos Cove and Tor Bay, including Inner West Bird Island, Cooks Island, Dorts Island, Hog Island, Forester Island, Sheep Island, and Sugar Harbour Islands. The entire IBA complex covers an area of approximately 40 to 50 km in length (Drawing 7.28) (IBA Canada, 2025 - Site Summary: NS028).

Within this IBA complex, Country Island has been known to host the highest number of nesting roseate terns in recent years with numbers declining steadily since 2020. Country Island is also classified by the CWS as Critical Habitat for the roseate tern. Since the late 1980s, roseate terns have been recorded nesting on Country Island. Numbers ranging from 30 to 35 nesting pairs were recorded between 1987 and 1996 (IBA Canada, 2025 - Site Summary: NS028). The highest number of roseate tern nesting pairs on Country Island was 45 pairs recorded in 1996 (approximately 37.5% of the estimated national population), however predation by gulls, crows, and ravens that year resulted in high breeding failure. Since 1996, roseate tern pairs reduced drastically to approximately one to two pairs a year on Country Island (IBA Canada, 2025 - Site Summary: NS028), which is confirmed by iNaturalist observations (iNaturalist, 2025).

Since 1995, records of large colonies (i.e., numbering in the thousands) of arctic tern, common tern, and Leach’s storm petrel have been observed nesting on the island despite trends of slow decline in numbers since. In 1998, over 50,000 pairs of Leach’s storm-petrels were estimated on Country Island. The CWS Waterbird Colony Database (Atlantic region) also has records of a common eider colony on Country Island (Wilhelm & Mahoney, 2017). This IBA, with its various islands and coves, is also known to host colonies of cormorants, terns, black guillemot, common eider, herring gull, and great black-backed gull (IBA Canada, 2025 - Site Summary: NS028).

Between 1987 and 1997, roseate tern pairs (i.e., under 20 in number) were observed nesting on other islands and peninsulas within or near this IBA (i.e., within 100 km; Goose Island, an

unnamed island off Charlos Cove, Inner West Bird Island, Cooks Island, Dorts Island, and Hog Island). Current numbers on these islands are not well known (IBA Canada, 2025 - Site Summary: NS028).

The closest features of this IBA to the Assessment Area are Harbour Island, Goose Island, Country Island, and the Fisherman Harbour peninsula (within approximately 6 km of the southern and southeastern border of the Assessment Area). Although terns tend to nest on offshore islands, due to its proximity, there is potential for species that frequent this IBA (e.g., such as the roseate tern) to forage off the coast of the Assessment Area. There are iNaturalist observations of roseate tern foraging along the coastline near Port Bickerton and Fishermans Harbour in August 2021 and June 2023, approximately 3 to 5 km south of the Assessment Area (iNaturalist, 2025).

Other avian SAR recently (i.e., since 2020) observed within this IBA include Canada warbler, common nighthawk, bank swallow, barn swallow, Eastern wood-pewee, Harlequin ducks, olive-sided flycatcher, and peregrine falcon (IBA Canada, 2025 - Site Summary: NS028).

Nature Reserves, Wilderness Areas, and Provincial Parks

Loon Lake Nature Reserve, Guysborough Headlands Wilderness Area, and Salsman Provincial Park are all within 10 km of the Assessment Area (Drawing 7.28). Further details on these three areas will be provided below.

Big Plains Wilderness Area (i.e., 10 km west, inland) and Bonnet Lake Barrens Wilderness Area (i.e., 10 km northeast, mix of inland and coastal) are within 11 km of the Assessment Area (Drawing 7.28). Both areas contain lakes/ponds, rivers, and large wetland complexes, including treed bogs and shrub fens (NSECC & NSNR, 2012). Aside from the level of existing habitat disturbance (i.e., clear-cut and developed areas) within the Assessment Area, these habitats are also found within or near the Assessment Area.

The closest provincial park is Salsman Provincial Park, which is located 7 km east of the Assessment Area (Drawing 7.28). This provincial park represents a small peninsula with camping facilities along Fraser Brook, which leads into Isaacs Harbour.

The Loon Lake Nature Reserve is located 1 km north of the Assessment Area based on the nearest boundary of the Ocean Lake buffer (Drawing 7.28). This nature reserve consists of forested habitat, watercourses, wetlands, lakes, and small ponds. Loon Lake Nature Reserve includes old growth stands of yellow birch (*Betula alleghaniensis*) and sugar maple (*Acer saccharum*) forest and there is little evidence of human disturbance within the boundaries of this reserve (NSECC & NSNR, 2012). This habitat differs from what is in the Assessment Area as the reserve is not coastal and the Assessment Area represents open and fragmented habitats due to a history of clear-cutting and anthropogenic development.

The Guysborough Headlands Wilderness Area (Drawing 7.28) protects four separate areas of coastline, the closest of which is located 3 km southwest of the Assessment Area, across the

water and on the other side of the coast of Isaacs Harbour. The three other protected areas within the Guysborough Headlands Wilderness Area are east of the Assessment Area, the closest of which is approximately 6 km. This wilderness area consists of spruce/fir forest, watercourses, wetlands (including peat bogs), and barren-type habitat (NSECC & NSNR, 2012).

The Guysborough Headlands Wilderness Area includes over 40 km of remote and undisturbed coastal habitat, including Gegogan Harbour to Tor Bay, and including coastal headlands at Cape Gegogan, Cape St. Marys, Country Harbour Head, and New Harbour. This undisturbed coastline includes rock and cobble shoreline, barrier beaches/ponds, low cliffs, and tidal flats. Country Harbour Head is known to host roseate terns for foraging as well as refuge from predators (NSECC & NSNR, 2012)

Other Goldboro Projects

Abutting portion of the Assessment Area associated with the freshwater pipelines is the site currently being developed for the Goldboro Gold Project, which received an EARD approved in August 2022 (GHD, 2022). Although the site is further inland from the Atlantic coast and currently less developed, with more forested areas compared to the Assessment Area for this Project, the site is similar with regards to geographic location and wetland types. SAR observations reported in this EARD included Canada warbler, evening grosbeak, olive-sided flycatcher, and wood thrush. All Canada warbler and olive-sided flycatcher observations were associated with treed swamps. In total, 3,747 individual birds representing 91 species were observed, 85.8% of which were passerines. This EARD concluded that the impacts to birds will not be significant due to the limitation of habitat loss/fragmentation and reclamation of habitat, the intermittent nature of the project, as well as the mitigations to sensory disturbance (GHD, 2022).

The EARD for the Goldboro LNG Project (which concerns a portion of the lands included in the Assessment Area) was approved in March 2014 (AMEC, 2013). The project description, like the Project, included a power plant and marine terminal. This EARD reported observations of 128 species of birds and concluded that the impacts to birds (i.e., loss of breeding and foraging habitat, bird displacement, and construction noise) were not significant based on mitigation measures, as well as rehabilitation and reclamation plans (AMEC, 2013).

7.4.4.4 Field Survey Methodology

Several types of survey methods were employed to assess the avian species using the Assessment Area throughout the year. Prior to conducting field surveys, a preliminary desktop survey design (i.e., using provincial aerial imagery, forestry, wetland, depth-to-water, and topography layers) was developed to target suitable habitat for avifauna species or groups of interest (e.g., migratory birds, breeding birds, shorebirds, waterfowl, owls, and nightjar). Survey methods were consistent with the guidelines stated above: ECCC-CWS (2007a, 2022), as well as the environmental assessment guidance documents for wind turbines and birds released by ECCC-CWS (2007b). These documents provided instruction in the following areas: survey site selection, survey location spacing, number of point counts (PC), survey duration, and season selection.

Based on desktop review, ECCC-CWS guidelines, The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009), and results from the SAR and SOCI species list and the ACCDC reports (2024a, 2024b), the following avifauna survey types were selected:

- Spring and fall migration PC surveys.
- Breeding bird PC surveys and area searches.
- Coastal watch counts/migratory stopover surveys.
- Nocturnal owl surveys.
- Nightjar surveys.

PC coverage within the Assessment Area adequately recorded raptor occurrences and negated the need for raptor-specific surveys. In addition to this, surveyors incidentally recorded raptor and large stick nest observations during all field survey types (e.g., wetland delineation, botany surveys, etc.).

Survey dates were selected to provide representative coverage of important stages of avifauna ecology. As an example, by spreading out survey dates the widest variety of migrating birds will be observed. Effort was made to spread rounds across survey periods (e.g., spring migration, breeding bird, and fall migration) to represent that entire period. A breakdown of survey type, dates, and survey rationale is described in Table 7.61. Survey rounds were separated by a minimum of 10 days.

Table 7.61: Avian Surveys Completed within the Assessment Area

Survey Type	Survey Rounds	Survey Locations	Dates	Rationale	Reference for Survey Dates and Methods
Spring migration	2	10	Round 1: April 15-16, 2024 Round 2: May 17, 2024	Bird species begin to migrate back to Canada to breed this time of year. Resident species may begin to breed on March 30. Surveying during this time period will detect any early nesters and the beginning of spring migration.	Nesting Periods – Government of Canada (ECCC, 2024a)
Nocturnal owl	1	5	April 15, 2024	Targeted the prime breeding time for various species of owls. Based on ACCDC, various species of owl have been detected within 100 km of the Assessment Area.	MBBA (Bird Studies Canada, 2024 - Breeding Dates) ACCDC (2024a, 2024b) (Project reports)

Survey Type	Survey Rounds	Survey Locations	Dates	Rationale	Reference for Survey Dates and Methods
Breeding bird	2	12	Round 1: June 13-14, 2024 Round 2: July 4, 2024	June is peak breeding season in Nova Scotia. Different species breed on different schedules, therefore, spreading surveys out within June allow for greater chances to detect species. Early to mid July will likely catch late breeders.	MBBA (Bird Studies Canada, 2024 - Breeding Dates)
Fall migration	2	12	Round 1: August 16, 2024 Round 2: September 24, 2024	Bird species begin to migrate south for the winter months from late August to September. Survey rounds began in late August and extended into late October to accommodate two survey rounds and potential early/late migrants.	MBBA(Bird Studies Canada, 2024 - Breeding Dates)
Nightjar	2	5	Round 1: June 12, 2024 Round 2: July 15, 2024	To understand the use of the land within and surrounding the Assessment Area by common nighthawk and Eastern whip-poor-will. Suitable habitat for both species is found within and adjacent to the Assessment Area. Based on ACCDC, common nighthawk have been observed 1.6 (± 7.07) km away from the Assessment Area and Eastern whip-poor-will have been observed 58.5 (± 7.07) km away from the Assessment Area.	Birds Canada 2022 Nightjar Survey Protocol (based on Knight et al., 2019) ACCDC (2024a, 2024b) (Project reports)

Habitat descriptions at each PC were recorded and each PC location was georeferenced by a handheld GPS. General observations including temperature, visibility, wind speed, date, and start and end time were also recorded during each survey. Bearings were recorded for SAR and SOCI species observed during dedicated survey periods and incidentally.

Bird species were identified based on functional bird groups to understand how each group uses the Assessment Area. These functional groups include:

- Waterfowl: Ducks, geese, or other large aquatic birds.
- Shorebirds: Waders, from the Order Charadriiformes.
- Other waterbirds: Seabirds (i.e., marine birds), grebes (Order Podicipediformes), loons (Order Gaviiformes), Ciconiiformes (i.e., storks, herons, egrets, ibises, spoonbills, etc.), pelicans (Order Pelicaniformes), Gruiformes (i.e., cranes and rails), kingfishers, and dippers (the only family of passerines considered waterbirds).
- Diurnal Raptors: Birds within the families Accipitridae (i.e., hawks, eagles, buzzards, harriers, and kites), Pandidonidae (i.e., osprey), Falconidae (i.e., falcons, caracaras, and forest falcons), Cathartidae (i.e., new world vultures), and one species from the Order Strigiformes (i.e., hawk owl).
- Nocturnal Raptors: Birds of the Order Strigiformes (i.e., owls; with exception of the northern hawk owl, which is a diurnal species of owl).
- Passerines: Any bird of the Order Passeriformes, which includes more than half of all bird species. This is with exception of the dippers, which are a passerine that is considered a waterbird.
- Other Landbirds: Birds within the Orders Galliformes (i.e., quail, pheasant, and grouse), Columbiformes (i.e., pigeons and doves), Cuculiformes (i.e., cuckoos), Caprimulgiformes (i.e., nighthawks and whip-poor-wills), Apodiformes (i.e., swifts and hummingbirds), and Piciformes (i.e., woodpeckers, flickers, and sapsuckers).

Survey methods varied for each survey type are described in detail below.

Spring/Fall Migration and Breeding Bird Surveys

Based on desktop review and aerial imagery, PCs were selected in representative habitats within the Assessment Area and placed to cover as much area as possible. These surveys are not species-specific, as avifauna species have different habitat requirements for breeding and migratory purposes, therefore a representative number of all major habitats was targeted for surveys. PC locations were spaced a minimum of 250 m apart (i.e., 250 m apart in forested habitats and a minimum of 500 m apart in open habitats) depending on the complexity of habitat types and to reduce, and hopefully eliminate, the risk of double-counting individuals, as outlined in Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds (ECCC-CWS, 2007a).

PCs were selected as the preferred method for avian usage surveys due to the large extent of the Assessment Area and PCs provide identification of a broad range of species. Attempts were made to establish PCs within and adjacent to the Project Footprint, should post-construction avifauna monitoring be required. Survey design primarily focused on both habitat and area coverage (as well as areas that will be directly impacted by Project Infrastructure). PC locations were selected based on the desktop habitat review, as well as consultation with an expert ornithologist, and were spread throughout and surrounding the Assessment Area to provide representative coverage for the diversity of habitats identified. It is Strum's understanding that the PC locations provide representative sampling of avifauna habitats. A map of survey locations is provided in Drawing 7.29.

Overall, PC layout focused on habitat coverage and the proposed infrastructure to understand the full extent of terrestrial effects relating to bird migration and breeding. Note that survey locations were selected before the final Assessment Area boundaries were chosen.

Habitat descriptions at each PC location as well as weather conditions for all survey types are provided in Tables 1-8 (Appendix N).

Spring and Fall Migration Surveys

A total of 10 PC locations were surveyed during the spring migration season and 12 PC locations were surveyed during the fall migration season (Drawing 7.29). Surveys began at, or within half an hour of, sunrise and effort was made to complete surveys by 10 am to observe the most active time of day for birds. Each PC was surveyed for a duration of 10 minutes. During each survey, weather conditions (i.e., temperature, wind speed, precipitation, and visibility) were monitored and bird observations were recorded at three distance categories: within a 50 m radius, 50 to 100 m radius, and outside the 100 m radius.

Note that PCs were slightly adjusted between spring migration rounds to account for and improve habitat conditions and suitability identified during round 1 (e.g., relocating a PC to a wetland or to represent the Assessment Area and coastal habitat). Two more PCs were added and PCs 1-4 were also adjusted for the breeding bird season (methods described below) for similar reasons, which also carried forward into the fall migration surveys. The 12th PC was added to survey Crane Lake for migration stopovers, which is slightly outside the western boundary of the Assessment Area (Drawing 7.29).

All birds identified (auditory and/or visual) were recorded by species, including age and sex if known. Breeding behaviour and flyovers were also documented (e.g., altitude and flight direction). Surveys were not conducted in wind speeds over three on the Beaufort scale (12-19 km/h), when noise levels made it difficult to hear or distinguish bird calls, or in rain that was more than a light drizzle (ECCC-CWS, 2007a). Incidental observations, those observed outside PC locations or outside allocated survey time, were recorded for novel species (e.g., not observed during any other survey) and SAR and SOCI, or species displaying breeding or other noteworthy behaviour(s).

Breeding Bird Surveys

As described in the previous section, the same 12 PCs surveyed for the fall migration surveys were surveyed during the breeding bird season.

The methods for breeding bird surveys mirror those described for spring and fall migration PC surveys in terms of suitable conditions and data recording. Area searches, that survey for breeding evidence within the Assessment Area, are also recommended by CWS to visit more habitat types and/or search habitats more thoroughly for species use during the breeding season (ECCC-CWS, 2007a).

Qualified biologists conducted the area searches between PC locations during the morning breeding bird survey or after the morning survey in different areas. Meandering, non-standardized transects were completed, focusing on new/complex habitats or habitat with notably high avian activity (within or adjacent to the Assessment Area). All bird observations were recorded in the same manner as the PC location method but with a focus on novel species, SAR and SOCI, and breeding evidence. Area searches do not require standardized effort (ECCC-CWS, 2007a). Area searches for this Project were completed in the form of the coastal watch/migratory stopover surveys, as described below.

To understand breeding bird activity within and adjacent to the Assessment Area, the breeding status of all bird species observed during breeding bird surveys was also recorded. The surveyor documented bird behaviour observed, including distraction display, carrying food, and carrying nesting material. The MBBA has various breeding evidence codes that are used to determine the breeding status based on field observations (Bird Studies Canada, 2024 - Breeding Evidence Codes). The following are examples of the breeding status indicators described in the MBBA for Species at Risk in the Maritime Provinces [complete breeding status indicators and definitions are available at MBBA (2008)]:

- Observed: Species observed in its breeding season.
- Possible: Species observed during breeding season in suitable nesting habitat or singing males or breeding calls heard, in suitable nesting habitat during breeding season.
- Probable: Male and female pair observed in suitable nesting habitat during nesting season, agitated behaviour or anxiety calls of an adult.
- Confirmed: Copulation, nest building (including adult carrying nesting material), adult carrying food, distraction display, courtship display or territorial behaviour between two individuals, behaviour indicating active nest, nest containing eggs, recently fledged young (nidicolous species), or downy young (nidifugous species), including incapable of sustained flight.

Coastal Watch / Migratory Stopover Surveys

Coastal watch count surveys were conducted at two locations along the Isaacs Harbour coastline portion of the Assessment Area (Drawing 7.29). These surveys were completed during all spring/fall migration and breeding bird PC surveys. After morning PCs were completed, generally in the late morning, the surveyors walked the coastline and conducted a 30- to 90-minute survey at each location, depending on avian abundance and activity during each survey. The total effort for these surveys was approximately 12 hours across all seasons. Due to PC survey rounds being spread out across an entire field season, the goal was to survey these locations at various tide cycles (i.e., various times of day) to potentially observe different species and behaviour and the focus was to observe seabirds, shorebirds, and waterfowl. Data collection for coastal watch surveys was identical to data collection for PC surveys.

Nocturnal Owl Surveys

Five locations (Drawing 7.29) were surveyed by vehicle during nocturnal owl surveys. Nocturnal owl PC stations are spaced at least 1.6 km apart, inside and surrounding the Assessment Area, to reduce the chances of detecting the same owl at multiple stations. Survey locations were on public roadsides or forestry roads and in habitats associated with forest, coastline, wetlands, and/or open areas (e.g., clear-cuts or cultivated lands/agricultural fields) within and adjacent to the Assessment Area. The edge of forested areas was surveyed to represent suitable owl habitat in the area and all survey locations located outside of the Assessment Area were on public roads or forestry roads. Conducting nocturnal owl PC locations on roads also alleviates safety concerns for the surveyor during nocturnal surveys. Survey locations were selected for their ease of access and suitable habitat. Nocturnal owl surveys started after sunset when it became dark.

The methods for monitoring nocturnal owls follow the Guidelines for Nocturnal Owl Monitoring in North America by Beaverhill Bird Observatory and Bird Studies Canada, Edmonton, Alberta (Takats et al., 2001). Nocturnal owl surveys occurred when vocal activity of most owl species is greatest (typically between April and May), as identified by Takats et al. (2001). Based on these guidelines, surveys started after dark and were conducted between half an hour after sunset and midnight.

Moon phase and noise levels (traffic, wind, machinery, etc.) were recorded as well as weather data for all surveys. Requirements for appropriate survey weather conditions followed those from breeding and migration PC surveys.

Prior to commencing the survey, the broadcaster was tested to ensure that owl calls are audible and recognizable at 400 m. Ensuring that the broadcast could not be heard beyond 400 m minimized bias at the next survey station due to owls hearing the recording from the previous station (Takats et al., 2001). The broadcaster test was carried out under weather and noise conditions similar to those that are likely to be encountered during the survey.

The Bird Studies Canada (BSC) Nova Scotia Nocturnal Owl Survey program broadcast was used at each nocturnal owl PC, which consists of a 9.5-minute track that follows the following format and owl data recording method (Birds Canada, 2019 - Atlantic Region):

- Initiates with a beep to indicate the start of the first silent listening period, which lasts one minute. All owls heard or seen are recorded. Only if an owl is calling during this period, estimate a distance and bearing, then immediately proceed approximately 300 m along the road (toward the owl if possible) and record a second distance and bearing to permit triangulation of the owl and facilitate habitat association. Another beep marks the end of the first silent listening minute.
- A second silent listening minute will follow. All new owls seen or heard in the second minute are recorded, as well as any owls that continue to call from the first silent listening minute. As described above, if a new owl is heard during the second silent

listening minute, record a second distance and bearing will be taken to permit triangulation of the owl and facilitate habitat association.
- During each of the following 20-second broadcasts, rotate the speakers fully.
- A 20-second boreal owl broadcast begins, which is followed by a one-minute silent listening period. All owls heard or seen during this period are to be recorded separately and it is important to keep track of whether the owls heard in the first two-minutes continue to call as well as any new owls.
- The boreal owl broadcast is repeated, which is again followed by a one-minute silent listening period. All owls heard or seen during this period continue to be recorded separately.
- A 20-second barred owl broadcast begins, which is followed by a two-minute silent listening period. All owls heard or seen during this period continue to be recorded separately.
- The barred owl broadcast is repeated, which is again followed by another two-minute silent listening period. All owls heard or seen during this period continue to be recorded separately.
- A beep marks the end of the broadcast track.

Species vocalization (with timing of response if responding to track) and/or sightings were recorded along with any other significant information noted (i.e., distance/bearing, gender, age, habitat, and/or behaviour). Any other bird species (e.g., particularly novel species or SAR and SOCI) observed during the nocturnal owl surveys were also recorded as incidentals.

Nightjar Surveys

The common nighthawk (*Chordeiles minor*; S-Rank “S3B”) is listed as “Special Concern” under SARA and “Threatened” under ESA. The common nighthawk prefers to nest in gravelly substrates and is best detected while this species is foraging for insects shortly after sunset (MBBA, 2008). Based on desktop analysis and reconnaissance surveys, the Assessment Area does contain suitable habitat for the common nighthawk, such as open wetlands, open forests, grasslands, barren areas with low shrub cover, rocky bluffs, open forests, developed areas (e.g., agricultural fields), clear-cut areas, and other disturbed areas (COSEWIC, 2018; Knight et al., 2019).

The Eastern whip-poor-will (*Antrostomus vociferus*; S-Rank “S1?B”) is listed as “Threatened” under SARA and ESA. The Eastern whip-poor-will uses a mixture of open lands for foraging and wooded areas for nesting and perching (Knight et al., 2019). Examples of suitable habitat for Eastern whip-poor-will include shrubbed wetlands, clear-cuts, agricultural fields, rock, or sand barrens with scattered trees, savannahs, burned areas, conifer plantations, and various types of forests at early stages of succession or edges of dense forest with similar ground-level structure. This species is found in habitat with moderate tree, shrub, and herbaceous cover (ECCC, 2018). Based on desktop analysis, the Assessment Area does contain suitable habitat for the Eastern whip-poor-will. Both the common nighthawk and Eastern whip-poor-will were targeted for the nightjar surveys. Targeted surveys were selected for nightjars because these species are not reliably detected during the breeding bird PC surveys due to their crepuscular nature (Knight et al., 2019).

Potential suitable breeding and foraging habitat for common nighthawk and Eastern whip-poor-will, such as roadside/gravel areas, clear-cut and disturbed areas, wetland, and forested areas (ECCC, 2018; Knight et al., 2019; MBBA, 2008), were selected as nightjar PC locations both within the Assessment Area and the area surrounding the Assessment Area. A minimum of 1.6 km spacing was used to provide adequate coverage of the area while minimizing overlapping observations (i.e., hearing the same individual at multiple locations). Five nightjar PC locations were selected in the preliminary desktop review, which were the same locations observed during the nocturnal owl surveys (Drawing 7.29). All nightjar PC locations were on public roadsides or forestry roads and in habitats associated with forest, coastline, wetlands, and/or open areas (e.g., clear-cuts or cultivated lands/agricultural fields) within and adjacent to the Assessment Area. Nightjar PCs on roads and open areas with wide visibility also alleviates safety concerns for the surveyor during crepuscular and nocturnal surveys.

Protocols were based on ECCC-CWS recommendations and, as a result, playback recordings were not used and the Birds Canada 2022 Nightjar Survey Protocol (based on Knight et al., 2019) was implemented into the field program. Nightjars are crepuscular and the ideal time to detect these species (particularly common nighthawks) is while they are foraging for insects shortly after sunset (MBBA, 2008).

Two rounds of nightjar surveys were completed. The 2022 protocol by Birds Canada recommends one survey round; however, NSNR prefers two rounds (May 2022, pers. comm., Mark McGarrigle, SAR Biologist, NSNR). These survey dates were selected because common nighthawk and Eastern whip-poor-will tend to breed between early June and late July in the Maritimes (Bird Studies Canada, 2024). Survey timing started within seven days on either side of a full moon (due to potential for Eastern whip-poor-will observations) and surveys were completed between one hour before sunset and two hours after sunset when nightjars are most active (Knight et al., 2019).

Nightjar surveys consisted of a six-minute passive surveying period at each nightjar PC location. This survey did not employ call playback or use of flashlights, based on survey protocol (Knight et al., 2019). As per survey protocol, effort was made to choose nightjar PC locations with little noise and surveys were completed between June 15 and July 15. Surveys were not conducted in wind speeds greater than three on the Beaufort scale, when rain was heavier than a light drizzle, or if noise levels were high enough to affect the surveyor’s hearing. Site conditions and data recorded included weather conditions, cloud cover, time effort, number of passing cars, noise levels (traffic, wind, machinery, etc.), and if the moon was visible. All individual nightjar observations were recorded, including behaviours such as vocalizations or wing booms, as well as the sex, distance to surveyor, bearing, and time the observation occurred (e.g., what type of observation or behaviour was observed when). Any other bird species (e.g., particularly novel species, SAR, or SOCI) observed during the nightjar surveys were also recorded as incidentals.

7.4.4.5 Field Survey Results

NS S-Ranks (ACCDC, 2025) were used to determine whether a species is a SOCI, based on the time of year in which the species was observed. If a species has only one seasonal ranking, such as "S3B", it was considered a SOCI regardless of the time of year it was observed. However, if the species had an alternate ranking, such as an S-Rank of "S2S3B, S5N", the species was considered a SOCI only if observed during the breeding season since the bird is considered secure outside the breeding season.

Based on other data sources (e.g., ACCDC, MBBA, eBird, iNaturalist, etc.), the bird species observed during the biophysical studies for this Project were considered normal for this area throughout the spring migration, breeding, and fall migration seasons.

Note that despite the inclusion of this avian chapter in the terrestrial section, field results will include coastal and marine data due to the inclusion of coastal surveys and the proximity of the Assessment Area to the coastline. Terrestrial and marine effects will be reported on separately.

Spring Migration Surveys

During spring migration surveys (PC surveys and coastal watch/migratory stopover surveys), a total of 419 individuals representing 52 species were observed (Table 7.62; Tables 1 and 2, Appendix N). Note, PCs 1 and 5 were not able to be surveyed during round one due to health and safety concerns related to wildlife encounters [i.e., signs of American black bear (*Ursus americanus*)].

Table 7.62: Total Observations by Bird Group – 2024 Spring Migration

Bird Group	# Individuals	# Species
Waterfowl	20	4
Shorebirds	38	6
Other Waterbirds	29	5
Diurnal Raptors	8	3
Nocturnal Raptors	0	0
Passerines	313	32
Other Landbirds	11	2
Total	**419**	**52**

There were no avian SAR observed during spring migration surveys. In total, three avian SOCI were observed (Table 7.x; Drawing 7.30):

- Boreal chickadee
- Pine siskin
- Willet
- Note that American robin, common eider, greater yellowlegs, purple finch, red-breasted merganser, and spotted sandpiper are not considered SOCI due to their S-Rank during the spring migration season (Table 7.63).

American crow (22), American robin (27), common eider (10), common yellowthroat (18), pine siskin (72), song sparrow (28), white-throated sparrow (19), white-winged crossbill (19), and yellow-rumped warbler (16) were the most abundantly observed species. Table 7.63 displays all species by common name, scientific name, as well as conservation rankings. Please refer to Appendix N for raw field data, including weather data, habitat descriptions, and survey location data.

Table 7.63: Species List – 2024 Spring Migration

Common Name	Scientific Name	COSEWIC	SARA	ESA	NS S-Rank[1]
American Black Duck	*Anas rubripes*	-	-	-	S5B,S5N
American Crow	*Corvus brachyrhynchos*	-	-	-	S5
American Goldfinch	*Spinus tristis*	-	-	-	S5
American Redstart	*Setophaga ruticilla*	-	-	-	S5B
American Robin	*Turdus migratorius*	-	-	-	S5B,S3N
Bald Eagle	*Haliaeetus leucocephalus*	-	-	-	S5
Belted Kingfisher	*Megaceryle alcyon*	-	-	-	S4S5B
Black-and-White Warbler	*Mniotilta varia*	-	-	-	S5B
Black-capped Chickadee	*Poecile atricapillus*	-	-	-	S5
Black-throated Green Warbler	*Setophaga virens*	-	-	-	S5B
Blue Jay	*Cyanocitta cristata*	-	-	-	S5
Blue-headed Vireo	*Vireo solitarius*	-	-	-	S5B
Boreal Chickadee*	*Poecile hudsonicus*	-	-	-	S3
Canada Goose	*Branta canadensis*	-	-	-	SUB,S4N,S5M
Common Eider	*Somateria mollissima*	-	-	-	S2B,S2N,S4M
Common Loon	*Gavia immer*	-	-	-	S4B
Common Merganser	*Mergus merganser*	-	-	-	S5B,S4N
Common Raven	*Corvus corax*	-	-	-	S5
Common Yellowthroat	*Geothlypis trichas*	-	-	-	S5B
Dark-eyed Junco	*Junco hyemalis*	-	-	-	S4S5
European Starling	*Sturnus vulgaris*	-	-	-	SNA
Golden-crowned Kinglet	*Regulus satrapa*	-	-	-	S5
Great Black-backed Gull	*Larus marinus*	-	-	-	S4S5
Great Blue Heron	*Ardea herodias*	-	-	-	S4B,S4S5M
Greater Yellowlegs	*Tringa melanoleuca*	-	-	-	S3B,S4M
Hairy Woodpecker	*Dryobates villosus*	-	-	-	S5
Hermit Thrush	*Catharus guttatus*	-	-	-	S5B
Herring Gull	*Larus argentatus*	-	-	-	S5
Least Flycatcher	*Empidonax minimus*	-	-	-	S4S5B,S5M

Common Name	Scientific Name	COSEWIC	SARA	ESA	NS S-Rank[1]
Lincoln's Sparrow	*Melospiza lincolnii*	-	-	-	S4B,S5M
Magnolia Warbler	*Setophaga magnolia*	-	-	-	S5B
Northern Flicker	*Colaptes auratus*	-	-	-	S5B
Northern Harrier	*Circus hudsonius*	-	-	-	S4B,S4S5M
Northern Parula	*Setophaga americana*	-	-	-	S5B
Osprey	*Pandion haliaetus*	-	-	-	S4S5B,S5M
Palm Warbler	*Setophaga palmarum*	-	-	-	S5B
Pine Siskin*	*Spinus pinus*	-	-	-	S3
Purple Finch	*Haemorhous purpureus*	-	-	-	S4S5B,S3S4N,S5M
Red-breasted Merganser	*Mergus serrator*	-	-	-	S3B,S4S5N,S5M
Red-necked Grebe	*Podiceps grisegena*	-	-	-	S4N
Red-winged Blackbird	*Agelaius phoeniceus*	-	-	-	S4B
Ring-billed Gull	*Larus delawarensis*	-	-	-	SUB,S5N
Savannah Sparrow	*Passerculus sandwichensis*	-	-	-	S4S5B,S5M
Song Sparrow	*Melospiza melodia*	-	-	-	S5B
Spotted Sandpiper	*Actitis macularius*	-	-	-	S3S4B,S5M
Swainson's Thrush	*Catharus ustulatus*	-	-	-	S4B,S5M
Swamp Sparrow	*Melospiza georgiana*	-	-	-	S5B
Tree Swallow	*Tachycineta bicolor*	-	-	-	S4B
White-throated Sparrow	*Zonotrichia albicollis*	-	-	-	S4S5B,S5M
White-winged Crossbill	*Loxia leucoptera*	-	-	-	S4S5
Willet*	*Tringa semipalmata*	-	-	-	S3B
Yellow-rumped Warbler	*Setophaga coronata*	-	-	-	S5B

[1](ACCDC, 2025); *SOCI

The locations with the highest species diversity (PC3 and PC10) were open sites with high levels of disturbance and within close proximity to forest and a waterbody (i.e., lake or coastline), providing a range of edge habitat and habitat diversity.

During spring migration surveys, a group of 10 common eider were observed foraging off-coast at coastal watch/migratory stopover survey location one, which is located along the coast of Isaacs Harbour and looking towards Webbs Cove. Based on the CWS Waterbird Colony Database (Atlantic region)(Wilhelm & Mahoney, 2017), there is a historical common eider colony observation from 2008 within Webbs Cove, which is off-shore from this location. No large groupings or breeding activity was observed for this species during the field surveys within or near the Assessment Area.

There were no high-flying, large migratory flocks (i.e., numbering in the hundreds or thousands) observed during the spring migration surveys.

There were both probable and confirmed breeding behaviours (MBBA, 2008) observed during the spring migration surveys, which included:

- Osprey pair observed on an existing nest located on a human-made nest platform near PC 6 (i.e., located near Sable Road and the existing wind turbines on site; Drawing 7.29).
- White-throated sparrow pair observed nest building.
- Yellow-rumped warbler pair observed nest building.
- Dark-eyed junco pair observed.
- Willet pair observed.

There were incidental avian observations recorded during the spring migration surveys. Incidentals were not included in data analysis and will be provided in the incidental results section below.

Field data for spring migration surveys (PC surveys and coastal watch/migratory stopover surveys) are provided in Tables 1 and 2 (Appendix N).

Nocturnal Owl Surveys

There were no owls or incidental birds observed during the nocturnal owl survey. Refer to Table 3 (Appendix N) for raw field data, including weather data, habitat descriptions, and survey location data.

Breeding Bird Surveys

During breeding bird surveys (PC surveys and coastal watch/migratory stopover surveys), a total of 483 individuals representing 67 species were observed (Table 7.64).

Table 7.64: Total Observations by Bird Group – 2024 Breeding Bird

Bird Group	# Individuals	# Species
Waterfowl	37	6
Shorebirds	80	7
Other Waterbirds	21	4
Diurnal Raptors	4	2
Nocturnal Raptors	0	0
Passerines	326	44
Other Landbirds	15	4
Total	**483**	**67**

There was one avian SAR observed during breeding bird surveys. Barn swallows were observed foraging along the coast. Note that avian SAR locations will not be included in any drawings due to this information being sensitive and to reduce potential risk for these species.

Eight avian SOCI were observed (Table 7.65; Drawing 7.30):

- Bay-breasted warbler
- Boreal chickadee
- Common eider
- Common tern
- Greater yellowlegs
- Red crossbill
- Spotted sandpiper
- Willet

Note that American robin and purple finch are not considered as SOCI due to their ACCDC S-Rank during the breeding bird season (Table 7.65).

Common yellowthroat (42), hermit thrush (25), herring gull (36), and white-throated sparrow (25) were the most abundantly observed species. Table 7.65 displays all species by common name, scientific name, as well as conservation rankings. Refer to Table 4 (Appendix N) for raw field data, including weather data, habitat descriptions, and survey location data.

Table 7.65: Species List – 2024 Breeding Bird

Common Name	Scientific Name	COSEWIC	SARA	ESA	NS S-Rank[1]
Alder Flycatcher	*Empidonax alnorum*	-	-	-	S5B
American Black Duck	*Anas rubripes*	-	-	-	S5B,S5N
American Crow	*Corvus brachyrhynchos*	-	-	-	S5
American Goldfinch	*Spinus tristis*	-	-	-	S5
American Redstart	*Setophaga ruticilla*	-	-	-	S5B
American Robin	*Turdus migratorius*	-	-	-	S5B,S3N
Bald Eagle	*Haliaeetus leucocephalus*	-	-	-	S5
Barn Swallow*	*Hirundo rustica*	Special Concern	Threatened	Endangered	S3B
Bay-breasted Warbler*	*Setophaga castanea*	-	-	-	S3S4B,S4S5M
Belted Kingfisher	*Megaceryle alcyon*	-	-	-	S4S5B
Black Scoter	*Melanitta americana*	-	-	-	S4N
Black-and-White Warbler	*Mniotilta varia*	-	-	-	S5B
Black-capped Chickadee	*Poecile atricapillus*	-	-	-	S5

Common Name	Scientific Name	COSEWIC	SARA	ESA	NS S-Rank[1]
Black-throated Green Warbler	*Setophaga virens*	-	-	-	S5B
Blue Jay	*Cyanocitta cristata*	-	-	-	S5
Blue-headed Vireo	*Vireo solitarius*	-	-	-	S5B
Boreal Chickadee*	*Poecile hudsonicus*	-	-	-	S3
Canada Goose	*Branta canadensis*	-	-	-	SUB,S4N,S5M
Cedar Waxwing	*Bombycilla cedrorum*	-	-	-	S5B
Chipping Sparrow	*Spizella passerina*	-	-	-	S4B,S5M
Common Eider*	*Somateria mollissima*	-	-	-	S2B,S2N,S4M
Common Grackle	*Quiscalus quiscula*	-	-	-	S5B
Common Loon	*Gavia immer*	-	-	-	S4B
Common Merganser	*Mergus merganser*	-	-	-	S5B,S4N
Common Raven	*Corvus corax*	-	-	-	S5
Common Tern*	*Sterna hirundo*	-	-	-	S3B
Common Yellowthroat	*Geothlypis trichas*	-	-	-	S5B
Dark-eyed Junco	*Junco hyemalis*	-	-	-	S4S5
Double-crested Cormorant	*Nannopterum auritum*	-	-	-	S5B
Golden-crowned Kinglet	*Regulus satrapa*	-	-	-	S5
Great Black-backed Gull	*Larus marinus*	-	-	-	S4S5
Greater Yellowlegs*	*Tringa melanoleuca*	-	-	-	S3B,S4M
Grey Catbird	*Dumetella carolinensis*	-	-	-	S4B
Hairy Woodpecker	*Dryobates villosus*	-	-	-	S5
Hermit Thrush	*Catharus guttatus*	-	-	-	S5B
Herring Gull	*Larus argentatus*	-	-	-	S5
Least Flycatcher	*Empidonax minimus*	-	-	-	S4S5B,S5M
Lincoln's Sparrow	*Melospiza lincolnii*	-	-	-	S4B,S5M
Magnolia Warbler	*Setophaga magnolia*	-	-	-	S5B
Mourning Dove	*Zenaida macroura*	-	-	-	S5
Nashville Warbler	*Leiothlypis ruficapilla*	-	-	-	S4B,S5M
Northern Cardinal	*Cardinalis cardinalis*	-	-	-	S4
Northern Flicker	*Colaptes auratus*	-	-	-	S5B
Northern Gannet	*Morus bassanus*	-	-	-	SHB
Northern Parula	*Setophaga americana*	-	-	-	S5B
Osprey	*Pandion haliaetus*	-	-	-	S4S5B,S5M

Common Name	Scientific Name	COSEWIC	SARA	ESA	NS S-Rank[1]
Ovenbird	*Seiurus aurocapilla*	-	-	-	S5B
Palm Warbler	*Setophaga palmarum*	-	-	-	S5B
Purple Finch	*Haemorhous purpureus*	-	-	-	S4S5B,S3S4N, S5M
Red Crossbill*	*Loxia curvirostra*	-	-	-	S3S4
Red-breasted Nuthatch	*Sitta canadensis*	-	-	-	S4S5
Red-eyed Vireo	*Vireo olivaceus*	-	-	-	S5B
Ring-billed Gull	*Larus delawarensis*	-	-	-	SUB,S5N
Ring-necked Duck	*Aythya collaris*	-	-	-	S5B
Rock Pigeon	*Columba livia*	-	-	-	SNA
Ruby-crowned Kinglet	*Corthylio calendula*	-	-	-	S4B,S5M
Savannah Sparrow	*Passerculus sandwichensis*	-	-	-	S4S5B,S5M
Song Sparrow	*Melospiza melodia*	-	-	-	S5B
Spotted Sandpiper*	*Actitis macularius*	-	-	-	S3S4B,S5M
Swainson's Thrush	*Catharus ustulatus*	-	-	-	S4B,S5M
Swamp Sparrow	*Melospiza georgiana*	-	-	-	S5B
White-throated Sparrow	*Zonotrichia albicollis*	-	-	-	S4S5B,S5M
Willet*	*Tringa semipalmata*	-	-	-	S3B
Winter Wren	*Troglodytes hiemalis*	-	-	-	S5B
Yellow Warbler	*Setophaga petechia*	-	-	-	S5B
Yellow-bellied Flycatcher	*Empidonax flaviventris*	-	-	-	S4B,S5M
Yellow-rumped Warbler	*Setophaga coronata*	-	-	-	S5B

[1](ACCDC, 2025); *SAR or SOCI

The locations with the highest species diversity (PC3 and PC4, as well as the coastal watch locations) were open sites with high levels of disturbance within close proximity to forest, as well as a wetland or waterbody (i.e., coastline), providing a range of edge habitat and habitat diversity.

During breeding bird surveys, multiple bird groupings of 8 to 15 individuals were observed for various species at both coastal watch/migratory stopover survey locations: American black duck, Canada goose, herring gull, and ring-necked duck. There was also one group of seven greater yellowlegs observed foraging along the shoreline at coastal watch/migratory stopover survey location two.

There were both probable and confirmed breeding behaviours (MBBA, 2008) observed during the breeding bird surveys, which included:

- American black duck: Recently fledged young observed.
- Canada goose: Recently fledged young observed.
- Double-crested cormorant nest observed with young seen or heard.
- Herring gull nest observed with young seen or heard.
- Osprey pair observed at the same nest that was observed during the spring migration season (i.e., located near the existing wind turbines on site; Drawing 7.29). There is a possibility that the same osprey pair observed during the spring migration surveys was observed again during the breeding bird surveys displaying territorial behaviour at this nesting location. This nesting platform will not be impacted by the Project.

There were incidental avian observations recorded during the breeding bird surveys. Incidentals were not included in data analysis and will be provided in the incidental results section below.

Nightjar Surveys

There were no nightjars observed during the nightjar surveys. Refer to Table 5 (Appendix N) for raw field data, including weather data, habitat descriptions, and survey location data. Other bird species were recorded incidentally, which will be provided in the incidental results section below.

Fall Migration Surveys

During fall migration surveys (PC surveys and coastal watch/migratory stopover surveys), a total of 1,251 individuals representing 82 species were observed (Table 7.66). Note, coastal watch/migratory stopover survey location two was surveyed at sunrise during round one which differed from previous methods. PC 12 was not surveyed during round two, as it was deemed not safe due to the combination of terrain and difficulty in surveying within the allocated survey time.

Table 7.66: Total Observations by Bird Group – 2024 Fall Migration

Bird Group	# Individuals	# Species
Waterfowl	86	5
Shorebirds	142	8
Other Waterbirds	130	9
Diurnal Raptors	22	6
Nocturnal Raptors	0	0
Passerines	854	49
Other Landbirds	17	5
Total	**1,251**	**82**

Three avian SAR were observed during the fall migration surveys (i.e., barn swallow, bobolink, and Canada warbler; Table 7.67):

- The bobolink observed was a fly-over and likely migrating based on the habitat and time of year. Due to its activity, the surveyor noted that it is reasonable to speculate that it was feeding in the grassy knoll area to the northwest of the survey location.
- The Canada warbler observed was also likely migrating due to the time of year and the fact that it was observed with a group of passerines in appropriate migration habitat (i.e., a coastal, scrubby area close to the highway with second-growth scrub that was bordering the disturbed area within the Assessment Area).
- The barn swallow observed was flying along the coastline and foraging, likely a migrant due to the time of year.
- Note that avian SAR locations will not be included in any drawings due to this information being sensitive and to reduce potential risk for these species.

Six avian SOCI were observed (Table 7.67; Drawing 7.30):

- Boreal chickadee
- Canada jay
- Cape May warbler
- Common tern.
- Pectoral sandpiper
- Pine siskin
- Red crossbill

Note that American robin, bay-breasted warbler, blackpoll warbler, common eider, greater yellowlegs, horned grebe, purple finch, semipalmated plover, spotted sandpiper, surf scoter, and turkey vulture are not considered as SOCI due to their S-Rank during the fall migration season (Table 7.67.).

Common yellowthroat (125), herring gull (98), surf scoter (72), and yellow-rumped warbler (99) were the most abundantly observed species. Table 7.67 displays all species by common name, scientific name, as well as conservation rankings. Refer to Table 6 (Appendix N) for raw field data, including weather data, habitat descriptions, and survey location data.

Table 7.67: Species List – 2024 Fall Migration

Common Name	Scientific Name	COSEWIC	SARA	ESA	NS S-Rank[1]
Alder Flycatcher	*Empidonax alnorum*	-	-	-	S5B
American Black Duck	*Anas rubripes*	-	-	-	S5B,S5N
American Crow	*Corvus brachyrhynchos*	-	-	-	S5
American Goldfinch	*Spinus tristis*	-	-	-	S5
American Pipit	*Anthus rubescens*	-	-	-	S4M
American Redstart	*Setophaga ruticilla*	-	-	-	S5B

Common Name	Scientific Name	COSEWIC	SARA	ESA	NS S-Rank[1]
American Robin	*Turdus migratorius*	-	-	-	S5B,S3N
Bald Eagle	*Haliaeetus leucocephalus*	-	-	-	S5
Barn Swallow*	*Hirundo rustica*	Special Concern	Threatened	Endangered	S3B
Bay-breasted Warbler	*Setophaga castanea*	-	-	-	S3S4B,S4S5M
Belted Kingfisher	*Megaceryle alcyon*	-	-	-	S4S5B
Black Guillemot	*Cepphus grylle*	-	-	-	S4B
Black-and-White Warbler	*Mniotilta varia*	-	-	-	S5B
Black-capped Chickadee	*Poecile atricapillus*	-	-	-	S5
Black-throated Green Warbler	*Setophaga virens*	-	-	-	S5B
Blackpoll Warbler	*Setophaga striata*	-	-	-	S3B,S5M
Blue Jay	*Cyanocitta cristata*	-	-	-	S5
Blue-headed Vireo	*Vireo solitarius*	-	-	-	S5B
Bobolink*	*Dolichonyx oryzivorus*	Special Concern	Threatened	Vulnerable	S3B
Bonaparte's Gull	*Chroicocephalus philadelphia*	-	-	-	S5M
Boreal Chickadee*	*Poecile hudsonicus*	-	-	-	S3
Brown Creeper	*Certhia americana*	-	-	-	S5
Canada Goose	*Branta canadensis*	-	-	-	SUB,S4N,S5M
Canada Jay*	*Perisoreus canadensis*	-	-	-	S3
Canada Warbler*	*Cardellina canadensis*	Special Concern	Threatened	Endangered	S3B
Cape May Warbler*	*Setophaga tigrina*	-	-	-	S3B,SUM
Cedar Waxwing	*Bombycilla cedrorum*	-	-	-	S5B
Chestnut-sided Warbler	*Setophaga pensylvanica*	-	-	-	S5B
Common Eider	*Somateria mollissima*	-	-	-	S2B,S2N,S4M
Common Loon	*Gavia immer*	-	-	-	S4B
Common Raven	*Corvus corax*	-	-	-	S5
Common Tern*	*Sterna hirundo*	-	-	-	S3B
Common Yellowthroat	*Geothlypis trichas*	-	-	-	S5B
Dark-eyed Junco	*Junco hyemalis*	-	-	-	S4S5
Double-crested Cormorant	*Nannopterum auritum*	-	-	-	S5B
Downy Woodpecker	*Dryobates pubescens*	-	-	-	S5
Golden-crowned Kinglet	*Regulus satrapa*	-	-	-	S5
Great Black-backed Gull	*Larus marinus*	-	-	-	S4S5

Common Name	Scientific Name	COSEWIC	SARA	ESA	NS S-Rank[1]
Great Blue Heron	*Ardea herodias*	-	-	-	S4B,S4S5M
Greater Yellowlegs	*Tringa melanoleuca*	-	-	-	S3B,S4M
Grey Catbird	*Dumetella carolinensis*	-	-	-	S4B
Hairy Woodpecker	*Dryobates villosus*	-	-	-	S5
Hermit Thrush	*Catharus guttatus*	-	-	-	S5B
Herring Gull	*Larus argentatus*	-	-	-	S5
Horned Grebe	*Podiceps auritus*	Special Concern	-	-	S3N, SUM
Lincoln's Sparrow	*Melospiza lincolnii*	-	-	-	S4B, S5M
Long-tailed Duck	*Clangula hyemalis*	-	-	-	S5N
Magnolia Warbler	*Setophaga magnolia*	-	-	-	S5B
Merlin	*Falco columbarius*	-	-	-	S5B
Mourning Dove	*Zenaida macroura*	-	-	-	S5
Mourning Warbler	*Geothlypis philadelphia*	-	-	-	S4B, S5M
Nashville Warbler	*Leiothlypis ruficapilla*	-	-	-	S4B, S5M
Northern Flicker	*Colaptes auratus*	-	-	-	S5B
Northern Gannet	*Morus bassanus*	-	-	-	SHB
Northern Harrier	*Circus hudsonius*	-	-	-	S4B, S4S5M
Northern Parula	*Setophaga americana*	-	-	-	S5B
Osprey	*Pandion haliaetus*	-	-	-	S4S5B, S5M
Palm Warbler	*Setophaga palmarum*	-	-	-	S5B
Pectoral Sandpiper*	*Calidris melanotos*	-	-	-	S3M
Pine Siskin*	*Spinus pinus*	-	-	-	S3
Purple Finch	*Haemorhous purpureus*	-	-	-	S4S5B, S3S4N, S5M
Red Crossbill*	*Loxia curvirostra*	-	-	-	S3S4
Red-breasted Nuthatch	*Sitta canadensis*	-	-	-	S4S5
Red-eyed Vireo	*Vireo olivaceus*	-	-	-	S5B
Red-necked Grebe	*Podiceps grisegena*	-	-	-	S4N
Red-throated Loon	*Gavia stellata*	-	-	-	S4N, S5M
Ruby-crowned Kinglet	*Corthylio calendula*	-	-	-	S4B, S5M
Ruby-throated Hummingbird	*Archilochus colubris*	-	-	-	S5B
Savannah Sparrow	*Passerculus sandwichensis*	-	-	-	S4S5B, S5M
Semipalmated Plover	*Charadrius semipalmatus*	-	-	-	S1B, S4M
Sharp-shinned Hawk	*Accipiter striatus*	-	-	-	S5
Song Sparrow	*Melospiza melodia*	-	-	-	S5B

Common Name	Scientific Name	COSEWIC	SARA	ESA	NS S-Rank[1]
Spotted Sandpiper	*Actitis macularius*	-	-	-	S3S4B, S5M
Spruce Grouse	*Canachites canadensis*	-	-	-	S4
Surf Scoter	*Melanitta perspicillata*	-	-	-	S2N, S4M
Swainson's Thrush	*Catharus ustulatus*	-	-	-	S4B, S5M
Swamp Sparrow	*Melospiza georgiana*	-	-	-	S5B
Turkey Vulture	*Cathartes aura*	-	-	-	S2S3B, S4S5M
White-crowned Sparrow	*Zonotrichia leucophrys*	-	-	-	SUM
White-throated Sparrow	*Zonotrichia albicollis*	-	-	-	S4S5B, S5M
Yellow Warbler	*Setophaga petechia*	-	-	-	S5B
Yellow-rumped Warbler	*Setophaga coronata*	-	-	-	S5B

[1](ACCDC, 2025); *SAR or SOCI

The locations with the highest species diversity (PC7, PC10, and PC11, as well as the coastal watch locations) were open sites with high levels of disturbance within close proximity to forest, as well as a wetland or waterbody (i.e., coastline), providing a range of edge habitat and habitat diversity. The peninsula at coastal watch/migratory stopover location two and the surrounding edge habitat were observed as the most diverse and abundant area for birds (i.e., avian migrants such as diurnal raptors, shorebirds, and songbirds).

During fall migration surveys, multiple bird groupings were observed for various species at coastal watch/migratory stopover survey location two, which is along the coast of Isaacs Harbour looking towards Betty's Cove:

- Group of 57 surf scoters, as well as a smaller group of 14 individuals, in the harbour.
- Group of 40 herring gulls, as well as smaller groups of approximately 10 individuals each, both flying around the Assessment Area and foraging in the harbour.
- Group of 30 double-crested cormorants in the harbour.
- Group of 23 great black-backed gulls in the harbour.
- Groups of common loons ranging from 9 to 19 individuals in the harbour.

Areas bordering disturbances, especially on the forest edges, contained a large array of migratory birds, most prevalent where bushes and wet areas are more diverse in their flora and maturity.

There were also multiple observations of groupings of passerines ranging from 10 to 27 individuals around the Assessment Area at various survey locations, either displaying foraging and/or migratory activity (i.e., common yellowthroat, dark-eyed junco, palm warbler, song sparrow, swamp sparrow, and white-throated sparrow). No high-flying, large migratory flocks (i.e., numbering in the hundreds or thousands) were observed during the fall migration surveys.

There were both probable and confirmed breeding behaviours (MBBA, 2008) observed during the fall migration surveys, which included:

- Dark-eyed junco: Recently fledged young were observed.
- Osprey pair: Likely same pair observed during both spring migration and breeding bird survey seasons. It is important to note that these individuals were likely counted multiple times across all seasons.

There were incidental avian observations recorded during the fall migration surveys. Incidentals were not included in data analysis and will be provided in the incidental results section below.

Winter Surveys

One round of winter tracking (i.e., pellet group inventory) surveys was completed on February 3 and February 5, 2025. Along with surveying for fauna tracks and scat, surveyors were also instructed to record avian observations. All identified species were also observed during dedicated bird surveys conducted within the Assessment Area.

Winter bird survey observations included:

- Two golden-crowned kinglets
- One hairy woodpecker
- One spruce grouse
- One unknown raptor and one unknown grouse species

Incidentally, surveyors recorded birds observed at the Goldboro Interpretive Centre, approximately 1 km west of the Assessment Area. Groupings of waterfowl and other waterbirds were observed foraging in Isaacs Harbour. Species observed included:

- Two American black ducks
- Two American crows
- One group of seven and another group of 14 buffleheads, a SOCI (*Bucephala albeola*; S-Rank “S3S4N”)
- One common loon
- Seven common mergansers
- Three European starlings
- Six herring gulls
- Four hooded mergansers (*Lophodytes cucullatus*)
- Eight unknown diving species - scoter or golden-eye species

Incidental Observations

In total, 48 avian incidental observations were recorded (i.e., 77 individuals representing 28 species) across all bird surveys (i.e., spring/fall migration, breeding bird, and nightjar surveys) as well as other survey types (i.e., wetland delineation, botany, lichens, etc.). The majority of

incidental observations occurred during the nightjar surveys (i.e., 35 observations representing 47 individuals). Table 7 (Appendix N) includes all incidental observations, including species, number observed, survey type, date, and location.

Two avian SAR were observed incidentally:

- Canada warbler.
- Peregrine falcon (*Falco peregrinus* (anatum/tundrius); ESA “Vulnerable”, S-Rank “S1B, SUM”).

Two Canada warblers were observed singing in suitable breeding habitat [i.e. in treed swamp habitat along the watercourse and wetland system to the north of the Assessment Area (the watercourse that flows between Gold Brook Lake and Seal Harbour Lake)]. The peregrine falcon was observed hunting warblers around the same watercourse system. All SAR locations have been provided to NSECC due to this information being sensitive and to reduce potential risk for these species.

Along the watercourse and wetland system to the north, as mentioned above, one of the avian surveyors noted observing greater yellowlegs foraging and potentially breeding there but the observation was not officially recorded due to the distance outside of the Assessment Area.

One avian SOCI (i.e., boreal chickadee) was observed incidentally (Drawing 7.30). All species recorded incidentally were also observed during the other avian-dedicated surveys, except for these two species not observed elsewhere in the Assessment Area.:

- Broad-winged hawk (*Buteo platypterus*; S-Rank “S5B”)
- Peregrine falcon

During round one of fall migration surveys, a group of nine ospreys were seen circling above the upper turbine pad by PC3. All but two of the birds were identified as birds born this year. This was a presumed post-breeding group that all bred within the surrounding area (i.e., approximately 100 km), preparing to migrate south together. This observation was not officially recorded due to the distance outside of the Assessment Area.

The largest grouping was observed during round two of spring migration PC surveys, with a fly-over of 13 white-winged crossbills observed incidentally near PC1.

There also were various observations of breeding behaviour observed incidentally:

- A common loon pair was heard calling to each other in the distance at nightjar survey location five during round one of nightjar surveys.
- During round two of nightjar surveys, an agitated osprey was observed at the same nest that was observed during the spring/fall migration and breeding bird surveys.

There were no signs of chicks or another adult. The surveyor noted that the bird may have been attempting to nest late or again after a failed attempt.

- A broad-winged hawk was observed displaying territorial behaviour in late July. The surveyor noted that there was potential for a nearby nest based on its behaviour.

Potential bank swallow nesting cavities were observed along the coastline of the Assessment Area, along the banks of the east side of the peninsula, surrounded by Dung Cove and Bettys Cove (Drawing 7.30). This observation occurred during the fall migration season (November 18, 2024) during wetland delineation surveys. Approximately nine cavities were observed with no activity as any bank swallows using this habitat likely would have migrated before this observation occurred. Due to this information being sensitive, the exact location of this observation will only be shared with the Proponent, as well as regulators upon request. These cavities will not be impacted by the Project Footprint.

7.4.4.6 Effects Assessment

Project-Avifauna Interactions

Project activities, primarily those that involve earth moving or vegetation removal, or interactions with avifauna in the airspace have the potential to impact avifauna (Table 7.68). These activities could result in habitat removal, reductions in food availability, and direct avifauna-infrastructure interactions. Other Project related activities, including during construction and operation, may impact avifauna behaviours, such as increased traffic, light, and noise.

Note that this effects assessment will only cover the terrestrial environment. Effects on the marine environment will be assessed in the provincial and federal permits and approvals phase.

Table 7.68: Potential Project-Avifauna Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	X
Water Pipeline and Roadway Construction	X
Facility Foundation Construction	X
Transportation of Facility Components	X
Facility Assembly	X
Utility Connections	X
Removal of Temporary Works and Site Restoration	X
Operations and Maintenance	
Commissioning	X
Handling of Biomass	-
Production of SAF and Other Products	X

Project Phase	Potential for Interaction
Product Storage	X
Vegetation Management	X
Decommissioning and Rehabilitation	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

For the purposes of this assessment, the Assessment Area includes the airspace directly above and surrounding the infrastructure. The LAA for avifauna includes the Assessment Area with a 5 km buffer, the boundaries of which include Isaacs Harbour (Drawing 7.31-7.39) This distance was selected as the boundary within which to assess the direct and indirect effects of the Project on avifauna based on its relevance for local species movements between habitat types. An RAA is not defined for this chapter.

Assessment Criteria

Assessment criteria provided in Section 4.5 also apply for avifauna. The VC-specific definition for magnitude is as follows:

- Negligible: No loss of important avifauna habitat (e.g., breeding bird habitat) and no impacts to birds (i.e., behaviours and injuries/mortalities) are expected.
- Low: Small loss of important habitat supporting avifauna and/or impacts to birds are expected to be low.
- Moderate: Moderate loss of important avifauna habitat and/or moderate impacts to birds on an individual level rather than entire populations.
- High: High loss of important avifauna habitat and/or high impact to birds that would be sufficient to impact species on a population scale.

Effects

Habitat Loss, Fragmentation, and Edge Effect

Clear-cutting, grubbing, and development for industry can result in significant habitat loss for forest and wetland-dependent avian species, as well as disrupt individuals and their migratory and breeding behaviours.

Overall, habitat loss and fragmentation within the Assessment Area is anticipated to be modest to low due to the high level of disturbed habitat existing within the Project Footprint area (i.e., clear-cutting and mining activities). Project development will likely not result in the loss or alteration of quality avian habitat. The placement of infrastructure reduces the impact on undisturbed, high-quality habitat that is essential for various avian species, including those identified during the breeding bird surveys. Based on desktop review and field assessments, a large portion of the Assessment Area is disturbed (i.e., open areas/harvests and urban/developed habitat as per the vegetation communities and flora baseline section) and in various states of regeneration. The Project Footprint (Drawings 2.2A-B) has even less

forested/shrub habitat and more disturbed habitat. The vegetation communities and flora and wetlands effects chapters can be referred to for further detail on habitat loss and fragmentation.

Habitat fragmentation and increased edge areas may lead to increased predation on birds; a study by Manolis, et al. (2002) found that distance to the nearest clear-cut was the best predictor of nest predation in multiple ground laying birds. However, some bird species benefit from forest edge habitat and have shown to return in subsequent years after an area is cleared due to the availability of foraging opportunities and other niche habitats (Tittler et al., 2001). Additionally, some species (e.g., blackbirds) can also tolerate forestry activities as long as their habitat of coniferous dominant trees of varied heights near waterbodies is maintained (C. Stacier, avian biologist and professor at Dalhousie University, personal communication 2018).

Despite the known negative impacts of habitat fragmentation as described above, habitat fragmentation has also been shown to increase the number of habitat generalist species while also decreasing the number of habitat specialists. Habitat generalists have a higher likelihood of surviving in smaller habitat patches in a mosaic landscape (e.g., a road network associated with a wind project) due to their ability to utilize various habitat patch types (Andrén, 1994). Bird species with different characteristics, such as habitat specialization, reproductive rates, and trophic guilds, may respond differently to edge effects. Interior-forest birds that prefer larger tracts of undisturbed forest or habitat specialists can be impacted by habitat fragmentation due to the lack of habitat connectivity (Andrén, 1994).

Edge effect caused by habitat fragmentation refers to the changes in environmental conditions and biodiversity that occur along the boundary between two different habitats (e.g., clearcut and forested habitat). These changes, as described above, can affect bird abundance, species composition, and nesting success (e.g., nest predation and parasitism). For example, edges may alter physical conditions like light, temperature (e.g., higher wind exposure), and wind, which in turn influences vegetation structure and food availability, potentially impacting bird communities (Andrén, 1994).

Species that prefer low-light habitats (e.g., larger eyed birds like owls and thrushes) may be more sensitive to fragmentation, while other bird species such as insectivores (e.g., flycatchers, swallows, and nightjars) and understory foragers may thrive in fragmentated habitats (Andrén, 1994; Tittler et al., 2001). Examples of species that rely on interior-forest habitat, especially with regards to nesting, include certain thrush [e.g., swainson's thrush (*Catharus ustulatus*) and wood thrush (*Hylocichla mustelina*)] and warbler species [e.g., bay-breasted warbler (*Setophaga castanea*) and ovenbird (*Seiurus aurocapilla*)].

Based on literature on the impacts of forestry on bird communities in adjacent forest, a 100 m buffer from the edge of forestry activity is generally considered a minimum zone of influence for birds (Brazner et al., 2024).

The Project Footprint size is 247 ha in size, which includes 172 ha of previously disturbed area (i.e., clearcut, industrial development, etc.). The Assessment Area is 1,030 ha, which includes

186 ha of previously disturbed area as well as the proposed freshwater pipelines from Meadow and Ocean lakes (i.e., 15 km total for both proposed pipelines).

Overall, the majority of the Assessment Area contains disturbed land and coastal barren habitat, with the surrounding area being forested. With respect to the degree of disturbance proposed to occur within the Assessment Area through the loss of habitat, the majority of undisturbed avian habitats present within the Assessment Area are not unique and are extensively present within the surrounding landscape (i.e., LAA). It is expected that most birds using habitat that will be disturbed by Project activities will move to similar habitats within and adjacent to the Project Footprint area. Unique habitat in the Assessment Area was limited to approximately a 20 m stretch of potential bank swallow habitat along the banks of the east side of the peninsula, as discussed in the field results section. Although these nesting cavities are close to the proposed Haul Road (i.e., approximately 30 m), they will not be directly removed by the proposed Haul Road.

Through desktop review and field observations, it is apparent that the general area supports various life stages for migratory birds due to the wide range of habitats present (e.g., various wetland types, watercourses, forested areas, open habitat (clear-cut areas), coastline, open water, etc.). Locations that provide a variety of habitat types, including edge habitat, appeared to offer the highest avian abundance and avian species diversity.

Based on observations from field surveys, a variety of bird species use the Assessment Area and LAA for migration and breeding purposes. The coastline of NS is known as a fly-way during migration and it is evident that birds utilize the various habitats found in the Assessment Area and the surrounding area for various needs (i.e., foraging, migratory stop-overs, etc.). The dense forest surrounding the Assessment Area would provide more suitable habitat for birds rather than the disturbed habitat that is currently present due to the history of anthropogenic activity at the site. The disturbed area is uniform and does not provide a variety of habitat types for birds, although the open and shrubby area has the potential to provide foraging grounds and staging grounds for migratory birds. Areas bordering disturbances, especially on the forest edges, contained a larger array of migratory birds, most prevalent where bushes and wet areas are more diverse in their flora and maturity. Open edges may attract insect prey, enhancing foraging opportunities for insectivorous species. These changes could potentially create favorable microhabitats within the Project Footprint area, particularly for generalist bird species or those that readily adapt to disturbed environments (i.e., common nighthawk) (COSEWIC, 2018). Open habitat creation may also attract predators for smaller bird species.

The oceanic ecosystems along the coast, and especially in the coves, are important stopping grounds for pelagic and general oceanic non-passerine birds. This flyway is speculated to continue up to Isaacs Harbour. Fish are speculated to congregate here, and multiple species of waterfowl and other waterbirds were observed foraging during the avian field surveys. It is important to note that this effects chapter focuses on terrestrial and coastal habitat.

Most of the coastline will not be impacted by the Project, except for the location of the marine berth and offloading facility in Isaacs Harbour as described in the project description. This impact is expected to be minimal. There is a small area of potential bank swallow nesting habitat approximately 20 m along the east side of the peninsula; however, this will not be impacted by the Project.

Avian Species at Risk

Various avian SAR species were observed within or surrounding the Assessment Area, including Canada warbler, barn swallow, bobolink, and peregrine falcon. There was also a small 20 m stretch of potential bank swallow nesting habitat observed along the coastline, although not confirmed as active (see the field results section). The potential bank swallow habitat is located approximately 30 m from the proposed haul road and 200 m from the proposed freshwater pipeline. The foraging and potential breeding habitat for barn and bank swallows along the coastline will not be impacted by the Project due to the location of the jetty/dock and coastal pipeline, as well as the small Project Footprint along the coastline. The bobolink and Canada warbler observed during fall migration in the Assessment Area were likely migrating due to the time of year, their behaviour, and lack of suitable habitat.

The peregrine falcon and the two other Canada warbler observations were outside of the Assessment Area, along the watercourse and wetland system to the north (i.e., the watercourse that flows between Gold Brook Lake and Seal Harbour Lake). The Canada warblers were observed in suitable breeding habitat (i.e., treed swamp and riparian wetland), as described in the incidental portion of the field results section. This watercourse and wetland system will not be impacted by the Project.

Based on the high level of disturbance within the Assessment Area and Project Footprint Area, the impacts on avian SAR habitat are expected to be low. The Project design has prioritized the use of disturbed habitat and minimized alterations to wetlands and the coastline along the edge of the Assessment Area. None of the directly impacted areas are considered significant habitat for avian SAR.

Avian Species at Risk Potential Habitat Modelling – Methods and Results

Potential avian SAR habitat modelling was completed to calculate the impact to potential habitat for the avian SAR identified through desktop review and/or observed during field surveys (modelling methods described in Appendix N). The avian SAR included for potential habitat modelling are bank swallow, barn swallow, bobolink, Canada warbler, common nighthawk, evening grosbeak, olive-sided flycatcher, roseate tern, and short-eared owl. Drawings 7.31–7.39 can be referred to for the potential modelled habitat for each of these avian SAR. Peregrine falcon was not selected due to the location of the field observation (i.e., the peregrine falcon was observed outside of the Assessment Area and was likely feeding in the area).

The potential habitat modelling is based on habitat descriptions within federal and provincial government recovery strategies and management plans, with a focus on breeding/nesting

habitat. It is also important to note that potential habitat modelling may include overestimation based on limits and constraints regarding GIS data and aerial imagery, which will be described in further detail in the methods below (e.g., outdated data, lack of data, etc.).

The methods for the potential SAR habitat modelling are provided in Appendix N. Based on the modelling results, the potential avian SAR habitat impacted by the Project within the Assessment Area and LAA is shown in Table 7.69.
Barn swallow had the highest potential habitat within the Assessment Area (i.e., 295.4 ha or 28.7% of the Assessment Area), likely due to the presence of anthropogenic structures along the coastline and appropriate foraging habitat within the Assessment Area (i.e., wetlands, coastline, etc.). Canada warbler (i.e., 191.0 ha or 18.5% of the Assessment Area) and common nighthawk (i.e., 135.8 ha or 13.2% of the Assessment Area) also had a relatively high potential habitat calculated compared to the other species (i.e., the rest of the avian SAR modelled habitats were approximately 5% of the Assessment Area or lower), likely due to the presence of appropriate wetland habitat for Canada warbler and common nighthawk as well as the presence of disturbed habitats (e.g., forestry activity) suitable for common nighthawk nesting. It is important to note that these calculations are based on the Assessment Area (i.e., 1,030 ha), while the Project Footprint is considerably smaller in size (i.e., 247 ha) and is limited to the more disturbed/contaminated areas of the site due to forestry activity and historical mining activities. It is evident through the potential habitat modelling that these species have more available habitat outside of the Project Footprint area when considering the overall Assessment Area and LAA.

The lower percentages for the other species indicate a lack of appropriate habitat for bobolink and short-eared owl (i.e., native grasslands and marshes). Although olive-sided flycatcher forage in a variety of edge habitats, even areas disturbed by forestry activities, there is a lack of appropriate wetland habitat for breeding for this species. The high level of disturbance within the Assessment Area and cleared forests is also a defining reason for the overall lack of appropriate habitat for a variety of these species (e.g., Canada warbler, evening grosbeak, and olive-sided flycatcher).

Roseate tern had no calculated potential habitat within the Assessment Area due to their presence being constricted to the Country Island IBA complex. Bank swallow also had no modelled habitat within the Assessment Area, although a small area of potential (i.e., could not be confirmed due to the time of year) bank swallow cavities were observed along the coast as described in the field results section.

Table 7.69: Avian SAR Potential Habitat – Assessment Area and LAA

Avian SAR	Potential Habitat in Assessment Area (ha)	% of Assessment Area	Potential Habitat in LAA (ha)	% of LAA
Canada Warbler	191.0	18.5	8578.5	31.2
Olive-Sided Flycatcher	56.3	5.5	3751.9	13.6
Evening Grosbeak	27.6	2.7	1405.8	5.1
Common Nighthawk	135.8	13.2	7515.4	27.3

Avian SAR	Potential Habitat in Assessment Area (ha)	% of Assessment Area	Potential Habitat in LAA (ha)	% of LAA
Short-eared Owl	47.2	4.6	1622.6	5.9
Barn Swallow	295.4	28.7	4793.4	17.4
Bank Swallow*	N/A	N/A	N/A	N/A
Rosenate Tern	0.0	0.0	143.1	0.5
Bobolink	8.0	2.2	17.2	0.1

*Refer to methods (Appendix N) as to why bank swallow habitat was modelled/mapped but not calculated. It is important to note that no bank swallow potential habitat was modelled within the Assessment Area.

Sensory Disturbance

Construction and operation activities for the Project including lighting, noise, and increased traffic, have the potential to disturb bird species within the Assessment Area.

Increased vehicle traffic along access roads and construction sites adds another disturbance factor. The movement of vehicles could lead to short-term displacement of birds, particularly ground-nesting or low-flying species within proximity to access routes. Traffic disturbance can be particularly stressful for species with established territories within the area, potentially prompting them to abandon nests or avoid otherwise suitable habitat. Overall, while these construction-related disturbances are temporary, they may cause localized changes in bird distribution and behaviour during the active phases of the Project.

Noise from heavy machinery and equipment can disrupt normal behaviours such as foraging, breeding, and resting, especially for sensitive species documented during breeding bird surveys. The sounds associated with construction, while temporary, may lead some birds to avoid areas near active construction zones, possibly altering their habitat use patterns during critical breeding or migration periods.

Noise and vibrations are provincially regulated under the Workplace Health and Safety Regulations, N.S. Reg. 52/2013 to protect the health and safety of site workers and the general public, which will help mitigate any negative impacts to bird species. Sensory disturbance from noise can impact birds in several ways. Birds can exhibit greater susceptibility to noise impacts as many species rely on vocal communication (Blickley & Patricelli, 2010). Avifauna may be displaced from areas adjacent to the Project from construction related noise. Impacts can also differ between acute and chronic noise sources. Chronic exposure may degrade auditory cues, feedback, and vocal development over time, important for predator/prey detection, communication, breeding, and orientation (Blickley & Patricelli, 2010; Marler et al., 1973; Shannon, Crooks, et al., 2016). A direct physiological impact causing a temporary decrease in auditory sensitivity can occur at acute noise levels above 93 dBA, while permanent damage to avian auditory systems is not recorded until 125 to 140 dBA (Blickley & Patricelli, 2010). Some bird species may not be impacted by sensory disturbances. A study of the impact of logging truck traffic on bird reports no observed effects on nesting at noise levels of 53 dBA (Grubb et al., 1998). It was also found that noise tolerant species had increased nesting success through decreasing nest predation (Francis et al., 2009).

A literature review (Shannon, Crooks, et al., 2016) found that birds have the potential to exhibit changes in song characteristics, reproduction, abundance, stress levels, and species richness at levels greater than 45 dBA. All noise attenuates (diminishes) with distance from the source (California Department of Transportation, 2016). This occurs through geometric spreading and signal reduction from ground and atmospheric absorption. Noise from point sources (i.e., construction equipment) travelling through a soft site (e.g., a forest or meadow), are reduced by attenuation rates of 7.5 dBA for each doubling of distance [i.e., based on 50 feet (15.2 m)] (California Department of Transportation, 2016). The Project sound attenuation during construction is expected to stay within the 45 dBA range based on the equipment being used and mitigation measures.

Lighting used during construction, particularly if activities extend into early morning or late evening hours, could also impact birds within the vicinity. Artificial lighting may disorient nocturnally active birds, increasing the likelihood of attracting them closer to construction areas. For species sensitive to light, especially migratory and nocturnal species, this could temporarily alter natural behaviours or increase the risk of collisions with equipment or structures. Given the frequency of foggy conditions due to the coastal location, light intensity may be amplified, further enhancing the potential for disturbance. Light sensory disturbance that can impact birds includes behavioural effects such as disorientation, avoidance, or attraction (Longcore & Rich, 2004).

Disoriented migratory birds are prone to circling light sources, which increases the potential for death by exhaustion or predation when forced to land in high-risk areas. In turn, these behavioural changes can affect the success of foraging, reproduction, and communication of wildlife and can disrupt habitat connectivity (Bliss-Ketchum et al., 2016; Longcore & Rich, 2004). It has been known that exterior structures such as buildings and other floodlit structures can attract birds during the night and lead to mortality events. In addition, migratory birds during fall and spring are especially attracted to lighting on tall structures. Modifications, for example using task lighting, and timing of use can all be managed to limit impacts on birds.

At night, and especially during nights of cloudy skies and low ceiling, artificial lighting can attract birds during migration periods. Lights that are known to increase disorientation include consistent white or red lights. Strobe lights or intermittent/flashing lights have been shown to decrease avian mortality as it interrupts the zone of influence that lighting on birds can have (Longcore et al., 2008). While continuous lighting can attract or disorient birds, especially nocturnal migrants, the brief and low-frequency nature of these lights reduces the risk of such disruptions.

For nocturnally active species that may be more sensitive to artificial lighting, the risk of attraction or disorientation remains low due to the limited light exposure. In the event of foggy or low-visibility conditions (i.e., heavy rain), short, infrequent flashes will also reduce the overall light presence, limiting the potential for enhanced attraction effects.

Upon completion of construction and throughout the lifespan of the Project, the lighting on-site will be minimized and mitigation measures will be applied to limit the effects of lighting on birds (i.e., motion-activated lighting, shielding, light emitting diode (LED) lighting, etc.).

Avifauna Interactions with Equipment and Infrastructure

Bird injuries and mortalities are a primary concern when considering the interactions of avifauna with the Project, including interactions with infrastructure (i.e., the flare stack, hot pipes, and buildings), construction equipment, vehicles, as well as potential for fuel and gas leaks and exposure to toxic or hazardous materials/chemicals (i.e., gas and liquids in pipelines as well as storage tanks - various fuel types, hydrogen, carbon dioxide, nitrogen, etc.).

There is also a potential that Project Infrastructure may attract certain species for nesting. Barn swallows often construct nests in anthropogenic structures such as buildings and under bridges, and bank swallows may nest along soil stockpiles with steep slopes. Generalist bird species such as doves, crows, and ravens may nest on structures and equipment not being used. The changes in the overall landscape and habitat can result in changes in wildlife patterns and increased risk in mortality.

Avifauna interactions with the flare stack are a primary concern due to the height of the stack and the flame and super-heated gas emissions that are intermittently released from it, particularly when the flare stack will be active at night during the spring and fall migration seasons. An avian mortality event occurred at the Canaport LNG facility in Saint John New Brunswick on September 13 and 14th, 2013 from a flare stack which was burning natural gas. More than 7,500 fatalities were attributed to direct and indirect impacts from the burning gas emitting from the flare stack. Deaths of 26 species of migratory birds were recorded including Canada warblers, which are SAR. Fines were issued under both the SARA and MBCA. As a result of the incident, the company monitors migratory bird activities weekly using the Cornell Lab of Ornithology's regional migration forecasts and implements mitigation measure to minimize the risks of the event re-occurring (ECCC, 2015a).

During a study on the behaviour of night migrating birds during gas flaring in Alaska, the general flight behaviour of birds differed during flaring and non-flaring periods. Higher percentages of birds exhibited directional (or straight line) flight behaviour during non-flaring periods. In comparison, higher percentages of birds exhibited erratic and circling flight behaviours during the gas flaring periods (Day et al., 2015). This erratic and circling behaviour is consistent with the attraction and disorienting behaviour relating to light disturbance as described in sections above.

Another aerial concern is the creation of edge habitat and open areas attracting aerial insectivores (e.g., swallows, common nighthawks, flycatchers, etc.). Post-construction monitoring will be important to understand this potential impact and avian species usage of the area once the REP is constructed.

An increase in road traffic will increase the chances of mortality to avifauna species that use roadways, especially grouse species and similar species, as they are known to use roadways for travel and nesting. Most roads within the Assessment Area are currently used for recreation by off-highway vehicle users and forestry activities. Construction and increased road traffic, in particular, pose a risk to nests and unfledged nestlings. Considering the pre-existing traffic load and the minimal traffic to be associated with the Project, along with road traffic mitigations (e.g., speed limits), road traffic is expected to have a negligible or low effect on avifauna in the Assessment Area and LAA.

Mitigation measures regarding lighting and deterrents will reduce the risk of avifauna interactions with Project equipment and infrastructure, as well as management and monitoring plans.

Mitigation and Monitoring

Mitigation measures and monitoring will be considered to minimize the effects on avifauna, including adhering to the MBR, ESA, and SARA.

Adaptive management of potential effects will be addressed through the development and implementation of a Wildlife Management Plan, which will include mitigation and monitoring for avian species. The primary mitigation for avifauna is avoidance in the siting of infrastructure, including:

- Avoidance of impacts to the terrestrial, coastal, and marine environment (e.g., limiting infrastructure impact).
- Avoidance, to the extent possible, of important bird habitats, such as wetlands, waterbodies, forest, etc. to reduce the impact of habitat changes. This includes siting Project Infrastructure within areas with existing disturbances, such as existing roads, historic mining areas, and cut-over areas of forest.
- Minimize, as much as possible, removal of large diameter decaying trees (>40 cm DBH).

Mitigations to reduce effects on avifauna include:

- Adhere to ECCC guidelines on clearing windows for nesting migratory birds, where possible. Vegetation clearing activities will be conducted outside of the nesting period that is generally from April 1 to September 30 each year (ECCC, 2024a). Timing of clearing activities is generally dependent on seasonal conditions. If vegetation and tree clearing activities during the nesting/breeding season cannot be avoided, nest sweeps will be conducted by a qualified avian biologist to search for any confirmed activity which must be avoided (i.e., active nests and recently fledged juveniles).
    - Regulatory bodies will be contacted, when necessary, to receive advice on construction buffers for any avian activity that must be avoided during the nesting/breeding season. When vegetation and tree clearing activities take place during the non-nesting/breeding season, crew must be aware and look

out for nests protected year-round under the 2022 update to the Migratory Bird Regulations SOR/2022-147 (under the MBCA), which includes great blue heron and pileated woodpecker nests (i.e., inactive pileated woodpecker nests are protected for three years and inactive great blue heron nests are protected for two years; permission must be obtained by ECCC-CWS to destroy or remove an inactive nest if the nest belongs to a species with year-round protection).

- Avoid disturbance of any ground- or burrow-nesting species should they initiate breeding activities within stockpiles or exposed areas during construction or operations, until chicks can fly, and the nesting areas are no longer being used. Exposed stockpiles will be limited or covered as much as possible during construction and operation phases.
- Revegetate disturbed areas, as appropriate, and allow disturbed areas to naturally revegetate when where vegetation maintenance is not required during operation.
- Develop a site reclamation plan in accordance with engineering standards and in consultation with NSECC and NSNR.
- Establish speed limits within the Assessment Area for construction vehicles to mitigate the effect of vehicle-avifauna collisions.
- Maintain all equipment and machinery on site to reduce noise and vibration emissions associated with malfunctions.
- Install mufflers on construction equipment and vehicles to limit noise.
- Maintain good housekeeping practices (i.e., designated garbage and recycling cans and pack out all waste) during construction and operation to avoid indirectly feeding birds and potentially attracting nuisance wildlife.
- Develop a spill response plan, and an Emergency Response Plan (ERP) within the Wildlife Management Plan to monitor and mitigate the impacts of fuel spills, gas leaks, toxic/hazardous substances, and other emergencies.
- Install measures (e.g., birds of prey calls, reflector tape, etc.) to deter birds from water and wastewater treatment residuals (e.g., sedimentation ponds) and effluent discharge areas.
- Equip site machinery with spill kits and instruct site personnel on their use.
- Develop a fire and explosion response plan in accordance with provincial standards.
- Implement an air quality management plan based on best management practices for construction equipment, material, and standard operating procedures. Air emissions will be reduced during operations. Scrubbers and pollution control devices will be used to treat air emissions and comply with regulatory air emission thresholds.
- Incorporate a lighting plan for construction-related activities into the Wildlife Management Plan.
- Minimize lighting, to the extent possible, including the use of LED lights (i.e., as they are less prone to light trespass in the surrounding environment), downward-facing lights, shielding to prevent light escaping above the horizontal plane, and motion-activated lighting when applicable (i.e., for employee safety). Non-essential lights will be extinguished during the spring and fall migration seasons (i.e., April to May, and mid-August to October). If perimeter lighting is required, it would be aimed inward to prevent off-site light trespass.

- Turn off high intensity lights, including floodlights, at night outside of working hours, if possible, especially during the spring and fall migration period. Low intensity lighting would be used to the extent possible rather than high intensity lighting.
- Avoid the operation of exterior decorative lights such as spotlights and floodlights, whose function are to highlight features of buildings or to illuminate an entire building, unless safety is a factor.
- Obstruction lighting marking the flare stack will use lights with short flash durations and the ability to emit no light during the “off-phase” of the flash (i.e., LED lights), with the minimum number of flashes per minute and the briefest flash duration allowable, as recommended by CWS.
- Where feasible, tinted or frosted glass windows would be used in buildings to reduce bird mortality from collisions.
- Monitor for bird injuries and fatalities frequently within the facility area. ECCC-CWS will be notified within 24 hours in the event of the mortality or injury of 10 or more migratory birds in a single event or in the event of the mortality or injury of a migratory bird species at risk. Under the Migratory Bird Regulations SOR/2022-147, a scientific permit is required to possess or handle any stranded, injured, or dead migratory bird. Any birds found injured that may require transport to on-land facilities must also be reported. Record will be kept of such incidents.
- Monitor for bird injuries and fatalities every morning when flare is in operation, particularly when flare is in operation during nights in peak spring and fall migration periods (i.e., April to May, and mid-August to October). Planned flaring will be conducted during daylight hours as much as is practicable. Minimal flaring will be required during normal operations.

A site-specific post-construction Wildlife Management Plan will be developed in consultation with NSECC, NSNR, and all other relevant parties. The management plan will inform monitoring activities that will take place to ensure continued protection of avifauna within the Assessment Area and LAA. Some preliminary monitoring activities related to avifauna may include post-construction injury and mortality monitoring, as described above. If avifauna interaction rates become concerning (i.e., continuous injury and mortality events over time), adaptive management options will be considered and may include:

- Implementation of audio or visual deterrents (i.e., birds of prey calls, reflector tape, etc.) in high-risk areas.
- Installation of perch guards and bird diverters/deflectors on infrastructure (e.g., pipes, buildings, flare stack, lines/wires, etc.) to limit interactions with birds.
- Alter vents to prevent birds from entering (e.g., installing cone-shaped mesh covers) on all open vents.
- Shutting down operations that require flare use during high-activity migration periods or nights with low visibility during migration periods (e.g., foggy, low cloud ceiling, etc.).

Conclusion

While effects to avifauna species differ, the potential effects considered to be of greatest concern include habitat loss and fragmentation, sensory disruption, and avifauna-infrastructure interactions.

- Magnitude: Low magnitude. Loss of limited and low value habitat may occur, but loss of individuals is not expected.
- Geographic Extent: Within the LAA.
- Frequency: Continuous frequency throughout the Project lifespan, with differences based on Project phase and on seasonal needs (i.e., breeding and migration).
  Duration: Medium duration, as effects will extend throughout the construction and operation of the Project.
- Reversibility: Reversible, as the effects will terminate at the end of the Project lifespan, as well as restoration activities.
- Significance: Not significant.

8.0 SOCIO-ECONOMIC ENVIRONMENT

8.1 Economy

8.1.1 Overview and Assessment Methodology

The assessment of the economy included consideration of local demographics, income, and businesses, as well as the economic contributions of the Project to the local economy through a review of the following resources:

- Census of Population – Statistics Canada (2023)
- Taxation legislation
- Public mapping resources
- Economic data from the Proponent

8.1.2 Existing Environment

The Project is located in Guysborough County, near the communities of:

- Goldboro (Project within community boundaries)
- Isaacs Harbour (1.5 km northwest of the Project's center point)
- Drum Head (2 km southeast)
- Coddles Harbour (5 km east)
- New Harbour (12 km east)

The Guysborough Municipal District census subdivision corresponds with the Municipality of the District of Guysborough (MODG), as it will be referred to here (Statistics Canada, 2023). Population statistics for the province and MODG were summarized using the 2016 and 2021 Census of Population (Table 8.1).

Table 8.1: Population Characteristics from 2016 to 2021 for NS and MODG

Population Statistics	NS	MODG
Population in 2021	969,383	4,585
Population in 2016	923,598	4,670
Population change from 2016 to 2021	+5.0%	-1.8%
Total private dwellings in 2021	476,007	3,043
Land area	52,824.7 km^2	2,115.2 km^2
Population density	18.4/km^2	2.2/km^2

Source: (Statistics Canada, 2023)

The age distribution in MODG reveals a median age of 58.4 years, over 10 years higher than the provincial median age of 45.6 (Statistics Canada, 2023). Further statistics on age distribution in 2021 were compared for the province and MODG (Table 8.2), revealing that MODG has proportionally fewer people in both 0-to-14 and 15-to-64-year age groups, indicating there are fewer people of working age or who will join the workforce within the next 1 to 2 decades.

Table 8.2: Age Distribution in 2021 in NS, MODG, and Mulgrave

Age Statistics	NS	MODG
0 to 14 years	136,710 (14.1%)	515 (11.2%)
15 to 64 years	617,345 (63.7%)	2,455 (53.5%)
65+ years	215,325 (22.2%)	1,615 (35.2%)
Total Population	**969,380**	**4,585**

Source: (Statistics Canada, 2023)
*Note that due to rounding, total percentage may be ±100%.

Median housing costs and median household total incomes in 2020 for MODG were compared to the provincial and national values (Table 8.3). This comparison shows that the median dwelling value in MODG was less than half of the provincial figure, which itself is less than half the national median. Examining the relative value of median total income and median dwelling value across these jurisdictions demonstrates that housing is much more affordable for those on a median income in MODG than in Nova Scotia or Canada as a whole. This is corroborated by the percent of owner and tenant households spending over 30% of their income on shelter costs, although this figure may be skewed by legacy homeowners or renters who either own their property outright or have longstanding leases lower than regional averages.

Table 8.3: Housing Costs and Average Individual Income in 2020 for Canada, NS, and MODG

Housing and Income Statistics	Canada	NS	MODG
Median total income	$41,200	$38,000	$31,200
Median dwelling value	$618,500	$250,000	$120,000
Median total income as a % of median dwelling value	6.7%	15.2%	26.0%
Median monthly shelter costs for owned dwellings	$1,498	$870	$400
% of owner households spending 30% or more of its income on shelter costs	14.8%	9.7%	7.0%

Housing and Income Statistics	Canada	NS	MODG
Median monthly shelter costs for rented dwellings	$1,209	$1,000	$552
% of tenant households spending 30% or more of its income on shelter costs	33.2%	34.7%	22.0%

Source: (Statistics Canada, 2023)

Most residents in MODG (98.6%) use English as their first official spoken language (Statistics Canada, 2023). Because of this, all public outreach and communication for the Project has been, and will continue to be, in English. There is some knowledge of other languages, though no communication has been requested in other languages.

The nearest fire station to the Assessment Area is the Harbourview Volunteer Fire Department, located approximately 2 km west of the nearest edge of the Assessment Area on Highway 316, in Isaacs Harbour North. The Sea Shore Volunteer Fire Department is also located nearby, approximately 9 km southwest on Highway 211, and the larger Guysborough Fire Hall is also nearby, approximately 19 km northeast on Queen Street in Guysborough. Because of coastal geography and otherwise indirect route in this area, the most direct routes from the three fire departments mentioned above to the nearest portion of the Assessment Area that intersects with Highway 316 are approximately 6 km, 20 km, and 41 km, respectively.
Health and emergency services also exist in the area and are accessible to Project workers. The closest location is the Guysborough Memorial Hospital, approximately 21 km northeast of the Assessment Area on Highway 16. St. Mary's Memorial Hospital is also nearby, approximately 26 km west of the Assessment Area on Hospital Road. These medical services are approximately 43 km and 50 km, respectively, from the Assessment Area on the most direct route by car.

Statistics indicate that the unemployment rate in 2021 for MODG was 18.1%, markedly higher than the provincial and national unemployment rates (Table 8.4). The employment rate for MODG was 38.0%, lower than the provincial employment rate of 51.9% (Statistics Canada, 2023).

Table 8.4: Employment Statistics for Canada, NS, and MODG

Unemployment Statistics	Canada	NS	MODG
Employment rate	57.1%	51.9%	38.0%
Unemployment rate	10.3%	12.7%	18.1%

Source: (Statistics Canada, 2023)

The top six industries in MODG in 2017 were compared with the top industries in the province (Table 8.5), as categorized under the North American Industry Classification System (Statistics Canada, 2023). The highest proportion of workers in MODG fall into the "agriculture, forestry, fishing and hunting" and "health care and social assistance" categories (21.6% and 12.5%, respectively). Other significant industries include "manufacturing," "retail trade," "educational services," and "construction."

Table 8.5: Top Six Industries for the Employed Labour Force in 2017 in MODG Compared to the Province of NS

Industry	MODG	NS
Agriculture, forestry, fishing and hunting	405 (21.6%)	17,880 (3.7%)
Construction	145 (7.7%)	35,720 (7.3%)
Educational services	145 (7.7%)	38,425 (7.9%)
Health care and social assistance	235 (12.5%)	70,595 (14.5%)
Manufacturing	165 (8.8%)	31,210 (6.4%)
Retail trade	150 (8.0%)	58,985 (12.1%)
Other (combined)	*630 (33.6%)*	*234,445 (48.1%)*
Total employed labour force 15 years +	1,875	487,260

Source: (Statistics Canada, 2023)

The largest economic centre is the community of Guysborough, located approximately 20 km from the Assessment Area. There are several other communities within a 20 km radius of the Project that offer a range of business services. A review of businesses located via Google business search located within 20 km of the Project is provided in Table 8.6.

Table 8.6: Local Businesses and Proximity to Assessment Area

Business	Nearest Community	Location Relative to the Project*
Whitney's Corner Store	Bickerton West	11 km southwest, Highway 211,
Mersey Seafoods	Bill Cooks Cove	5 km west, Highway 316
T. Pinkham's Nursing Footcare and Wellness	Coddles Harbour	6 km southeast, Coddles Harbour
HWY 316 Mobile Welding & Repair	Cross Roads Country Harbour	12 km northwest, Highway 316
Smokey Hollow General	Cross Roads Country Harbour	17 km northwest, Highway 316
Funky Munkys Bath & Body	Cross Roads Country Harbour	9 km northwest, Highway 316
Drumhead Market – Harbour Island Ecologics Inc.	Drum Head	2 km southeast, Highway 316
Pump House Fuels	Drum Head	2 km southeast, Highway 316
NovaNature Adventures	Goldboro	2 km west, Isaacs Harbour Road
Mann's Your Independent Grocer	Guysborough	19 km northeast, Highway 16
Great Canadian Dollar Store	Guysborough	19 km northeast, Highway 16
Robins Donuts	Guysborough	19 km northeast, Highway 16
The Canny Canine Bakery	Guysborough	20 km northeast, Church Street
DesBarres Manor Inn	Guysborough	20 km northeast, Church Street
Guysborough Pharmachoice	Guysborough	20 km northeast, Main Street
RBC Royal Bank	Guysborough	20 km northeast, Main Street
Big G's Pizza & Restaurant	Guysborough	20 km northeast, Main Street
Cast Away Cafe	Guysborough	20 km northeast, Main Street

Business	Nearest Community	Location Relative to the Project*
Nova Sandblasting and Surface Prep	Isaacs Harbour North	3 km northwest, Highway 316
Cozy Harbour House	Isaacs Harbour North	9 km northwest, Highway 316
Siler 9 Contracting Limited	Larrys River	11 km northeast, New Harbour Lundy Road
W.M. Schrader Fisheries	Larrys River	18 km east, Highway 316
Murphy's Inn	Larrys River	18 km east, Highway 316
Lonely Rock Seaside Bungalows	New Harbour	13 km east, New Harbour Road
Whitney's Corner Store	Port Bickerton	9 km southwest, Highway 211
Bigger Dreams Farms	Port Hilford	15 km southwest, Highway 211
Forgotten Shore Farm Ice Cream Shop	Port Hilford	16 km southwest, Highway 211
Ledge Cottage	Port Hilford	17 km southwest, Highway 211
Country Harbour RV Site	Stewart Cove	5 km west, Highway 316
Tor Bay Fisheries	Tor Bay	19 km east, Tor Bay Branch Road
Chedabucto Home Hardware	West Cooks Cove	17 km northeast, Larrys River Rd
ME Harnish Heating & Ventilation	West Cooks Cove	17 km northeast, Larrys River Rd
Grants Heavy Equipment Limited	West Cooks Cove	17 km northeast, S River Lake Road

*All distances were measured from the nearest edge of the Assessment Area by a straight line and rounded to the nearest whole number.

Nearby residents are generally dependant on the community of Guysborough for health care facilities, including emergency services and inpatient care. The small communities in this area are generally dependent on the greater municipal centres of Antigonish and Port Hawkesbury for many shops and services, including indoor recreation and big-box stores. Some residents of the nearby communities surrounding the Project commute daily within Guysborough or to Antigonish or Port Hawkesbury for work.

8.1.3 Effects Assessment

Project-Economy Interactions

Project activities have the potential to interact with the economy during all phases of the Project (Table 8.7).

Table 8.7: Potential Project-Economy Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	X
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Water Pipeline and Roadway Construction	X
Facility Foundation Construction	X
Transportation of Facility Components	X

Project Phase	Potential for Interaction
Facility Assembly	X
Utility Connections	X
Removal of Temporary Works and Site Restoration	X
Operations and Maintenance	
Commissioning	X
Handling of Biomass	X
Production of SAF and Other Products	X
Product Storage	X
Vegetation Management	X
Decommissioning and Rehabilitation	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for economy is MODG. The RAA for economy includes the entire province.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for the economy as well. The VC-specific definition for magnitude is as follows:

- Positive – Project is expected to have a positive effect on the economy.
- Negative – Project is expected to have a negative effect on the economy.

Effects

The valuation of the economy incorporates the employment rate, income of residents, industry characteristics and services offered within a given area.

As a result of construction activities, the following effects to the economy are anticipated:

- An increase in employment opportunities for the local community, First Nations communities, and equity-seeking groups.
- Support for economic reconciliation through a meaningful partnership between the Project and First Nation communities.
- An increase in economic prosperity within First Nation communities.
- Local businesses may experience increased sales and/or patronage.
- An increased demand for short-term accommodations.
- An increased demand in the food services, construction, health care and social assistance, and retail trade industries.
- An increase in essential services to meet demand.
- An increase in employment opportunities, especially in the areas of accommodation and food services, education, health care, and social assistance sectors.

As a result of operational activities, the following effects are anticipated:

- An increase in employment opportunities for the local community, First Nations communities, and equity-seeking groups.
- Project-generated employment opportunities may also provide an opportunity for repatriating workers who may have moved away to secure well-paying jobs elsewhere (outside of NS).
- Support for economic reconciliation through a meaningful partnership between the Project and First Nations communities.
- An increase in economic prosperity within First Nations communities.
- An increase in high-paying jobs enabling local, regional, and provincial youth to engage and excel in meaningful careers.
- Increased opportunities for workers interested in upskilling to expand their capabilities to better align with the emerging sector and green economy.
- Local businesses may experience increased sales and/or patronage.
- An increased demand/patronage in the food services, construction, health care, social assistance, and retail trade industries.
- An increase in essential services to meet demand.
- An increase in employment opportunities, especially in the areas of accommodation and food services, education, health care, and social assistance sectors.
- Expansion of NS's green energy market.
- Increased publicity for the province of NS and the formation of international trade relationships.
- An increase in investments to the regional (Guysborough) economy and employment opportunities.
- A substantial increase in tax revenues for the regional economy.

As the economic market increases, more money will be dispersed within the province of NS and, more importantly, to the local communities and MODG. The Project is anticipated to generate significant positive economic impact through a largely export-focused industry, new to Atlantic Canada. Additional employment opportunities will also increase expendable income within local communities, potentially increasing average local earnings and decreasing the unemployment rate.

The Project will result in investment of $4-6 billion into NS prior to operations at the end of 2031. The Proponent is committed to sharing economic opportunities with the local community throughout the development and lifespan of the Project through the use of local skills and labour where possible and the generation of municipal tax revenue. Additionally, the Proponent is dedicated to working with educational institutions to train NS residents in related careers and on-going energy literacy and educational opportunities, such as presentations about renewable energy at local schools, community meetings or for municipal councils, REP tours and visits, and more. The Project Team has and will continue to engage the community, local businesses, and municipal staff and leaders to help identify Project-related opportunities and benefits for the local community.

The Proponent understands the importance of supporting local and rural communities. The Project Team is committed to using as many local skills as possible. Potential work includes environmental studies, geotechnical investigation, engineering, land and snow clearing, surveying, worksite security, road construction and maintenance, installation of site infrastructure, collector system construction, and substation construction. Specifically, elements of job creation throughout the lifespan of the Project may include:

- Project Development: During the development phase of the Project, Nova Scotian professionals have and will continue to deliver services in a variety of areas, including civil and electrical engineering, geotechnical engineering, legal, environmental, and biological surveys, archaeological, land and community relations, and many others. Dozens of professionals within NS will render their services as part of the development of the Project.

- Construction: Throughout the construction phase of the Project, it will require a large workforce that will fluctuate throughout the construction period. Much of the construction employment will come through contracting and subcontracting of Canadian, and where possible, Nova Scotian construction firms and specialized service providers. It is estimated that the Project will generate in excess of 1,000 jobs for varying scopes and duration throughout the construction period. The largest construction scopes of work are anticipated to be:
    - Civil installation, that is, land clearing, grubbing, road construction, and foundation installation, which includes:
        - Excavating
        - Rebar supply and installation
        - Forming
        - Concrete supply and pouring
        - Grouting
    - Electrical installation, that is connection to the NSPI grid and/or other power supplies, which includes:
        - Underground and overhead installation
        - Cable terminations
        - Electrical testing
        - Instrument installation and testing

- The Proponent will look to maximize local content where appropriate. To this end, the Proponent will hold a job fair prior to the start of construction to engage with local community members and service providers and identify suitable candidates and/or businesses to support the construction phase employment and service providers. Additionally, the proponent will work with local educational institutions to discuss training opportunities for future positions.

- Operations and Maintenance: The operational phase of the Project will include two key areas of economic impact, the first being direct effects of the facility's operation, with

operational expenditures in excess of $200 million annually, and the second an indirect effect on the NS forestry industry.

- Facility operation will require a permanent staff of 60 - 80 who will live within the RAA and whose income will benefit the local economy of the communities in which they live. Operation of the facility and production of exportable products will require skilled labour for a variety of tasks including:
  - Biomass handling
  - Biomass and water processing
  - Sustainable fuel and other co-product production
  - Product preparation and loading for shipment
- The Independent Review of Forest Practices, more commonly known as the Lahey Report (2018), acknowledged the impact of the closure of pulp mills on the NS forest sector. The loss of a market for less-merchantable timber meant decreasing financial sustainability of the silvicultural practices required to engage in ecological forestry. By purchasing such wood fibre, the Proponent will help support sustainable forest practices in NS and the forest industry at large.

In addition to the direct investments that the Project would bring to the NS economy, the Project will result in indirect and induced economic benefits that will be realized by governments, local businesses, communities, and residents. Workers that are directly involved with the development, construction, and operations would contribute to the local economy by redistributing wealth to a variety of goods and services such as hotels, restaurants, and grocery stores (NREL, 2016). In addition to increased spending due to locally paid wages and salaries, the Proponent plans to develop a benefits agreement with the MODG and has established a CLC with a community investment component to further increase the financial benefits to local communities.

Mitigation Measures

The economic impact to the LAA and RAA is positive; therefore, no mitigation is proposed.

Monitoring

A specific monitoring program for the economy is not recommended.

Conclusion

The impacts to economy are characterized as follows:

- Magnitude: Have a positive impact on the economy.
- Geographic Extent: Extend to the RAA.
- Frequency: Occur continuously during the Project lifespan.
- Duration: Be of long duration as the effects will last through the decommissioning phase.
- Reversibility: Irreversible as the effects are unlikely to be reversed.

- Significance: No significant negative impacts. Positive impacts expected (significance not evaluated) due to economic stimulus.

8.2 Land Use and Value

8.2.1 Overview and Assessment Methodology

The assessment of land use and value was completed through a review of desktop resources and in consideration of feedback from public engagement to evaluate how the Project may interact with this VC. The following resources were reviewed:

- NS property records
- Public mapping resources
- Literature review of property values and industrial facilities

8.2.2 Existing Environment

The Project is within MODG. The Facility is planned entirely on private land owned by the Proponent and MODG. It is located at the Goldboro Industrial Park, which was the previous location for the Keltic Petrochemicals and the Goldboro LNG EAs, and extensive historical gold mining. It is located along Sable Road and Highway 316 and consists of industrial land, clear-cuts, treed forests, and several liquid and gas pipelines, including a decommissioned natural gas plant. The water pipeline is located primarily on Crown land with a small portion on private lands as well, dependent on final route selection (Section 3.1). It is located to the north and northwest of the Facility and crosses a variety of landscape types (see Section 7.4.1 for more details on the landscape). The nearest community is Goldboro, approximately 1 km away from the Project, and within 500 m of the Assessment Area there are nine receptors (houses, either seasonal or permanent).

The Assessment Area is not currently utilized and includes industrial land that has been subject to extensive surveys due to the historic oil and gas-related activities in the area. A decommissioned natural gas plant is located northeast of the site and is connected to the Maritimes and Northeast Pipeline network. This pipeline delivers natural gas from the United States to NS and New Brunswick (NB) (CER, 2024). Two other gas pipelines, owned by Exxonmobil Canada Limited and Ovintiv Canada Unlimited Liability Corporation, exist near the Project (CER, 2023). Three turbines and a helipad are also located within the Assessment Area.

The Assessment Area was previously the subject of the Keltic Petrochemicals and Goldboro LNG EAs. In 2006, Keltic Petrochemicals Inc. proposed to construct and operate a petrochemical complex supported by an LNG importation and vapourization facility and an electrical co-generation plant. The project was approved in 2007 but was never built. In 2013, Pieridae Energy proposed to construct a natural gas liquefaction plant and marine terminal, which received approval in 2014. Similarly, the plant was never built, and the approval was transferred to NSF.

Several public protected lands and parks, both active and pending, are also located in the vicinity of the project (Drawing 8.1), including currently designated and areas pending approval (Table 8.8).

Table 8.8: Parks and Protected Areas Within 20 km of the Project

Protected Area	Status+	Location Relative to Project*
Guysborough Headlands Wilderness Area	Designated	3 km southwest and 6 km east
Loon Lake Nature Reserve	Designated	1 km north
Isaacs Harbour River Wilderness Area	Pending (Under interim policy)	4 km northwest
Port Bickerton Provincial Park	Pending (Under interim policy)	7 km southwest
Salsman Provincial Park	Designated	7 km west
New Harbour Provincial Park	Approved (Under interim policy)	11 km east
Big Plains Wilderness Area	Designated	10 km west
Bonnet Lake Barrens Wilderness Area	Designated	9.5 km northwest
Chedabucto Fault Nature Reserve	Pending (Under interim policy)	13 km north
Ogden Round Lake Wilderness Area	Designated	15 km north
West Cooks Cove Provincial Park	Pending (Under interim policy)	15 km northeast
Pearts Cove Provincial Park	Pending (Under interim policy)	18 km northeast
Tor Bay Provincial Park	Approved (Under interim policy)	20 km east

+ Status from NS Parks and Protected Areas online map (NSECC, 2020b)
*All distances were measured from the nearest edge of the Assessment Area by a straight line and rounded to the nearest whole number.

There are no Mi'kmaq reserve lands within 10 km of the Study Area (MDCC, 2025). Further consideration of Mi'kmaq resources is discussed in Section 5.0.

Based on a review of NSNR's Mineral Resource Land Use Atlas (2021e), there are several mineral exploration licenses covering the entire Assessment Area. Further, there are as many as 291 AMOs within the Assessment Area, particularly in the center and southern portions. Further consideration of the Project's geophysical environment is included in Section 7.2.

8.2.3 Effects Assessment

Project-Land Use and Value Interactions

Project activities have the potential to interact with land use and value during all phases of the Project (Table 8.9).

Table 8.9: Potential Project-Land Use and Value Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	X
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Water Pipeline and Roadway Construction	X
Facility Foundation Construction	X
Transportation of Facility Components	X
Facility Assembly	X
Utility Connections	X
Removal of Temporary Works and Site Restoration	X
Operations and Maintenance	
Commissioning	X
Handling of Biomass	X
Production of SAF and Other Products	X
Product Storage	X
Vegetation Management	X
Decommissioning and Rehabilitation	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for land use and value includes MODG. The RAA is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for land use and value as well. The VC-specific definition for magnitude is as follows:

- Negligible: No change in land value expected and surrounding land use can largely continue.
- Low: Small change in land value expected and/or minor limitations to surrounding land use.
- Moderate: Moderate change in land value and/or moderate limitations to surrounding land use.
- High: High change in land value and/or widespread limitation to surrounding land use.

Effects

Land use and value assesses the existing property that the Project will reside within and the impacts its development may have on neighbouring properties and/or surrounding developments. As a result of construction and operational activities, the following effects are anticipated:

- An increase in development opportunities because of the influx of employment opportunities and people relocating to the area for Project work.
- An increase in home market value based on demand.

Further, as a result of construction activities, an increase in short-term rental and commercial space leases is anticipated.

While not directly related to land use and value, changes in traffic patterns and volumes have the potential to impact the area's desirability from a residential development standpoint. It is not possible to estimate daily traffic volumes from workers, heavy machinery, and other construction-related traffic during the construction phase. This will vary day to day and will be determined by the type and tempo of work. During the operational phase of the Project, facility-related traffic is expected to be more stable and of a lower volume. A total of 60 wood-hauling trucks are expected to make return trips daily, resulting in 120 passes along Highway 316 per day. Additionally, the facility's staff of 60-80 will commute daily to the facility from neighbouring areas, coinciding with shift changes. Commuter traffic will therefore result in an additional 120-160 passes along Highway 316 daily, although these will come from multiple directions. Wood-hauling and commuter trips are expected to comprise most of the traffic, and it is not possible to account for other incidental trips to the facility currently.

Compared to baseline values, the addition of wood-hauling and commuter vehicles totalling 240-280 passes per day may represent a doubling of daily vehicular traffic compared to 2014-2023 annual averages of between 250 and 260 passes per day (NSPW, 2024). The expected traffic volume is less than the 2017 annual average for the section of Highway 316 between Country Harbour Cross Roads and Salsman Provincial Park, which saw 592 vehicles, and has since increased to 706 vehicles in 2024 (NSPW, 2024). This increased traffic will contribute to road wear on Highway 316, which open house participants reported as being in poor condition currently. While the road will likely wear faster, increased traffic and economic activity in the area may result in greater road maintenance attention, though this is the responsibility of NSPW and the Proponent has no role in this decision-making process.

While road traffic is expected to increase, expected volumes are not beyond conditions experienced nearby on the same highway, and are not out of the range of expectations for a main trunk highway in a rural setting.

Mitigation

The Project has been designed to minimize potential effects to land use and value through siting considerations and engagement with neighbouring landowners. To minimize uncertainty and concerns from local/regional residents, the Project is committed to continuing to engage with these communities to solicit feedback and will assess any potential impacts brought forward as the Project progresses. A traffic management plan will be developed to evaluate and manage road traffic related to construction and operation activities. This will be a key role for the CLC, where members will share community perspectives and ensure diverse experiences are reflected in the project. No specific mitigation related to land use and value is recommended.

Monitoring
A specific land use and value monitoring program is not recommended.

Conclusion
The impacts to land use and value are characterized as follows:

- Magnitude: Negligible in magnitude as no change in land value expected and surrounding land use can largely continue.
- Geographic Extent: Within the LAA.
- Frequency: Occur continuously during the Project lifespan.
- Duration: Be of medium duration as the effects will last through the operation and maintenance phase.
- Reversibility: Reversible as the residual effects are likely to be reversed after the Project is completed.
- Significance: Not significant.

8.3 Recreation and Tourism

8.3.1 Overview and Assessment Methodology

The assessment of recreation and tourism was completed through a review of desktop resources and in consideration of feedback from public engagement to evaluate how the Project may interact with this VC. The following resources were reviewed:

- Nova Scotia Visitor Exit Survey (TNS, 2024)
- Literature review of industrial facility on tourism and recreation
- Review of local governments' tourism and recreation websites:
    - Guysborough County (TGS, 2024)
    - Municipality of the District of Guysborough (MODG, n.d.)

8.3.2 Existing Environment

The communities of Isaacs Harbour, Goldboro, Drum Head, Coddles Harbour, and New Harbour, as well as other communities near the Assessment Area, are home to a variety of primarily outdoor recreational activities. The primary recreational draws include the area's trails, used by ATV riders in summer and snowmobilers in the winter. Multiple nearby Provincial Parks (Table 8.8) offer hiking, camping, picnicking, canoeing, fishing, kayaking, and sightseeing opportunities.

Guysborough County has a rich history, dating back over 400 years, and offers museums and historical and cultural attractions including the Old Courthouse Museum in Guysborough. Music and theatre are popular in the area, with Mulgrave Road Theatre, a professional theatre company focused on the Atlantic Canadian experience located in Guysborough, as well as the Chedabucto Place Performance Centre for live performances of all types (MODG, n.d.).

Despite the lack of direct tourism destinations within the Assessment Area, there are many tourists who pass near the area on Highway 316 either travelling north towards Antigonish, or easts towards Canso. It is part of Nova Scotia's Marine Drive scenic travelway (TNS, 2025) that travels along the Atlantic Ocean and is an option for travel to Canso, although this route is secondary to the more direct Highway 16.

Most game and furbearer hunting seasons in Nova Scotia start in the fall and have varying end dates by species. Deer hunting starts in September and October depending on the method of hunting and age of hunter (NSNR, 2024g). Additional approved hunting or trapping may occur in the vicinity of the Project, especially near water pipelines, per NSNR guidelines. There was some evidence of hunting near Meadow and Ocean lakes observed during fieldwork, although no hunters were encountered during fieldwork between February and July 2025.

Several fish species were confirmed in lakes within the Study Area and several waterfowl were also observed. There are numerous trails that lead to the edges of the lakes that could be used for fishing or waterfowl hunting in this area. Although evidence of hunting was observed during fieldwork, it is not possible to discern whether it was related to waterfowl hunting

8.3.3 Effects Assessment

Project-Recreation and Tourism Interactions

Project activities have the potential to interact with recreation and tourism during all phases if access is changed, is temporarily limited to facilitate work, or if changes to the visual environment impact users' experience (Table 8.10).

Table 8.10: Potential Project-Recreation and Tourism Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	X
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Water Pipeline and Roadway Construction	X
Facility Foundation Construction	X
Transportation of Facility Components	X
Facility Assembly	X
Utility Connections	X
Removal of Temporary Works and Site Restoration	X
Operations and Maintenance	
Commissioning	X
Handling of Biomass	X
Production of SAF and Other Products	X
Product Storage	X
Vegetation Management	X

Project Phase	Potential for Interaction
Decommissioning and Rehabilitation	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for recreation and tourism is MODG. The RAA is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for recreation and tourism as well. The VC-specific definition for magnitude is as follows:

- Negligible: No expected changes to recreation and tourism.
- Low: Small change to tourism expected and/or minor limitations to recreation use.
- Moderate: Moderate change to tourism and/or moderate limitations to recreation use.
- High: High change to tourism and/or widespread limitation to recreation use.

Effects

It is difficult to determine with certainty how tourists will react to an energy industrial facility. Industrial facilities can be seen to detract from natural scenery and a community's aesthetics. However, there is an opportunity to attract visitors to the Project during operation using industrial tourism. One study highlighted the economic potential of industrial tourism, inviting visitors to view public-facing aspects of the participating firms while drawing a fraction of the tourisms to the local businesses and attractions (Otgaar & Klijs, 2010). Demonstrating the quality of the location and facilities may also provide additional promotions to the project and individual company, potentially raising awareness on the industrial facility and its processes to the local community (Montenegro et al., 2023).

The 2022/2023 visitor exit survey, the most recently published results of Tourism Nova Scotia's (TNS) periodic visitor exit surveys, collected visitor data from 1 April 2022 to 31 March 2023 (TNS, 2024). The report provides information about domestic, Canadian, and international visitors to NS, but does not include information about activities undertaken by visitors travelling for pleasure. The older 2019 visitor exit survey did collect information on the reason for people's visits and activities that visitors undertook while in NS (TNS, 2021). The top five main reasons for visiting Nova Scotia in 2019 among pleasure visitors were:

- For the scenery/natural landscape (22%)
- To visit a specific area or location in Nova Scotia (18%)
- For the seacoast and ocean (14%)
- To do a specific activity (8%)
- To experience Nova Scotia's culture (8%)

Of those who participated in outdoor activities, the most common were coastal sightseeing, visiting a beach, and hiking (TNS, 2021). No spatial data are available from this or other

research products of TNS regarding the places visited within province, limiting the understanding of the impact that tourism has on the communities that surround the Project. Given the high prevalence of minimally structured and uncommercialized activities (e.g. hiking and beach exploration), the low prevalence of tourism providers near the Assessment Area would not necessarily be a deterrent to tourists using the area. However, it is more likely that visitors to MODG seeking natural experiences would visit established destinations such as the previously mentioned Port Bickerton or Salsman Provincial Parks, which are each over 5 km from the Project.

The region is also known for its recreational offerings such as hiking, camping, and biking. There are several notable hikes in the region, including some featured in Michael Hayne's popular Hiking Trails of Nova Scotia (2002), including trails at Black Duck Cove, Chappel Gully, the Guysborough Nature Trail, Tor Bay, and more, however none are found within or near the Study Area. Furthermore, there are no trails within the Study Area on the public trails repository AllTrails.com (n.d.), a popular and well-used source for information about hikes globally recommended by Hike Nova Scotia as the source for information about trails in NS. Enjoyment of the region's outdoor recreational activities is not expected to be impacted by the Project and Guysborough County will remain an area of interest for visitors.

- Outdoor recreational activities such as snowmobiling, ATV use, fishing, and hunting are unlikely to be impacted by the Project. The Facility does not overlap with any areas dedicated to these activities. The freshwater pipeline crosses through areas, particularly Crown land, that may be used for recreational activities but will be trenched where possible and thus avoid impeding access to areas historically used for hunting, fishing, and other recreation.
- Construction activities will be temporary, and any incidental encounters with recreational users (e.g., potential hunting activities within the water pipeline corridor) will be short-term and temporary.
- The Industrial Facility is located within an industrial zone, and recreational activities are not permitted within this area.
- An increase in the number of local outdoor recreational users may be experienced (because of the influx of personnel associated with the Project).

The Project Team is committed to working with local recreational groups to ensure continued access to the area and associated trails, within the bounds of all safety considerations, particularly during construction. Access to the Facility footprint will be restricted, however land-based activities within the surrounding areas and along the pipeline route is not expected to be limited.

Mitigation

To reduce the impacts on recreation and tourism during Project phases, the following mitigation measures will be applied:

- Continue to work with local recreation groups to ensure continued access to areas around the Assessment Area for recreation and hunting/trapping where appropriate and safe.
- Continue to work with nearby landowners to ensure there is a positive and productive relationship within the community.

Monitoring
A specific tourism and recreation monitoring program is not recommended.

Conclusion
The impacts to recreation and tourism are characterized as follows:

- Magnitude: Magnitude is low due to low direct impact on recreation and tourism activities.
- Geographic Extent: Within the LAA.
- Frequency: Continuous as some effects due to the visual presence will persist until decommissioning; however, other effects related to construction and decommissioning will be intermittent and temporary during their respective phases.
- Duration: Medium-term duration as the effects will continue until decommissioning.
- Reversibility: Reversible, as effects will terminate at the end of the construction phase.
- Significance: Not significant.

9.0 ARCHAEOLOGICAL RESOURCES

9.1 Overview

The purpose of the Archaeological Resource Impact Assessment (ARIA) is to identify areas of elevated archaeological potential within the Assessment Area. Davis MacIntyre & Associates Limited (DMA) was contracted to conduct the ARIA. Assessment work for the ARIA took place in 2024, with fieldwork conducted between September and November. A draft report was submitted to NSCCTH by DMA in January 2025 which received acceptance from NSCCTH in March 2025.

The ARIA was scoped to the portion of the Assessment Area associated with the REP only and did not include an assessment of the raw freshwater pipelines or areas surrounding Meadow and Ocean lakes. This is due to uncertainty regarding the final design of the raw freshwater pipelines. Once the final design and routing of the raw freshwater pipelines are confirmed, an ARIA for the final Project Footprint will be completed.

9.2 Regulatory Context

The *Special Places Protection Act* (Nova Scotia, 1989b) provides the province of NS with a mandate to protect important archaeological, historical, and paleontological sites and remains, including those underwater. A permit is required for any archaeological or paleontological exploration or excavation in NS. The permit system ensures that work is completed based on established standards by qualified applicants.

This ARIA was conducted in accordance with the terms of Heritage Research Permit A2024NS178, issued by the NSCCTH – Special Places Program.

As archaeological work can often result in findings or information that is confidential or sensitive, a summary of the results of the ARIA is provided in the EA, with the ARIA report itself provided directly to NSCCTH.

NSCCTH accepted the findings and recommendations provided in the ARIA prepared by DMA in a letter dated March 21, 2025 (Appendix O). This chapter summarizes the fundings of the ARIA and mitigations proposed by DMA and accepted by NSCCTH.

9.3 Assessment Methodology

The objectives of the ARIA were to:

- Evaluate archaeological potential within the Assessment Area.
- Identify, delineate, and investigate areas considered to exhibit elevated potential for encountering archaeological resources.
- Provide detailed and accurate information on the results of the survey.
- Provide comprehensive recommendations so that appropriate archaeological resource management strategies can be devised.

To achieve these objectives, DMA designed an assessment strategy consisting of a historic background study, engagement with the KMNO-Archaeological Research Division, and field reconnaissance.

The historical background study examined several resources to understand the environmental and anthropological context and history of the Assessment Area. Specifically, the following resources were consulted:

- Historic maps, manuscripts, and other published literature from a variety of sources.
- Previously conducted archaeological assessments of the Assessment Area or parts thereof.
- LiDAR and air photos.
- The Maritime Archaeological Resource Inventory (MARI).

The environmental context is examined to identify past and current environmental influences or conditions that may elevate archaeological potential (e.g., topography, local resources, and potential for agriculture). The archaeological context is examined to identify how people used and occupied the surrounding landscape based on evidence from previously registered archaeological sites and past archaeological work conducted near the Project. The historical context is examined to identify how people used and occupied the local area based on evidence from published archival documents, ethno-historic records, local oral traditions, historic maps, local and/or regional histories, scholarly texts, and available property records.

In NS, the MARI is maintained by the NS Museum on behalf of NSCCTH. Reports from past archaeological assessments and academic research conducted near the Project provide archaeological context, which informs the interpretation and evaluation of any potential archaeological resources identified during the field component of the ARIA.

Previous archaeological surveys in 2004 and 2007 provided additional context for understanding historical land use, archaeological resources in the Assessment Area, and a baseline for change over time. The 2024 ARIA yielded additional, previously unreported findings due to increased transect coverage and changing archaeological standards. However, the 2024 ARIA was unable to observe some previously documented features, which DMA attributes to increasing vegetative land cover over time and difficulty accessing some sites safely due to terrain hazards from past mining activity.

The field component involved an on-site visual examination of the Assessment Area. Parallel pedestrian transects were completed throughout the Assessment Area to visually assess archaeological potential at intervals of approximately 20 to 30 m, although greater spacing was sometimes required due to terrain hazards. These transects assist in maintaining effective coverage. Details of observations were documented in field notes, and photographs were captured with location and orientation information. A hand-held GPS unit was used to record coordinates and track logs.

The archaeological significance of artefacts and other features, as conveyed in the ARIA and accepted in the NSCCTH letter, is used differently from its usage in this EA. In an archaeological sense, significance refers to the importance of artefacts or resources and does not correlate with the significance of the Project's overall effects. Therefore, this chapter refers to this different meaning of significance as assessed archaeological significance (AAS).

Identified cultural features related to documented historical use or a visible feature within a discrete area were named and assigned an AAS rating of unknown, low, moderate, or high. Cultural features were assigned a low AAS rating if they were associated with modern activities on site. Moderate and high AAS ratings were assigned to features with historical value and mitigations were recommended including avoidance if possible and otherwise recording for posterity and monitoring by qualified archaeologists during disturbance. Features were assigned an AAS rating of 'unknown' when the nature of the feature was not apparent without further investigation, and mitigations assigned included testing for more information and recording features' qualities if disturbance is necessary.

Additionally, areas of elevated potential for the discovery of L'nuk resources were categorized by their relative likelihood of such finds. A high potential area (HPA) is associated with conditions that would be conducive to L'nuk settlements and use for resource gathering, where artefacts of prior use might be concentrated and later found. Classification of a moderate potential area (MPA) is based on the same features as an HPA, but with mitigating circumstances that reduce the likelihood of finding such artefacts.

In addition, underwater benthic habitat survey footage collected by CSR GeoSurveys Limited in August and October 2024 was reviewed by DMA to assess potential archaeological resources in the adjacent marine environment.

Upon completion of the desktop and field assessment, analysis, and interpretation, the assessment results were summarized in the ARIA (submitted to NSCCTH under separate cover). The ARIA includes recommendations for appropriate resource management strategies specific to each area of elevated potential or cultural feature. Photos, detailed plans, and GIS-based mapping of the testing area were also incorporated.

9.4 Assessment Results

The field component of the ARIA was carried out between September and November 2024. In conjunction with studies of past ARIAs conducted on approximately the same Assessment Area and other consulted resources, the ARIA identifies both areas of potential archaeological resources, and named cultural features based on historical accounts or visual evidence of past human activities. NSCCTH accepts the ARIA as submitted including the recommended actions or mitigations for potential and identified archaeological resources, referencing from the ARIA:

- Two HPAs.
- Five MPAs.
- A total of 52 named cultural features, including 28 of which have an AAS rating of unknown, moderate, or high, and have specific recommendations for mitigation.
- The remainder of observed features do not require mitigations per NSCCTH.

No archeological resources or potential areas were identified through a review of the underwater benthic habitat survey footage.

9.5 Effects Assessment

Project-Archaeological Resources Interactions

Project activities could interact with archaeological resources during ground disturbance, including earth-moving activities, in the construction phase (Table 9.1).

Table 9.1: Potential Project-Archaeological Resources Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	X
Water Pipeline and Roadway Construction	X
Facility Foundation Construction	X
Transportation of Facility Components	-
Facility Assembly	-
Utility Connections	-
Removal of Temporary Works and Site Restoration	-

Project Phase	Potential for Interaction
Operations and Maintenance	
Commissioning	-
Handling of Biomass	-
Production of SAF and Other Products	-
Product Storage	-
Vegetation Management	-
Decommissioning and Rehabilitation	
Infrastructure Removal	-
Site Reclamation	-

Assessment Boundaries

The LAA for archaeological resources is the Assessment Area. The RAA is not applicable.

Assessment Criteria

The assessment criteria provided in Section 4.6 apply to archaeological resources. The VC-specific definition for magnitude is as follows:

- Negligible: Activities have no planned or potential impacts on archaeological resources.
- Low: Activities have a low potential for encountering archaeological resources, or impacted resources have negligible to low AAS ratings according to qualified archaeologists.
- Moderate: Activities have a moderate to high potential for encountering archaeological resources during ground disturbance and impacted cultural features have a moderate to high AAS, but risk of harm to identified and potential archaeological resources can be mitigated through appropriate actions and procedures.
- High: Activities have a high potential for accidentally encountering and impacting archaeological resources during ground disturbance, and there is an unavoidable and high potential for accidental and irrevocable loss of archaeological resources.

Effects

There is the potential for effects on archaeological resources across the Assessment Area. Of the total list of features and areas identified by the DMA within the Assessment Area, only the 28 cultural features and seven areas of high and medium potential listed in the NSCCTH letter are considered going forward. Features that were assigned a low AAS and for which there were no further recommendations of avoidance or mitigations from NSCCTH were excluded from further consideration as removal/disturbance of these features is permitted with NSCCTH approval.

There are 10 cultural features intersected or possibly intersected by components of the Project's buildings or infrastructure (Table 9.2). Of these, one has a high AAS, one a low AAS, and the remaining eight are of unknown AAS. NSCCTH accepted the DMA recommendations as articulated in the ARIA.

Table 9.2: Anticipated Interactions and Mitigations for Cultural Resources [1]

Feature	Archaeologically Assessed Significance [2]	Interpretation	Project Component	NSCCTH Approved Mitigation [3]
Stone-lined depression	Unknown	Unknown	Road	Testing
Stone pad 1	Unknown	Unknown	Road	
Stone pad 2	Unknown	Unknown	Fenceline	
Ferrous chute	Unknown	Mine related infrastructure	Fenceline	Recording (object measurements and location) and monitoring
Machine bases (skunk den mine)	High	Mine-related infrastructure	Stormwater pond	
Hattie belt	Unknown	Previous site of mining activity	Fenceline	Monitoring, verification, and recording
Stone pile 8	Unknown	Unknown	Fenceline	Manual clearing and testing with excavation
Red Head Cemetery	Low (mitigation already completed)	Historic cemetery, exhumed in 2001	Road	Monitoring, consultation with Lincolnville community
Paris house	Unknown	House of former area residents, located from historic aerial imagery, actual location uncertain	Various, equipment	Contact Coordinator of Special Places if archaeological resources are found
Buckley farm	Unknown	Farmland associated with a former area resident	Possibly roadway, unclear	

Source: (Davis MacIntyre & Associates, 2025)
[1] Features of low AAS that had no further recommendations for mitigations/avoidance were excluded from the table as removal/disturbance of these features is permitted with NSCCTH approval.
[2] Unknown potential = the potential importance of the archaeological resource can not be determined without shovel testing or other further investigation.
[3] Source: (NSCCTH, 2025)

While all two identified HPAs and five MPAs are within the Assessment Area, none are overlapped by proposed Project Infrastructure or require disturbance in connection with development of the Project as planned. If the Project's layout within the Assessment Area changes and disturbance to areas of potential archaeological resources becomes likely, the Proponent will adhere to the mitigations agreed to by NSCCTH. This includes shovel testing conducted by qualified archaeologists in advance of ground disturbance, followed by notification upon discovery of archaeological resources.

Mitigation

The following mitigation measures are recommended:

- Maintain avoidance of MPAs, HPAs, and named areas or features where possible.
- Complete an ARIA for the raw freshwater pipelines once the design and routing have been finalized.
- Undertake shovel testing in consultation with NSCCTH at HPAs and MPAs if the Project layout changes and avoidance is not feasible.
- Follow the NSCCTH approved mitigations outlined in Table 9.2 for cultural features that are likely to be impacted. Consult with NSCCTH on appropriate measures based on the findings.
    - The cultural features skunk den mine ferrous chute, machine bases, and Giffin's mill millrace will be cleared of brush for further examination and archaeologically monitored to better delineate and characterize features before and during removal (if required).
    - A qualified archaeologist will monitor ground disturbance (if required) at Red Head Cemetery to ensure no burials exist beyond areas previously mitigated. Protocols for the appropriate handling of human remains will be developed prior to ground disturbance. Representatives of the Lincolnville Black Community have been contacted to identify and address concerns relating to the cemetery.
- If the Project Footprint changes within the archaeologically assessed area, follow the NSCCTH approved mitigations provided in the letter dated March 21, 2025, for cultural features that are likely to be impacted. Consult with NSCCTH on appropriate measures based on the findings.
    - The cultural features of Hattie belt and McMillan mine would need to be further assessed through archaeological monitoring to verify the status of intact features at or below the surface to ensure appropriate recording and mitigation prior to disturbance (if required).
    - Qualified archaeologists would need to monitor clearing activities (if required) at the Dung Cove site. Hand-clearing would also be conducted as necessary. Excavation of a stone pile to assess age and function would be completed to determine the archaeological sensitivity of the site and appropriate next steps in consultation with NSCCTH.
- Develop a chance find procedure in the contingency plan related to the potential unexpected discovery of archaeological items, sites, or human remains during construction. This would include halting any work immediately upon discovery of suspected resources and contacting NSCCTH. If the resources are suspected to be of Mi'kmaq origin, the Executive Director of KMKNO would also be contacted.
- Conduct additional archaeological assessment if, during final engineering design, it is determined that ground disturbance is required in areas not previously assessed. The EA Branch will be provided with the acceptance letter from NSCCTH prior to the completion of any disturbance in newly proposed areas.

Monitoring

A qualified archaeologist will conduct archaeological monitoring and/or testing if disturbance of specific cultural features (as outlined in Table 9.2) is required during the construction phase.

Conclusion

After mitigations, residual effects on archaeological resources associated with the Project have been assessed, including the potential to find and accidentally impact archaeological resources. Based on the assessment and through the implementation of proposed mitigation and monitoring strategies, residual effects on archaeological resources are characterized as follows:

- Magnitude: Moderate due to the moderate to high potential for encountering archaeological resources, taking into account the low significance of some known features expected to be disturbed and the archaeological mitigation and monitoring programs required.
- Geographic Extent: Within the LAA.
- Frequency: Occur once, as potential effects on archaeological resources are limited to ground disturbance during the construction phase.
- Duration: Be of short duration as potential effects on archaeological resources are limited to ground disturbance during the construction phase.
- Reversibility: Irreversible, should impacts to archaeological resources occur.
- Significance: Not Significant.

10.0 EFFECTS OF THE UNDERTAKING ON THE ENVIRONMENT

Table 10.1 summarizes the results of the effects assessment for each VC.

Table 10.1: Effects of the Undertaking on the Environment Summary

VC	Magnitude of Effects	Geographic Extent of Effects	Frequency of Effects	Duration of Effects	Reversibility of Effects	Significance Level
Atmosphere and Air Quality	Low – air quality is expected to remain less than or equal to the maximum permissible ground-level concentrations as defined by the NSAQR.	Within the Assessment Area	Continuous and intermittent	Medium-term	Irreversible	Not significant
Climate Change	Positive – Project is expected to have a positive effect on GHG emissions.	Within the global environment	Continuous	Long-term	Irreversible	Positive impacts (significance not defined)
Sound	Moderate – Project activities to be completed in accordance with relevant MODG by-laws and permitting.	Within 500 m of the Assessment Area	Continuous and intermittent (depending on source)	Medium-term	Reversible	Not significant
Geophysical Environment	Moderate – changes to local topography/geology are possible as geologic hazards exist within proximity to the Assessment Area but can be mitigated with routine measures; impacts to the quality/quantity of groundwater wells are possible if blasting is	Within 800 of the Assessment Area	Intermittent	Short-term	Partially reversible	Not significant

VC	Magnitude of Effects	Geographic Extent of Effects	Frequency of Effects	Duration of Effects	Reversibility of Effects	Significance Level
	required (wells are located within 800 m of the Project Footprint) or there is a release of contaminants.					
Waterbodies and Watercourses	Moderate – small loss of aquatic habitat and altered hydrology is expected but can be managed with routine measures	Within the secondary watershed	Single event, intermittent and continuous (depending on source)	Medium-term	Reversible	Not significant
Fish and Fish Habitat	Moderate – moderate loss of fish habitat or impacts to fish behaviour is expected, but these impacts will only be experienced by individuals rather than entire populations and can be managed with routine measures.	Within the secondary watersheds containing the Assessment Area	Single event, intermittent and continuous (depending on source)	Medium-term	Reversible	Not significant
Wetlands	Moderate – direct loss of wetland habitat and impact to wetland functions will occur, but wetland area loss will not impact the hydrology of the wetland's watershed	Within 5 km of the Assessment Area	Single event and continuous	Medium-term	Partially reversible	Not significant

VC	Magnitude of Effects	Geographic Extent of Effects	Frequency of Effects	Duration of Effects	Reversibility of Effects	Significance Level
	and/or the impacted wetland areas are not part of a WSS.					
Terrestrial Vegetation Communities and Flora	Low – a small loss of habitat supporting priority flora species is expected, but no loss of priority flora species individuals or priority vegetation communities.	Within 5 km of the Assessment Area	Single event	Long-term	Irreversible	Not significant
Terrestrial Fauna	Low – a small reduction in the amount or quality of priority fauna habitat may occur, but no impacts to priority fauna behaviours are expected.	Within 5 km of the Assessment Area	Single event and continuous (depending on source)	Long-term	Partially reversible	Not significant
Bats	Low – a small amount of habitat supporting bats may occur, but loss of individuals is not expected	Within 5 km of the Assessment Area	Continuous	Medium-term	Reversible	Not significant
Avifauna	Low – a small loss of important habitat supporting avifauna and/or impacts to birds are expected to be low.	Within 5 km of the Assessment Area	Continuous	Medium-term	Reversible	Not significant

VC	Magnitude of Effects	Geographic Extent of Effects	Frequency of Effects	Duration of Effects	Reversibility of Effects	Significance Level
Economy	Positive – Project is expected to have a positive effect on the economy.	Within MODG	Continuous	Long-term	Irreversible	Positive impacts
Land Use and Value	Negligible – no change in land value expected and surrounding land use can largely continue	Within MODG	Continuous	Medium-term	Reversible	Positive impacts
Recreation and Tourism	Low – small change to tourism expected and/or minor limitations to recreation use.	Within MODG	Continuous	Medium-term	Reversible	Not significant
Archaeological Resources	Moderate – due to the moderate to high potential for encountering archaeological resources, taking into account the low significance of some known features expected to be disturbed and the mitigation and monitoring programs required.	Within the Assessment Area	Single event	Short-term	Irreversible	Not significant

11.0 EFFECTS OF THE ENVIRONMENT ON THE UNDERTAKING

Incorporating climate change and sustainability considerations into the Project from the early design stage will enhance its adaptability and resilience to environmental change. The following sections examine how climate change may exacerbate natural environmental processes, including natural hazards and extreme weather events. Potential effects of the environment on Project Infrastructure and operations, as well as mitigation and design strategies to minimize the effects, are also described.

11.1 Increased Air Temperature

A key aspect of climate change is global warming, which refers to the long-term rise in the Earth's average surface temperature, measured over 30 years, in comparison to preindustrial levels (IPCC, 2018). Based on the range of emissions scenarios in the Coupled Model Intercomparison Project Phase 6 (most current scenario), annual average temperatures in the Assessment Area during the period 2031-2060 are expected to be 2.2°C to 2.9°C warmer than the 1971-2000 baseline (ClimateData.ca, 2025).

Temperature increases associated with global warming may impact all phases of the Project and on-site personnel. For example, longer and more intense heat waves may increase the demand for cooling (and subsequently increase halocarbon emissions) and increase electricity use in the summer months. Acute temperature spikes and longer and more intense heat waves may increase risks of forest fires (described below) (ECCC, 2019e) during both the construction and operation phase. Warmer temperatures may also enhance the spread of forest and agricultural pests and disease vectors (i.e., ticks) to the Project location.

Warmer temperatures also have the potential to impact Project personnel. Requirements for stopping work or taking regular breaks to cool down and rehydrate will be mandated throughout the Project's lifetime to protect Project personnel. If it is unsafe to work due to extreme heat, a stop-work authority may be issued.

11.2 Changes in Precipitation

Heavy rainfall events are a common, highly probable natural hazard in NS that may be exacerbated by climate change. Short-duration heavy rainfall is defined as 25 mm or more of rain within one hour, whereas long-duration heavy rainfall can range from 25 mm of rain or more within 24 hours during winter, or 50 mm of rain or more within 24 hours during summer (ECCC, 2024b). Climate change has the potential to increase the frequency and/or duration of heavy rainfall events, heightening the risk of overland flooding. Future climate scenarios suggest that total annual precipitation will increase over the Project's lifespan, from a 1971-2000 baseline of 1,463 mm to 1,624 mm during 2051-2080 under a high-emissions scenario (ClimateData.ca, 2025)

Heavy rain events may directly impact Project Infrastructure and operations through flooding or impacts to local water supplies. Overland flooding within the Assessment Area, particularly in low-lying areas, could damage Project Infrastructure, and disrupt access, transportation

networks, and supply chains. Local water supplies are also vulnerable to flooding. For example, heavy rain events may interact with existing contaminants within the Assessment Area by mobilizing pollutants, causing erosion, and potentially overwhelming on-site remedial infrastructure. Increased runoff may transport contaminants off-site, impacting surrounding areas and potentially contaminating water sources. The Project will develop various management plans to ensure proper due diligence measures are implemented to control runoff on-site. Water management plans will be designed to accommodate elevated volumes of water, and the site will be inspected following heavy rain fall events.

Changes in winter precipitation, including seasonal snow patterns, may also pose a risk to Project Infrastructure. For example, an increased snowfall accumulation over a short period may cause damage to Project Infrastructure (e.g., roof collapse). In contrast, areas that experience significant decreases in snow-water equivalent (i.e., the amount of water released from the snowpack when it melts) may also see a reduction in freshwater availability. This could impact vegetation growth, limit water supplies, and increase the risk of forest fires in the area surrounding the Project (ECCC, 2019d).

If it is unsafe to work during high precipitation events, a stop-work authority may be issued. Mitigation strategies to reduce the risk of changing precipitation regimes and heavy rainfall events on the Project area described below.

11.3 Sea Level Rise

On a global scale, sea levels are currently rising as a result of warming air and ocean temperatures (via thermal expansion of ocean water and increased inputs of melting of sea ice/glaciers). Sections of the Atlantic coastline have been highlighted as some of Canada's most severely threatened areas from sea level rise and resulting impacts. Rising sea levels are anticipated to amplify coastal flooding, coastal erosion, and storm surges across the Atlantic region (ECCC, 2023). Sea level in the Atlantic region has risen approximately 0.3 m in the last century and is anticipated to rise between 0.75 m and 1.00 m by 2100 (ECCC, 2023; Lemmen et al., 2016). According to the National Oceanic and Atmospheric Administration (NOAA, n.d.), the relative sea level rise across NS range from approximately 3.19 mm/year to 3.99 mm/year (based on data from 1895 to 2021).

Changes in sea level have the potential to impact Project Infrastructure, shipping routes, adjacent terrestrial land (i.e., shoreline erosion), and ecosystems (ECCC, 2019c). The portion of the Assessment Area most likely to be impacted by rising water levels is Red Head Peninsula, south of Highway 316 (Drawing 2.2A). These lands, which extend into Isaacs Harbour, may be exposed to waves and storm surges with potential for erosion and flooding.

Mitigations to reduce the risk of sea level rise on the Project are described below.

11.4 Severe Weather Events and Natural Hazards

Climate change is expected to increase the frequency and severity of extreme weather events, including tropical storms, cyclones, and summer droughts (Canadian Climate Institute, 2025)

Precipitation extremes may also result in frequent and intense rainfalls, such as downpours from thunderstorms, more instances of rain falling as snow, and new storm patterns (ECCC, 2019b).

Nova Scotia regularly experiences severe weather events and natural hazards, including flooding, tsunamis, blizzards, hurricanes, lightning, and wildfires. These events can lead to adverse outcomes such as power outages, health-related emergencies, infrastructure damage, and road damage, thereby posing direct risks to infrastructure (Government of Canada, 2024).

11.4.1 Drought

More frequent and intense droughts under climate change have potential to decrease water availability and quality. Water shortages may lead to increased water costs and reduced supplies of quality drinking water. Droughts also have potential to attract wildlife to the Project site, increasing potential for Project-wildlife interactions.

The availability of abundant freshwater is essential for the Project to operate at capacity (required for various processing stages as well as electrolysis). Freshwater withdrawal is not included in this EA but is noted here because of the potential for periods of drought to significantly impact Project operations. As described in Section 3, a hydrological assessment is currently underway to identify a suitable freshwater supply for the Project. Sea water desalination is being explored as an option to meet production requirements during future Project stages, which would reduce the Project's dependence on freshwater and increase its resilience to drought.

Periods of dry conditions may also impact Project operations if forest access is restricted due to increased wildfire risk. Forest access restrictions during prolonged dry periods have been enforced in Nova Scotia in recent years and have potential to disrupt the supply of biomass (including processing, delivery) to the Project. Operational strategies such as storing additional biomass inputs on-site may help to reduce the vulnerability of the Project to supply chain interruptions caused by drought.

Drier-than-normal conditions may also cause an increase in dust, resulting in fugitive dust emissions. Dust will be managed via mitigations (refer to Section 7.1.1) as necessary.

11.4.2 Tsunami

Climate change is expected to have a profound impact on coastal regions, intensifying the risks associated with natural disasters such as tsunamis. Tsunamis are massive, long-lasting water waves that can strike coastal regions, sometimes towering several tens of metres high (NSNR, 2021d).

The risk of tsunamis in NS remains relatively low due to its position on the continental plate margin; however, climate-related factors may still influence the region's vulnerability (NRCan, 2021).

Climate change, which impacts rising sea levels, affects the extent of coastal flooding in the event of a tsunami or storm surge. Higher sea levels mean that even moderate wave activity can have more significant consequences, affecting infrastructure and ecosystems along the shoreline (Oppenheimer et al., 2019).

Underwater landslides, another potential trigger for tsunamis, may become more frequent due to shifting geological stresses exacerbated by climate change. Warming ocean temperatures can lead to changes in sediment stability, increasing the likelihood of landslides that could displace large volumes of water and generate tsunami-like waves (NSNR, 2021d).

Coastal erosion is a growing issue in the Assessment Area (Davis MacIntyre & Associates, 2025). Erosion weakens natural barriers such as dunes and cliffs, reducing the coastline's ability to absorb wave energy and increasing the potential for damage (NSNR, 2021c).

The 1929 Grand Banks earthquake and resulting tidal wave serve as a historical precedent for the potential impact of such events. The tidal wave devastated the coastal communities of Isaacs Harbour and Goldboro, an adjacent coastal area northwest of the Assessment Area, demonstrating the region's susceptibility to extreme water movement (Davis MacIntyre & Associates, 2025). No recent catastrophic events have been recorded; however, the presence of ongoing coastal erosion suggests that the Assessment Area may be increasingly vulnerable to future climatic and geological changes (Davis MacIntyre & Associates, 2025; NSNR, 2021d).

Although the possibility of tsunami events is considered low, the Project design will incorporate appropriate mitigation measures to ensure safety and resilience in the unlikely event of such occurrences.

11.4.3 Wildfire

Wildfire poses a potential risk to the Project during the site preparation and construction, operation and maintenance, and decommissioning phases of the Project. A substantial portion of the Project Footprint is surrounded by forest cover (Drawings 2.2A-B) and there is potential for naturally occurring and/or human-caused forest fires to interact with and damage Project Infrastructure.

Fire is one of the most important sources of natural disturbance in NS, with moderate to high severity fires impacting an estimated 0.17% to 0.4% of forested land per year (Taylor et al., 2020). The susceptibility of a landscape to fire depends on a range of factors, including stand composition, disturbance history (e.g., presence of blowdown), human land use, and weather conditions. From 1950 to 2018, the Eastern and Atlantic Coastal ecoregions, which coincide with the Project Assessment Area, experienced a moderate number of fires and high area burned per year relative to other ecoregions in the province (Taylor et al., 2020). As a whole, the frequency and extent of fires has declined in NS since 1980 due to the increased effectiveness of fire detection and suppression techniques (Taylor et al., 2020). It is challenging to precisely predict changes in the province's fire regime; however, modelling suggests wildfire risk in the Acadian forest region (which includes the Assessment Area) will increase

moderately under climate change as a result of warmer and drier conditions (Whitman et al., 2015).

Safety protocols for the Project will be implemented to mitigate the potential risk of wildfire to infrastructure, operations, and site personnel. In addition to preparing and implementing a fire prevention and site evacuation plan, fire extinguishers will be located on site in case of fire and the Facility will be equipped with a fire water system. During the summer months, the local Fire Weather Index (FWI; general measure of fire danger) will be reviewed regularly for nearby weather stations to determine the potential for highly dangerous wildfires. Precautions will be taken when undergoing construction or maintenance activities such as mechanical brushing/land clearing, using spark-producing tools, or piling of woody debris that may result in fires on days when FWI scores are moderate or higher. Should the risk of fires increase throughout the lifetime of the Project, mitigation strategies to protect Project Infrastructure and relevant VCs will be adapted accordingly.

11.4.4 Hurricanes

Tropical cyclones and hurricanes have the potential to impact the Project through damage to infrastructure (e.g., flooding, wind damage), disruptions to utilities (e.g., prolonged power outages), and safety risks to Project personnel. A growing body of research indicates that Atlantic tropical cyclones and hurricanes are becoming more intense (Gilford et al., 2024; Kossin et al., 2020), primarily owing to rising air and sea surface temperatures. For instance, attribution studies have shown that between 2019 and 2023, approximately 30 Atlantic hurricanes achieved wind speeds about one Saffir–Simpson category (measure of hurricane intensity) higher than they would have in a pre-industrial climate (Gilford et al., 2024).

Nova Scotia is particularly exposed to intense coastal storms. While many tropical cyclones weaken before reaching the province’s shores, several notable storms have made landfall as hurricanes, including Hurricane Juan (2003) and Hurricane Dorian (2019), as well as Fiona (2022). Rising sea levels (described in Section 12.3) will further amplify storm surge and flood risk, further compounding hurricane impacts.

If work conditions become unsafe due to hurricane conditions (e.g., downed debris, access constraints, prolonged utility disruptions), a stop work order may be issued. The Facility is located sufficiently in-land that it is unlikely to be impacted by hurricane-related storm surge; however, the land containing the access haul road to the marine berth and offloading facility is highly exposed to the coast and may experience impacts. Ensuring coastal infrastructure is designed to withstand the likely impacts of hurricanes and other storm systems will help to increase the resilience of the Project.

11.5 Mitigative & Protective Measures

Understanding climate projections leads to better planning and adaptation measures during each phase of the Project's development. Therefore, the projected increases in temperature, precipitation, snow, sea ice, and potential weather extremes were considered during the Project design to ensure infrastructure would be able to manage these predictions, including:

- Stormwater management systems will be designed to manage predicted volumes for the next 50 years by considering the most conservative scenario precipitation projections.
- Infrastructure will be developed to withstand more intense storms and weather events.
- Purchase of more robust and weather-resistant materials or equipment to minimize wear and tear from climate-related events (i.e., rain, snow, heat, ice) will be considered and implemented where feasible.
- The fire response plan will include practices to be followed in the event of a wildfire.
- Operation of power tools in vegetated areas within the Assessment Area will only occur when and as permitted under the Forest Fire Protection Regulations (N.S. Reg. 135/2019).
- Any activities requiring burning during the Project lifetime will be timed according to local burning restrictions.

In addition to Project design considerations, health and wellness mitigations to protect site personnel will also be implemented, including:

- Additional break rooms or water stations will be installed to ensure personnel remain cool and hydrated during all Project phases.
- Ensuring water needs are considered to account for drought-like circumstances and that mitigation plans are available for limited water usage scenarios.
- Developing and implementing response plans and evacuation or muster programs for extreme weather events (i.e., wildfire, flooding, lightning risk, hurricanes).
- Educating personnel on potential pests and disease vectors that the Project may be exposed to through on-site training programs.

11.6 Potential Residual Effects

Environmental effects associated with climate change and natural hazards have potential to impact the Project. Project location siting and design measures will minimize many of the risks associated with these environmental hazards, and the mitigation measures described above will allow for both proactive and adaptive management of any remaining risks, thus limiting the likelihood of impacts on all phases of the Project. Therefore, the residual effects associated with climate change are considered not significant.

12.0 ACCIDENTS, MALFUNCTIONS, AND UNPLANNED EVENTS

Accidents, malfunctions, and unplanned events are events that are not planned or anticipated to be part of any Project phase but could cause a significant adverse environmental effect in the event of occurrence, if not properly mitigated or managed.

This section addresses the accidents, malfunctions, and unplanned events associated with the Project's construction, commissioning, operation, and decommissioning phases that could potentially result in environmental impacts. The circumstances under which the events could occur are described, and proposed risk mitigations are provided in subsequent sections.

The risks associated with accidents and malfunctions are determined by both their likelihood and potential consequences. To address these risks, mitigation strategies will be designed and applied throughout the Facility's life cycle. These strategies involve:

- Decreasing the probability of such events (e.g., strengthening infrastructure, implementing robust operating procedures).
- Reducing consequences should an event occur (e.g., providing controls, containment and infrastructure or best management practices to limit impacts).
- Establishing system redundancies (e.g., backup systems, monitoring protocols).

Implementing preventative measures such as safe work procedures, best management practices, and ongoing assessment of the Project's Environmental, Occupational, Health an& Safety Programs will aim to limit the probability of occurrence, and having appropriate response procedures in place will reduce the magnitude of residual effects, prevent/minimize the event, and assist in mitigating and managing an event should it occur.

Accidents, malfunctions, and unplanned events considered as part of this EA include, but are not limited to, the following:

- Accidental Emissions Release
- Erosion and Sediment Control Failure
- Fire and Explosions
- Hazardous and Non-Hazardous spills & releases
- System/Unit Failure
- Transportation Related Incidents
- Untreated Effluent Release

Note that the BMPs and mitigation measures presented herein are based on the Project's current Pre-FEED status. As the Project advances through the FEED phase and into detailed engineering, these measures may evolve and be refined further to reflect updated technical specifications, regulatory requirements, and site-specific considerations. Continued development and optimization of the design will ensure that all mitigation strategies remain effective, practical, and aligned with the Project's overall environmental and operational objectives.

12.1 General Considerations

NSF will implement mitigation measures aimed at preventing accidents and malfunctions, as well as reducing their effects in the event of occurrence.

Emergency Response

A site-specific Emergency Response Plan will be developed to address accidents, spills, and malfunctions. Detailed management procedures associated with responding to these incidents will be provided in the Emergency Response Plan. In addition, an on-site Emergency Response Team will be established and provided with training and equipment to respond in the event of an emergency and regular drills will be conducted to test preparedness.

Inspection, Maintenance, and Monitoring Program

A regular inspection, maintenance, and monitoring program will be established for all units, systems, equipment, and hazardous material storage areas within the Facility, in line with industry best practices. A monitoring program will be developed to ensure a systematic approach to assessing the various components of the Facility and ensuring safe operations and ongoing risk management. An annual auditing program will be established to review inspection, maintenance, and monitoring practices, ensuring compliance with requirements.

Employee Training Programs

Training programs will be implemented to inform all employees and on-site contractors about the risks associated with the Facility and the relevant mitigation strategies and controls. Targeted training covering safe handling practices, spill prevention, and response procedures will be developed as necessary. Training frequency will depend on the job type but will be provided at least once per year. All training will be documented, and audits will be conducted to ensure compliance. Contractors will be required to show compliance with all internal training requirements before accessing the Project site.

Adaptive Management

All incidents and accidents will be thoroughly investigated and documented. Insights gained from these investigations will be used to update and improve work procedures and emergency response methods. All incidents and accidents will be reported to the relevant authorities, as required.

The safety of on-site personnel is a vital Project component; however, it is not specifically considered in this EA, as workplace occupational health and safety is regulated by the policies, procedures, plans, and codes of practice set in the Nova Scotia *Occupational Health and Safety Act*, S.N.S. 1996, c. 7.

12.2 Accidental Emissions Release

The potential release of air pollutants into the atmosphere during an accident or malfunction at the Facility poses an environmental concern due to its potential impact on surrounding air quality.

Based on the operational process to produce the SAF, potential emissions to the atmosphere include hot, wet air, and oxygen (O_2). Other potential emissions will be directed to the flare, including methane (CH_4), carbon monoxide (CO), carbon dioxide (CO_2), carbonyl sulphide (COS), ammonia (NH_3), and hydrogen (H_2). During SAF production, it is common for high pressures to develop within the various processes (e.g., gasification). Should a process upset, overpressure or equipment failure occur, excess gases must be vented quickly to prevent explosions. Flares burn off these gases in a controlled way, reducing harmful emissions and environmental impacts.

Accidental release of gases during the production process could include nitrogen (N_2), hydrogen (H_2), argon (Ar), hydrogen sulphide (H_2S), and hydrocarbons (typically light

hydrogens such as methane, ethane, and ethylene, oxygenated volatile organic compounds (VOCs) such as methanol, acetic acid, formaldehyde, and acetone, and aromatic compounds such as limonene, toluene, and phenols, with the exact profile dependent on the fibre feedstock and drying conditions). The potential release of these gases may result in localized air quality degradation, occupational health hazards, and potential safety risks. H_2 poses a significant fire and explosion hazard due to its wide flammability range (see Section 12.6 for additional details). Inert gases, such as N_2 and Ar, can cause oxygen displacement, leading to asphyxiation in confined or poorly ventilated areas. H_2S is highly toxic, even at low concentrations, and could cause health risks after exposure (CCOHS, 2025).

Emissions such as NO_x, SO_x, CO, and PM transported by wind and air currents can contribute to photochemical smog formation, acid rain, and nitrate particulates in the atmosphere (Majewski, 2024). Fine particulates ($PM_{2.5}$) and VOCs can cause health impacts, including respiratory illnesses such as asthma and bronchitis (US EPA, 2024b).

Hydrocarbons could be released during the drying of biomass (through a combination of physical evaporation and thermal decomposition of the organic matter), which, when exposed to sparks, could result in a localized fire or potential explosion in the event of an exposure (see Section 12.4 for additional details).

The accidental release of emissions could occur in the event of a malfunction of the gasification unit, CO_2 capture, compression/liquefaction, storage units, methanol synthesis unit, and flare system associated with the SAF production process. Low amounts of hydrogen cyanide, NH_3, and sulphide could be produced due to leakage from the syngas filter, posing a potential risk of asphyxiation and affecting the safety of personnel working near the gasification unit.

A flare system failure could result in the potential release of gases from incomplete combustion (hydrocarbons, including methane), fires or explosions from unmanaged gas release, damage to equipment due to thermal stress from unmanaged high-temperature gases, or mechanical failure due to pressure build-up (Denham & Donnelly, 2015). If the flare fails to ignite or sustain combustion, unburned processed gases, including VOCs, hydrogen, CO, and CH_4, may be vented directly into the atmosphere. Other pollutants, such as CO_2, and COS, may degrade local air quality and contribute to climate change, and as flammable substances, increase the risk of fire or explosion when mixed with ambient air. Factors contributing to these emissions may include incomplete combustion, the presence of contaminated feedstock, and the combustion of by-products (Denham & Donnelly, 2015).

12.2.1 Mitigation

Mitigation measures to limit the probability of an incident and reduce the magnitude and extent of potential effects include:

- Implement rigorous process and mechanical design of flare system to ensure that all equipment/material is suitably selected for the lowest possible temperatures in abnormal operations or upset conditions.

- Install actuated isolation valves (where feasible) near the PLEM to limit any discharge volume to the environment due to a leak.
- Design gasification, CO_2 capture, and methanol synthesis units as closed-loop systems (where feasible) to reduce fugitive emissions.
    - Capture and recycle unreacted gases.
    - Avoid accidental direct venting, where possible.
- Establish a rigorous monthly maintenance schedule for inspections of the flare tip, pilot burners, pressure relief valves, and ignition systems.
- Regularly test the ignition system (monthly or quarterly) and calibrate (semi-annually to annually) all control systems and sensors that monitor gas flow and flame presence.
- Conduct routine monthly inspections to ensure the mechanical integrity of all critical equipment, piping, and secondary containment systems.
- Ensure screening and pre-treatment of feedstock to limit contaminants that can contribute to suboptimal gasification or increased pollutant formation.
- Ensure that containment structures (e.g., enclosed processing areas) are well-maintained to prevent emissions from escaping.
- Install gas detectors around the equipment to detect any hazardous or explosive gas leaks.
- Train Project personnel on system operation, failure response, and troubleshooting.
- Develop and implement a Project-specific Emergency Response Plan.
- Train Project personnel on Emergency Response Plan and conduct periodic emergency drills.
- Ensure Project personnel working near emission sources are trained and provided with appropriate PPE (e.g., respirators, gloves, eye/skin protection) to ensure safety during servicing or repair scenarios.
- Coordinate with local and regional emergency management agencies to ensure a rapid and coordinated response in the event of an accidental emission release.
- Locate the flare system upwind relative to the process units to prevent flammable vapour from being carried towards the flare by prevailing winds.
- Conduct audits of all safety inspection procedures annually or following an incident at the Project site.

An accidental emission release could result in changes to local air quality; however, the application of the above mitigations, as well as the implementation of risk mitigation measures and best management practices, will reduce the likelihood of an accident or malfunction occurring and limit potential environmental impacts.

12.3 Erosion and Sediment Control Failures

Erosion and sedimentation control (ESC) failures may result in potential adverse effects, primarily during the construction phase.

ESCs are implemented to minimize and mitigate the transportation and deposition of sediment from disturbed soils (i.e., excavation) and stockpiled materials to the surrounding environment during all Project phases. As this is a contaminated site, ESC failures may mobilize contaminants and impact sensitive environmental receptors.

ECSs may fail due to extreme weather conditions (e.g., flooding), improper installation, and improper maintenance. Failure of these control measures may result in the release of sediment into the environment, negatively impacting water quality and both aquatic and terrestrial habitats.

12.3.1 Mitigation

The following mitigation strategies will be implemented to minimize the impacts of erosion and sediment control failures.

- Develop and implement an Erosion and Sediment Control Plan for all Project phases (prior to disturbance).
- Ensure erosion and sediment controls are installed per manufacturer's specifications.
- Follow industry standards and best management practices regarding excavation and soil storage procedures.
- Heed Environment Canada's special weather warnings to ensure proper care is given to stabilize erosion and sediment controls in advance of, and following, extreme weather events (i.e., precipitation).
- Conduct regular (daily to monthly, depending on the on-site activities) monitoring of all the erosion and sediment controls and repair or replace them as necessary.
- Ensure that erosion and sediment controls are functioning effectively and that additional support or controls are available to support with repair or reinforcement efforts as needed.

An erosion and sediment control failure may have a potentially significant impact on the surrounding environment due to its effects on water quality. However, implementing the above mitigations, along with best management practices and procedures, will reduce the likelihood of an accident or malfunction occurring.

12.4 Fires and Explosions

An accidental fire may occur as a result of Project activities, which could lead to larger events (such as explosions) and potentially adverse effects on the atmospheric environment (emissions), the natural environment, Project Infrastructure, and neighbouring communities.

Fires at the Facility may occur as a result of, but not limited to, the following:

- Equipment accidents
- Flare system failure
- Hot works
- Human error/carelessness
- Improper waste disposal
- Malfunction of chemical/product and feedstock storage tanks
- Natural causes (e.g., lightning strike)
- Unit/system failure
- Volatile gases, fuel, and chemical release

The storage of biomass (i.e., wet wood chips) in large quantities could pose significant fire safety, environmental, and operational risks, including:

- Spontaneous combustion of biomass dust due to internal heat build-up from microbial activity (Alakoski et al., 2016).
- Dust explosions from the accumulation of fine biomass dust (Alakoski et al., 2016).
- Structural instability and collapse, posing physical hazards to personnel and equipment.
- Restricted airflow, resulting in anaerobic conditions and odour or CH_4 formation (Alakoski et al., 2016; Koppejan et al., 2013).

Of these potential sources, fires originating from or in proximity to H_2 and fuel sources are inherently dangerous, as fuel may sustain a fire for longer periods and lead to explosions and/or extensive damage. In addition, fires may release hazardous materials, which could impact air quality and cause adverse effects on the surrounding environment (i.e., terrestrial or aquatic habitat).

In the unlikely event of a fire, the immediate concern will be human health and the surrounding environment. Fires, if uncontrolled, could spread rapidly and intensify due to the availability of fuel and highly flammable gases, posing risks to both personnel, receptors, and the environment. An accidental fire could potentially impact human health, the atmospheric environment (including emissions), vegetation, and wildlife throughout all Project phases.

12.4.1 Electrical Fires

Electrical fires pose a significant risk in the Facility due to the presence of electrical equipment such as motors, drives, battery systems, generators, lighting fixtures, portable power tools, reactors, distillation towers, compressor recycle loops, fired heaters, etc., which contain key fire elements such as fuel and ignition sources. Electrical fires are one of the most common causes of workplace fires (Boskovic et al., 2020). Potential electrical fire hazards associated with all the Project phases include the presence of high-voltage equipment, control panels, and interconnected systems that are critical for the safety and continuity of SAF production (CSTC, n.d.). Electrical fires could potentially result in explosions due to the presence of fuel and volatile materials in the Facility.

In addition to fire risks, electrocution can occur when workers come into contact with energized electrical components. The presence of high-voltage systems and wet or conductive environments within the Facility can significantly increase the risk of severe injury or fatality from electric shock.

Some electrical fire hazards include:

- Overloaded circuits due to the exceedance of the electrical capacity of a circuit.
- Overcharging and short circuits.
- Faulty wiring or equipment.

- Malfunctioning electrical equipment.
- Poor maintenance of electrical systems.
- Fuel leaks onto electrical components.
- Static electricity generated by friction between materials, conveyor belts, and liquid or powder transfer.

12.4.2 Hydrogen and Oxygen Release (Fire or Explosion Hazard)

Hydrogen is classified as a hazardous material for storage and a dangerous good for transportation (Kauling et al., 2023). Minor leaks can pose a fire or explosion hazard if an ignition source is present, due to low ignition energy of less than 0.02 millijoules and a wide range of flammable limits (approximately 4% to 75% by volume in air) (Kumar & Sleiti, 2025). Hydrogen and oxygen will be generated from the electrolyzers and stored on-site at the Facility as components of the PEM electrolysis process. Approximately 40 t of hydrogen will be compressed and stored in pressure vessels to moderate the flow to the methanol synthesis process. Currently, oxygen will be dried, compressed, and redirected in pressure vessels to feed the gasifier during times of low or no renewable energy.

In the electrolyzer, hydrogen is produced at the cathode and oxygen at the anode. Over time, mechanical, chemical, or thermal degradation of the membrane can lead to gas cross-permeation. Under high-pressure operation, this can result in elevated hydrogen concentrations in the oxygen stream (or vice versa), potentially exceeding lower explosivity limits and forming explosive mixtures within the electrolyzer stack or downstream piping (Mohsen et al., 2025).

There is a risk of hydrogen explosions associated with this process due to the potential for hydrogen and oxygen (an oxidizer) to mix and ignite. Hydrogen and oxygen release scenarios considered to be the most probable emergency event scenarios for potential loss of containment include the following:

- Membrane degradation (mechanical, chemical, thermal).
- Presence of ignition sources (static energy or sparks).
- System failure/hydrogen crossover.
- Overflow of the water separator, resulting in operational failures of valves due to water impurity.
- Explosion event due to a connection leak within compressor enclosures (on the high-pressure discharge line).
- Exceedance in safe limits of flammable gases (Al-Douri et al., 2025).

Hydrogen flames travel at a high velocity of approximately 3.5 m/s, which is significantly faster than that of other common fuels. The rapid flame spread further increases the risk of explosions, particularly in confined spaces where the accumulation of hydrogen gas can result in high-pressure explosions (Kumar & Sleiti, 2025). Projectiles are typically part of explosion events and may significantly impact infrastructure and/or the integrity of process buildings, potentially compromising the safety of Project personnel.

12.4.3 Methane Release

The auxiliary boiler will be fueled by natural gas, the main component of which is methane (CH_4). CH_4 is a fire hazard and a highly flammable, clean-burning fuel contributing to the project's low-carbon objectives. However, improper handling, storage, or system failures can lead to the release of CH_4, potentially resulting in safety and operational incidents. The release of CH_4 could occur under the following circumstances.

- Storage system failures such as corrosion, structural failures, or pressure imbalances.
- Improper handling during transfer, such as overfilling, valve mismanagement, or poor connection integrity.
- Lack of preventive inspection and maintenance could lead to unintended leakage from pipelines, and valves.
- Transportation Incidents (refer to Section 12.7 for additional information on this scenario).

The consequences of a CH_4 release depend on the quantity released, the location of the release, environmental conditions, and the effectiveness of response measures. Methane is lighter than air, disperses quickly, and can form a flammable gas cloud in open spaces, posing significant explosion and health risks.

12.4.4 Mitigation

Mitigation measures to limit the probability of an occurrence and reduce the magnitude and extent of potential effects include:

- A fire prevention and evacuation plan will be developed, in addition to general safety protocols and training, as part of the Emergency Response Plan.
- Prohibit all burning within the Facility by staff and contractors, unless it is managed under a designated work permit and/or an equipment isolation system.
- Allow smoking in designated areas only.
- Construct hazardous or fire-prone areas with blast-resistant materials (e.g., reinforced concrete, fire-rated walls, explosion venting panels) and physical barriers to minimize the impact of potential explosions and protect adjacent facilities, equipment, and personnel.
- Dispose of all flammable waste regularly at an approved facility (e.g., flammable chemicals, waste fuels, etc.).
- Implement mitigation related to chemical and fuel storage (see Section 12.5 for additional details).
- Install fire and gas detection systems (FGDS), which will either detect or mitigate the consequences from a wood chip fire and the unintentional release of toxic/combustible gases and fires (smoke, thermal, or flame).
- Install firewater suppression systems.
- Consult with local fire departments to ensure shared knowledge of access routes suitable for emergency vehicle access during all Project phases, as well as hazardous material storage areas and Facility layouts.

- Develop an Emergency Response Plan that includes a fire safety plan, which will be shared with local fire departments for input and awareness.
- Conduct regular inspections, capacity assessments, and maintenance to ensure water availability and compliance with fire safety regulations.
- Ensure an inventory of ancillary firefighting equipment is well-maintained and readily accessible to manage on-site fires effectively.
- Train all personnel in emergency response, fire prevention, and evacuation plans, as well as the use of firefighting equipment, and conduct regular (semi-annually to annually) emergency drills.

In addition, the following measures will be applied to protect against the risk of potential electrical fires:

- Install Arc flash protection and thermal overload devices.
- Ensure that the selection of pumps, motors, instrumentation, and other electrical components complies with the applicable electrical hazard zone, which will minimize the probability of ignition.
- Install electrical equipment and wiring using licensed technicians whose work complies with the Canadian Standards Association (CSA), Canadian Electrical Code, and applicable Electrical Codes and Standards.
- Provide appropriate PPE where the risk of arc-flash or arc-blast is present.
- Conduct regular inspections (monthly to annual) of wiring connectors and switch gear for signs of wear, corrosion, or damage.
- Schedule preventative maintenance of electrical systems to identify potential failure occurrences.
- Design electrical systems with adequate load capacity to prevent overloading.
- Install (where feasible) emergency shutdown systems to isolate electrical power during critical electrical fire incidents, thereby reducing the risk of fire spread and ensuring personnel safety.
- Implement Safe Systems of Work programs, such as “lock out, tag out”, prior to performing hot work and any work done on energized systems.
- Implement a waste management system that ensures the timely removal of combustible materials, safe storage of flammable waste in fire-rated containers, and designated disposal areas to reduce ignition sources and prevent fire hazards.

For mitigating the potential risks associated with biomass storage:

- Adhere to established guidelines and industry protocols for maximum pile height and slope angle.
- Install sensors to detect heat build-up.
- Keep moisture content at safe levels to prevent microbial activity and self-heating.
- Ensure good airflow to prevent heat and gas accumulation.
- Check for hotspots or signs of spontaneous combustion.
- Install sprinklers, fire extinguishers, and firebreaks.
- Minimize dust accumulation to reduce explosion risk.

- Use the “first-in, first-out” method to reduce long-term storage.
- Use water sprays or air filters to reduce airborne particles.
- Install CO and methane detectors in enclosed areas.
- Educate workers about safe handling and emergency procedures.
- Design storage sites with runoff control systems in place to prevent erosion and contamination.

For mitigating the potential risks of a hydrogen and oxygen release:

- Ensure the use of certified high-pressure vessels and leak-tight piping systems.
- Install explosion-proof equipment and intrinsically safe electrical systems in areas where hydrogen is handled.
- Install continuous pressure and temperature monitoring of storage systems.
- Install FGDS to detect the unintentional release of hydrogen and oxygen gases.
- Install oxygen-compatible materials and equipment designed to prevent ignition sources.
- Install automated pressure relief devices and emergency shutdown systems to ensure safety.
- Develop permit-to-work systems for the maintenance of hydrogen or oxygen systems.
- Implement mitigation related to fires and explosions (see Section 12.4 for additional details).
- Conduct routine (monthly to annual) inspection and testing of pressure vessels, valves, and instrumentation.
- Develop a comprehensive Emergency Response Plan, including scenarios for gas releases.
- Provide personnel training on hydrogen and oxygen hazards, and the use of PPE and emergency procedures.
- Ensure that all equipment is explosion-proof or intrinsically safe for use in hazardous areas, and wiring consists of HL TECK.
- Implement a comprehensive risk management and process safety management system for hydrogen storage activities. In addition to all applicable hazardous materials regulations, the management systems must be in accordance with CAN/BNQ 1784-000, ISO 31000, ISO/IEC 31010, and CSA Z767 for process safety requirements.
- Ensure specific risk assessment protocols are implemented to effectively manage the flammability hazards associated with hydrogen over a wide range of concentrations.

The electrolyzer system will employ maintenance strategies, integrity evaluations, and safe operating procedures to minimize and maintain a very low probability of loss of containment of hydrogen. In addition, workers must follow the Project's Emergency Response Plan to ensure their own safety and that of their colleagues in the event of an emergency.

Various BMPs and mitigations have been developed to minimize the chances of fires occurring in industrial facilities and associated infrastructure. These protocols also reduce the direct impacts of electrical fires on human health and biodiversity loss. A fire event with the potential

to cause an explosion could have a significantly detrimental effect on the Project's personnel, infrastructure, and the surrounding environment. However, implementing the site's Emergency Response Plan, ensuring timely response, and utilizing on-hand suppression materials would limit potential environmental impacts. Additionally, the implementation of the above mitigations and staff training initiatives will reduce the likelihood of a significant fire event occurring.

12.5 Hazardous and Non-Hazardous Spills & Releases

Spills resulting from fuel (i.e., storage, refuelling, operation of the Facility), lubricants, and other on-site catalysts/chemicals may occur during Project construction and operations activities. Hazardous spills can adversely impact air, soil, surface water, groundwater, human health, and safety. The severity of the impacts will depend on the nature of the hazardous material and the quantity spilled. Significant quantities of chemicals to be stored on-site for Facility operations include:

- Methanol synthesis converter catalysts
- Methanol to Jet reactor catalysts
- Water gas shift reactor catalysts
- Caustic mixing and distribution systems - used in the methanol synthesis and MTJ process
- Propylene and Ethylene refrigerant storage - used in the MTJ process
- Physical solvent storage – used in the Acid Gas Removal process
- Cooling water system chemicals (corrosion inhibitors, scale inhibitors, biocides)
- Lubrication fluids, oils, grease, and hydraulic fluids
- Ammonia
- Methanol
- SPK

12.5.1 General Spills and Release

During the Facility's operational phase, potential spills may occur due to the storage and handling of on-site catalysts/chemicals, operation, refuelling, or servicing of systems and process units. Chemicals stored on site for maintenance of mobile mechanical equipment and unit maintenance (i.e., lubricants, hydraulic oil, grease, glycol, paints, coatings, adhesives, and sealants) should also be taken into consideration. Some potential causes of spills and releases of hazardous and non-hazardous materials include:

- Damaged or punctured product containers.
- Equipment failures due to improper operation, malfunction, or wear and tear.
- Leaks or ruptures in secondary storage containment.
- Operational errors resulting in accidental overfilling, incorrect handling of materials, or failure to follow standard operating procedures.
- Vehicular accidents on-site, resulting in leaks from heavy equipment or storage tanks.

12.5.2 Chemical/Product Release

In the gasification process at the Facility, solids that are not converted into syngas exit the reactor as ash and tars, which are collected and stored in a dedicated silo. The remaining byproducts (primarily bottom ash and gasifier ash) are stored in separate storage silos. Natural gas, instrument air/plant air, and nitrogen are also required for Facility operations, including green hydrogen, syngas, methanol, and SPK production. Table 12.1 provides an overview of the storage inventory and release considerations for chemicals, products, and process materials. Note that the quantities provided in Table 12.1 are based on the Pre-FEED and are subject to change throughout the FEED and detailed engineering design.

Table 12.1: Chemical/Product Storage Inventory and Release Considerations

Product Description	Number of Tanks	Quantity Stored	Comments	Release Considerations
Natural Gas	1	3,000 normal cubic metres per hour (Nm^3/h)(1)	-	Potential release through flange/gasket failures, valve leaks, or pipeline ruptures; uncontained release can form explosive atmospheres.
Nitrogen	TBD	16,878 Nm^3/h(1)	-	Possible release via valve malfunction, pipeline rupture, or venting during maintenance can displace oxygen, causing suffocation risks.
Gasifier bed material	2	- (2)	Make-up bed material	Dust release during transfer, loading/unloading, or from silo breaches; wind dispersion if containment is compromised.
Bottom ash	2	- (2)	Filter ash storage silo	Escape through damaged silo walls, overfilling during transfer, or failure of discharge seals; dust can become airborne.
Gasifier ash	2	- (2)	Gasifier ash storage silo	Leakage through unsealed discharge points, conveyor system failures, or breaches in the storage vessel.
Methanol	2	25,000 m^3/tank	Internal floating roof tanks with Nitrogen blanketing.	Release via tank roof seal failure, pump seal leakage, flange leaks, or overfill; vapour can escape through faulty vents.

Product Description	Number of Tanks	Quantity Stored	Comments	Release Considerations
Off-Spec Methanol	1	5,000 m^3	Internal floating roof tank with Nitrogen blanketing	Leakage from roof seal, transfer line leaks, or pump seal failure; vapour released through venting or equipment malfunction.
SPK	4	5,000 m^3/tank (Rundown & Certification – 2 tanks) 21,000 m^3/tank (Export – 2 tanks)	Internal floating roof tanks.	Potential release from roof seal degradation, valve leaks, or loading arm failures; vapour from venting or overflow.
Off-Spec SPK	1	2,000 m^3	Internal floating roof tank	Leakage pathways include seal failure, drain valve leaks, or pipeline ruptures during transfer.
Naphtha	1	1,000 m^3	Internal floating roof tank	Possible release via roof seal failure, pipeline leaks, or valve malfunction; high vapour pressure increases emission risk.
Diesel	1	40 m^3	Fixed roof tank	Leakage from tank wall corrosion, flange leaks, or overfill; spills during transfer operations.
Stored biogenic CO_2	4	5,000 t total	Bullets	Release via valve malfunction, pipeline rupture, or pressure relief activation; rapid discharge could cause a localized asphyxiation hazard.
Hydrogen	24	24 x 1 t tanks	Associated with PEM electrolyser	Leak from piping, fittings, and valves. Rapid rupture from tanks and high-pressure piping failure.
Oxygen	TBD	10 – 20 t	Associated with ASU	Leaky connections (i.e., flanged joints, threaded fittings, and compression fittings).

Product Description	Number of Tanks	Quantity Stored	Comments	Release Considerations
Dimethyl Disulphide (DMDS)	TBD	TBD	Only used during start up, once every 5-6 years during maintenance, to replace the catalyst	Potential spillage could cause severe burns, fire, and impact the safety of personnel working in the vicinity.

(1) Flow rate and not storage.

(2) Storage silos provided by the gasifier supplier. Gasifier supplier to provide capacity when selected.

m^3: Cubic metres

Nm^3/h: Normal cubic metres per hour

t: Tonne (Metric Tonnes)

TBD: to be determined

Product (SPK/Methanol) transfer from the Facility to the offshore liquid berth will be facilitated via an export pipeline. The pipeline will run both onshore and offshore (subsea), starting from the SPK and methanol metering stations located in the REP and ending at a subsea PLEM. The metering stations will measure and regulate the flow of the export products, which will be pumped from 3 x 50% SPK and Methanol export pumps located adjacent to the storage tanks (refer to Section 12.7 for additional information on transportation-related scenarios).

Both naphtha and diesel are intended to be stored for a maximum duration of seven days prior to truck export. Cross-contamination of naphtha with another chemical, such as accidental loading of a Naphtha truck with diesel, could potentially result in static explosions due to switch loading.

Potential leaks or spillages during the unloading of high-concentration raw caustic (sodium hydroxide) could result in personnel exposure, leading to severe chemical burns and related health risks. Fine catalyst could be released through the stacks in the CO boiler, potentially causing respiratory issues due to inhalation, the potential for auto-ignition, and the potential to impact personnel working in the vicinity.

Releases of these products during production and storage may occur due to operational or technical failures, including equipment or system malfunctions, potentially resulting in fire and/or explosion. Potential release events could take place during loading, unloading, or transportation activities (refer to Section 12.7 for further details on transportation-related scenarios). Leakage of products and chemicals can result in significant production loss and contaminate soil, surface water, and groundwater, potentially harming the environment. An Emergency Response Plan will be developed to provide detailed procedures for responding to the release of products. The potential causes that could lead to product release include:

- Insufficient secondary containment
- Process control failures
- Equipment malfunction
- Maintenance and operational activities
- Operator error

12.5.3 Mitigation

General mitigation measures to limit the probability of an occurrence and reduce the magnitude and extent of potential effects include:

Administrative Controls

- Develop spill prevention and response procedures as part of the Project's ERP.
- Comply with all relevant regulations related to storage, transportation, handling, and use of hazardous materials (Section 2.3).
- Store all dangerous goods in compliance with the Workplace Hazardous Material Information System (WHMIS).
- Locate fuel storage areas, refuelling, and/or mobile equipment maintenance activities a minimum of 30 m from watercourses, wetlands, and groundwater features (i.e., wells).
- Establish an inspection and maintenance procedure for all equipment to ensure mechanical integrity and early identification of wear or potential failure points.
- Equip mobile equipment with spill kits stocked with appropriate spill containment materials for the activities taking place, such as soaker pads, oil-absorbing materials, and containment booms.
- Locate stationary spill kits or spill drums at work areas utilizing mobile equipment, hazardous fluids and/or in proximity to environmentally sensitive areas (i.e., wetlands).
- Stock spill kits with the appropriate quantity and type of material for the anticipated product type(s) and volume(s) in use; include neutralizing agents as applicable.
- Adhere to applicable federal and provincial regulations.
- Ensure hazardous materials storage/piping areas are developed away from heat and ignition sources.
- Ensure that storage tanks are located outside the explosion zone (safety distances to be determine during FEED and detailed engineering design).
- Ensure that equipment and materials are approved for use in the Class and Zone in which it is installed.
- Establish radio communication between the supply vessel and the onshore crew.
- Design and implement high-integrity storage and piping systems.
- Schedule regular inspections for all mobile and processing equipment to assess for potential leaks, wear, or damage, particularly associated with hosing, joints, seals, and valves. Identify and repair leaks promptly.
- Complete equipment servicing off-site, where possible. If this is not possible, require that the work be completed in a designated area, greater than 30 m from a watercourse or wetland.
- Provide Safety Data Sheets for all chemicals and train personnel to ensure proper handling, storage, and response in the event of spills or exposure.

Engineering Controls

- Engineer and construct designated chemical and product storage areas with reinforced structural integrity and secondary containment (e.g., bunds, spill berms, double-walled tanks) to prevent migration of spilled material.
- Maintain containment capacity of 110% for stored materials.
- Monitor silo and tank levels with automated alarms to prevent overfilling.
- Equip and automate shut-off valves on the connection point of pipeline feeds. For example, include a signal indicating pressure loss or leak detection on liquid hydrogen feeds, which would result in shut-off valve closure and help minimizing the gas cloud volume in the event of a leak.
- Ensure all equipment is explosion-proof or intrinsically safe to be used in the hazardous areas, and wiring consists of HL TECK.
- Ensure engineering controls (e.g., automatic shut-off valves, sensors) are implemented into the design and can identify a gas leak within 15 minutes, allowing for prompt response and isolation controls to engage.
- Include high-integrity pressure-rated piping systems, automated shut-off valves, and leak detection systems integrated into the refrigeration circuit.

Operations and maintenance personnel may be exposed to hazardous gases and materials while working within the Facility. Workers performing activities in a hazardous area or who have the potential to be exposed to hazardous gases and materials during operations will be trained accordingly and provided with the appropriate PPE (e.g., gloves, eye/skin protection) to ensure their safety during any routine and non-routine servicing or repair scenarios. In an emergency, workers will have access to additional PPE (e.g., chemical protective clothing, chemical cartridge respirator, supplied-air respirator) to protect themselves from respiratory hazards and must follow the Project's on-site Emergency Response Plan to ensure their own safety and that of their colleagues.

The application of the above mitigations and the implementation of the Facility's Emergency Response Plan will ensure a timely response in the event of an accident and will reduce the likelihood of a significant release from taking place.

12.6 System/Unit Failure

A complex integration of primary processing units and ancillary systems operates collectively to support the safe, efficient, and continuous operation of the Facility. These units and systems include, but are not limited to, biomass handling and drying, gasifiers, methanol synthesis units, methanol-to-jet units, hydrogen production systems, CO_2 capture and liquefaction systems, power generation systems, process control systems, and utility systems such as cooling water, raw water treatment, firewater, and air separation units.

In the absence or low flow of CO_2, in the Capture, Compression/Liquefaction & Storage unit, cold ammonia could result in the embrittlement of pipes, resulting in the potential loss of toxic NH_3 release.

Although all systems and units will be designed and constructed in accordance with industry standards and undergo rigorous commissioning and testing, the potential for failure remains due to factors such as mechanical malfunction, electrical faults, instrumentation errors, control system failures, or human error.

12.6.1 Mitigation

The mitigation strategies below will be implemented to minimize the impacts of equipment/ unit failure.

- Develop and implement an equipment sparing system to ensure high availability and minimal downtime of critical equipment during equipment failures, maintenance.
- Install an Integrated Control and Safety System (ICSS) consisting of a Process Control System (PCS), a Safety Instrumented System (SIS), and an FGDS.
- Install and operate a Process Control System (PCS), containing the upset by isolating the affected system while causing the least disturbance to the other systems. This allows a rapid and straightforward restart.
- Install a SIS to provide an additional layer of protection for the plant to perform process-critical safety functions and shutdowns when the PCS fails to keep the process within safe operating parameters.
- Implement a SIS to automatically activate an Emergency Shutdown (ESD) of a process unit or system.
- Develop and operate a control center to account for maintenance planning, operations interaction, startup manpower, staffing, console utilization, unit upset operations management, utility operations, major incident operations, emergency response, and incident command.
- Develop preventive and predictive maintenance programs, including regular inspection, calibration, and testing of critical equipment.
- The electrolyzer system will apply maintenance strategies, integrity evaluations, and safe operating procedures to minimize and maintain a very low probability of loss of containment of hydrogen. In addition, workers must follow the Project's on-site ERP to ensure their own safety and that of their colleagues in the event of an emergency.

Once these mitigation measures are implemented, the likelihood of equipment or unit failure is expected to be significantly reduced, resulting in a low probability of occurrence. The combination of sound engineering design, preventive and predictive maintenance, advanced process control systems, multiple safety layers, and trained operational staff will collectively ensure that any potential failures are identified, contained, and resolved with minimal disruption to operations and minimal risk to personnel, the environment, and surrounding infrastructure.

12.7 Transportation Related Incidents

Vehicular incidents could occur at any Project phase, although the type and intensity of vehicular traffic will vary depending on the activities being conducted. In addition, operator errors and techno-mechanical malfunctions are likely to occur during all stages of the Project's lifespan. The construction and decommissioning phases will see the highest volume of traffic

and the largest vehicles travelling to and on the site. The vehicles in operation during the construction phase will include gravel trucks, loaders, and light-duty vehicles. Off-site contractors may access the Facility using their own vehicles or service equipment. Where personnel may be near light- to heavy-duty traffic, there is a higher risk of incidents affecting human health (HSE, n.d.). While vehicular use has implicit risks that cannot be fully eliminated, implementation of mitigation measures will ensure that these risks are abated to the highest degree possible and that they are understood by anyone accessing the Facility.

During the Project's operation phase, material transportation, including biomass feedstock, petroleum products, chemicals, and other hazardous substances, poses a potential risk of leaks or spills, which could result in adverse environmental impacts such as soil and water contamination. Diesel and naphtha will be transported off-site via tanker trucks for export, requiring stringent safety protocols to minimize the risk of accidents during loading, transit, and unloading. SPK and methanol will be transported via a dedicated export pipeline, hence reducing the risks associated with road transport; however, pipeline transport will also require stringent contingency measures in case of valve leakage or malfunction.

12.7.1 Mitigation

Mitigation measures to limit the probability of an incident and reduce the magnitude and extent of potential effects include:

- Comply with all relevant regulations related to storage, transportation, handling, and use of hazardous materials.
- Conduct periodic inspections to ensure all mobile equipment is in good condition and follow the manufacturer's specifications for preventative maintenance.
- Establish, post, and enforce speed limits on the site.
- Set in place applicable signage in accordance with relevant traffic regulations.
- Develop and maintain roads in accordance with the Project's Erosion and Sedimentation Control Plan.
- Require that public road speed limits are followed by Project vehicles, including vehicles under contractor control.
- Require that drivers follow all laws and regulations pertaining to distracted (e.g., cell phone usage) or impaired driving on and off-site.
- Minimize transportation-related traffic in school zones and on school bus routes during school hours and bus pick-up and drop-off times.
- Follow weather statements and alerts and adjust plans accordingly to avoid transportation in extreme weather conditions whenever possible.
- Establish the following, within the Facility, to the extent possible (HSE, n.d.):
    a. Keep vehicles and pedestrians apart.
    b. Minimize vehicle movements.
    c. Minimize reversing by providing adequate room to turn vehicles.
- Ensure adequate visibility by operating in appropriate weather and providing ample lighting and visibility aids (e.g., mirrors around tight turns).
- Develop robust pipeline integrity management, regular inspections, and leak detection

systems to prevent and promptly address any potential releases in pipelines.
- Ensure visitors are familiar with the Project layout or are accompanied by Project personnel as necessary.
- Conduct regular audits of the Project safety procedures on, at least, an annual basis, or following an incident.
- Require all contractors to implement equivalent safety-related protocols and report defined metrics to the Proponent on a quarterly basis.

In addition to the above, the Project's Emergency Response Plan will include plans for spill prevention and response related to the storage and transportation of chemicals and products to and from the site. The proponent will ensure that employees, suppliers, and clients comply with safety measures, spill prevention protocols, and best management practices during Project activities. The Proponent will also consult with local emergency services to strengthen coordinated response efforts and ensure an aligned approach. With the implementation of preventative measures and appropriate response plans, any interactions with VCs in the event of an accident or malfunction will be limited, and the effects will be quickly contained.

12.8 Untreated Effluent Releases

Untreated effluent releases from the Project may potentially cause adverse environmental effects. Untreated effluent may be introduced into the environment by exceeding the retention pond capacity (overflow) or malfunction of the treatment system. Where retention pond capacities are exceeded, untreated effluent may overflow the containment system and discharge into the environment.

A malfunctioning treatment system will fail to effectively treat wastewater and stormwater, resulting in the discharge of contaminated effluent into the environment. The discharge of untreated and/or poorly treated effluent may result in the following impacts:

- Eutrophication of marine and freshwater sources
- Degradation of water quality
- Endangerment of aquatic species and habitat
- Contamination of soils
- Contamination of groundwater; impacts to residential potable groundwater.

Effluent sources that have the potential to impact the surrounding area adversely include:

- Cooling Water System
- Raw Water Treatment System (RWTS)
- SRP
- Wastewater Treatment System (WTS)

12.8.1 Mitigation

The following mitigations will be implemented to minimize the impacts of an effluent release:

- Ensure all internal stormwater drainage originating from the Facility is directed to the SRP for disposal.
- Ensure that SRPs are designed with a conservative freeboard to accommodate unexpected flows.
- Ensure that any SRP is equipped with a pumping system of sufficient capacity to handle all water directed to it.
- Ensure the final effluent from the effluent treatment at the raw water treatment sludge is sampled to confirm that it meets all parameter limits (per regulatory requirements) prior to discharge.
- Continually assess the SRPs during routine operations; if damage is identified or maintenance is required, the affected area will be repaired as soon as possible, and all efforts will be made to redirect effluent away from the damaged location until repairs can be completed.
- Ensure monitoring of the discharge from the Cooling Water System to confirm compliance with applicable regulatory water quality standards before being released into the environment.
- Conduct dredging of ponds as needed to maintain sufficient water column and treatment capacity, ensuring the ability to isolate one pond and redirect flows to another during dredging activities.
- Implement a comprehensive preventive maintenance program for the WTS, including routine inspections, equipment servicing, cleaning of tanks and pipelines, calibration of monitoring instruments, timely replacement of worn components, and staff training to ensure efficient operation and minimize environmental risks.

13.0 CUMULATIVE EFFECTS

13.1 Overview

Cumulative effects are changes to environmental, social, and economic values caused by the combined effect of past, present, and potential future human activities and natural processes (Government of British Columbia, 2024). Concerns are often raised about long-term changes that may occur not only as a result of a single action but of the combined effects of each successive action on the environment (Hegmann et al., 1999). While a single undertaking might not cause significant adverse effects, multiple undertakings may result in incremental impacts, referred to as cumulative effects. These cumulative effects may potentially result in an overall impact to a VC of interest.

13.2 Cumulative Effects Assessment Methods

The goal of a Cumulative Effects Assessment (CEA) is to assess changes to an environmental condition (i.e., a VC) that could occur based on a combination of the proposed Project with other past, present, or reasonably foreseeable future projects. The CEA is completed using publicly available data, with uncertainties clearly identified, following guidance outlined in the

Cumulative Effects Assessment Practitioners Guide (Hegmann et al., 1999). As outlined by Hegmann et al. (1999), a CEA scoping exercise is completed using the following steps:

- Identification of the VCs that will enter the CEA process.
- Determination of spatial and temporal boundaries for the CEA.
- Identification and description of other projects or activities in the spatial boundary (or boundaries).
- Confirmation of which VCs will be carried through the CEA process.

For those VCs selected for the CEA process, an analysis was conducted considering the residual effects of the Project on that VC, the effect of other activities or projects on that VC, and potential cumulative effects. Mitigation measures and proposed monitoring programs and follow up are described, if cumulative effects are predicted. At this stage, the certainty in effects predictions was considered. It is not uncommon for data on effects of other projects or activities to be limited, increasing the uncertainty of the CEA predictions.

13.2.1 Selection of Boundaries

To identify other Projects for inclusion in the CEA, a 10 km buffer on the Assessment Area was selected as a conservatively inclusive boundary (Drawing 13.1).

The temporal boundary for the Project is based on three Project phases: construction (3 ½ years), operations and maintenance (50 years), and decommissioning and reclamation. For the CEA, Strum considered past Projects as those registered, approved, and/or constructed within the past 10 years and those projects that are visible via aerial imagery. Reasonably foreseeable future projects are those which have been registered with EA documents through NSECC but have not been approved or constructed.

13.2.2 Selection of VCs for Evaluation in the CEA

The primary pathways of effects to the environment from the Project include air emissions, archaeological resources, changes in surface water flows, and impacts to wetlands and watercourses in the Facility footprint. Through the effects assessment, no significant adverse residual effects were identified to the VCs evaluated. Details of the effects assessment for each VC evaluated can be found in Sections 7.0, 8.0, and 9.0.

Due to the disturbed nature of the site, Habitat loss and impacts to terrestrial fauna and flora are reduced. Additionally, the project will contain pre-existing site contamination. The innovative and carbon-offsetting nature of the project means that socio-economic and many atmospheric VCs, especially climate change, are positive.

Effects assessments detailed in Sections 7-9 were evaluated for both the significance of their effects and the potential to interact with nearby activities to produce effects that may be significant when examined cumulatively. Table 13.1 summarizes the potential for VCs to have cumulative impacts with other activities in the area.

Table 13.1: Potential for Cumulative Effects on Identified VCs

VC	Cumulative Effects Assessed	Reasoning
Air Quality	Yes	Residual effects of dust, exhaust, and process emissions from the Project will be non-significant but may add to atmospheric effects of adjacent commercial/industrial activities.
Climate Change	No	Effects on Climate Change will be positive, offsetting GHG emissions from fossil fuels.
Sound	Yes	Residual effects from general operations will be within compliance on their own but may add to existing sound levels of adjacent commercial/industrial activities.
Geophysical Environment	No	The Project will contain on-site contamination and remediate geologic risks such as AMOs during construction.
Waterbodies & Watercourses	Yes	Residual effects on waterbodies and watercourses anticipated through Project development and operation will be non-significant but may add to effects of adjacent commercial/industrial activities.
Fish & Fish Habitat	Yes	Residual effects on fish-bearing waterbodies and watercourses will be non-significant but may add to effects of adjacent commercial/industrial activities.
Wetlands	Yes	Residual effects on wetlands through permitted alterations during project development will be non-significant but may add to effects of adjacent commercial/industrial activities.
Terrestrial Vegetation Communities and Flora	Yes	Avoidance of flora SOCI (no SAR identified); however, loss of vegetated areas throughout the extent of the water pipeline, while not significant on its own, has the potential to add to habitat loss and fragmentation for terrestrial fauna, avifauna, and bats from neighbouring activities.
Terrestrial Fauna	No	Residual direct effects on terrestrial fauna through a variety of mechanisms will be non-significant.
Bats	No	Residual direct effects on bats, primarily through construction of the raw water pipeline, will be non-significant.
Avifauna	No	Residual direct effects on avifauna, through a variety of mechanisms will be non-significant.
Economy	No	Residual impacts are anticipated to be positive.
Land Use and Value	No	Residual impacts are anticipated to be negligible.
Recreation and Tourism	No	Minimal negative effects to tourism due to Project Infrastructure, and some positive effects due to increased economic activity in the area.
Archeology, Culture, & Heritage	No	Moderate magnitude of effect due to likelihood of encountering archaeological resources; however, these effects are not expected to extend beyond the Archaeological LAA or overlap with other commercial/industrial activities.

The following VCs are assessed for cumulative effects:

- Air Quality
- Sound
- Waterbodies & Watercourses
- Fish & Fish Habitat
- Wetlands
- Terrestrial Vegetation Communities and Flora

13.2.3 Other Activities and Undertakings in the Area

The community of Goldboro and its environs are not currently home to any heavy industrial activities. The Maritimes & Northeast Pipeline runs into the Assessment Area from the north, where it continues north to the west of mining activities at Gold Brook Lake. Other commercial activities within a 10 km buffer of the Project (Drawing 13.1) include small-footprint gold prospecting activities, forestry, several fishing wharves, a cold-storage facility for Mersey Seafoods at Bill Cooks Cove, and a small quarry in Isaacs Harbour North.

There are five proposed activities within a 10 km buffer of the project with EARD's registered within the past 10 years, in addition to some major nearby existing (ongoing) projects. These include an additional LNG pipeline, Highway 316 realignment, and gold mining activities (Table 13.2) (Drawing 13.1). Of these identified activities, only two are either currently active or still planned for development.

Table 13.2: Nearby Industrial Activities/Developments/Undertakings

Development	Development Activity	Status of Activity	Activity Location	Distance to AA*
Forestry	Harvests, thinning, plantations, and other treatments.	Active	On all sides of and within Assessment Area	Immediately adjacent and within
Gold Mining	Goldboro Gold Project	Planning and Post-EA (2022) Approvals	Abutting portion of the Assessment Area associated with the pipeline	Directly abutting
Highway Realignment	Realignment of Highway 316 away from shoreline.	EA Approved 2021, project transferred to NSF but no longer planned for development	Inside Assessment Area	Within
LNG Project	Pieridae Energy (Canada) Limited Goldboro LNG Project	EA Approved 2014, project transferred to NSF but development under this EA no longer planned	Within and adjacent to Assessment Area	Within
LNG Pipeline	Bear Paw Pipeline Project	EA Approved 2016, project no longer under consideration for development	Entering Assessment Area from north	Within

*Distance to nearest point of the Assessment Area

Forestry

Forestry is ongoing throughout Nova Scotia including in the vicinity of the Project. Forestry operations may take place up to the edge of the Project Assessment Area on either Crown or private land, increasing the potential for localized cumulative effects. Forest harvesting and silvicultural interventions beyond the vegetative clearing associated with the Project are not anticipated within the Assessment Area.

Forestry near the Project occurs on both private and Crown land. Forest management is regulated differently on private and Crown land. Crown land is harvests are subject to a variety of laws and regulations that are enforced through a licensing process. Private forest harvests are governed primarily by the *Forests Act* (Nova Scotia, 1989a), Forest Sustainability Regulations, and Wildlife Habitat and Watercourses Protection Regulations (Nova Scotia, 2001b, 2001a). Of these regulatory instruments, the Wildlife Habitat and Watercourses Protection Regulations contain the most restrictive provisions for forest practices, requiring minimum tree retention levels and protection of riparian zones. Best practices that are required on Crown land, such as the Nova Scotia Code of Forest Practices (NSNR, 2012a), are recommended for application on private land but not enforced.

Goldboro Gold Project

The Goldboro Gold Project is planned for development directly adjacent to portions of the Assessment Area associated with the water pipeline for the NSF REP. The gold project is planned to consist of an open pit mine with associated infrastructure including a 4,000 tonne per day processing facility, tailings management facility, waste rock storage areas, and till and organic material stockpiles (GHD, 2022). The gold project received EA approval in 2022 (NSECC, 2022c) and is in the process of development, reportedly preparing to begin work in 2026 (Canadian Mining Journal, 2025). Although the gold project is directly adjacent to portions of the Assessment Area associated with the water pipeline, it is approximately 6.5 km to the industrial facility where many effects are localized. Because of the physical separation of the two activities, the opportunity for many localized cumulative effects is lessened.

13.3 Cumulative Effects Assessment

Cumulative effects were assessed for the Project by taking into consideration the potential residual effects of significance (as identified in VC sections) in relation to the activities that have taken place in the past, those that currently exist, and those that can be reasonably expected to be developed within the area surrounding the Project (i.e., undergoing regulatory approval/under construction). Table 13.1 summarizes the potential for VCs to have cumulative impacts with other undertakings in the area.

13.3.1 Air Quality

Effects on air quality are discussed in terms of pathways to cumulative effects with the Goldboro Gold Project. The Project's potential effects on air quality are outlined in Section 7.1.1. These effects are assessed to be of low magnitude and are considered not significant.

The NSF REP LAA for air quality includes the Goldboro Gold Project in its entirety, therefore the potential for a cumulative effect should be examined. The Goldboro Gold Project EARD discusses impacts to air quality in terms of fugitive dust emissions and tailpipe exhaust emissions as GHG emissions (GHD, 2022, Appendix D.1). Whereas the Project's process emissions do not have an identifiable equivalent in the Goldboro Gold Project and these emissions are within regulated limits, the potential for a cumulative effect with process emissions will not be evaluated.

Project Activities that will generate the highest TSP are due to site construction and associated roadways, with additional contributions during operations through roadway maintenance and, to a lesser extent, movement of woody biomass to and within the site. The Facility is over 2 km from main haul routes associated with the Goldboro Gold Project, and particulate dispersion model outputs from the latter project's EARD demonstrate that the Facility is beyond the distance at which TSP levels of concern are expected (GHD, 2022, Appendix D.1). The Project's water pipelines are closer to the gold project's haul routes where generated dust is expected to be greatest during construction, with minor outputs during maintenance required occasionally through the operational phase. These amounts would be similar to or less than the amounts generated through the construction and maintenance of a forestry road in terms of ground disturbance required.

Due to the distance between the Project's Facility and the low levels of particulates likely to be generated by the Project components closest to the Goldboro Gold Project haul routes (i.e. the water pipelines), the two projects are unlikely to result in the cumulative generation of particulate matter that results in exceedances of regulated limits.

As above, generation of combustion residuals and/or exhaust tailpipe emissions, primarily PM, NOx, SO2, and CO from vehicles is primarily in association with the Project Facility. The Goldboro Gold Project identifies that most tailpipe emissions are associated with haul roads within the project's footprint. Modelling of tailpipe emissions conducted for that project found that emissions from both haul trucks and mining equipment are "well below assessment criteria" (GHD, 2022, Appendix D.1, p. 8). It is not possible to quantify the emissions expected to reach the Project Facility and nearby receptors as the model results are not depicted that far away. Despite the quantitative uncertainty, from the conclusions of the Goldboro Gold Project EARD and insignificance of findings, it is reasonable to conclude that the two projects are unlikely to result in a cumulative effect from tailpipe emissions that would exceed regulated limits and present a hazard to nearby receptors.

13.3.2 Sound

Effects on the acoustic environment are discussed in terms of pathways to cumulative effects with the Goldboro Gold Project. The Project's potential effects on the acoustic environment are outlined in Section 7.1.3. These effects are assessed to be of moderate magnitude and are considered not significant.

Portions of the NSF REP LAA for sound (Drawing 7.2) are overlapped by the Goldboro Gold Project's LAA for noise (GHD, 2022, p. 109), warranting further examination to understand the potential for sound produced by the two projects to act cumulatively on any one or multiple receptors. Because of the non-linear nature of the addition of two unique sound sources (Baker, n.d.), it is not possible to quantify the possible production of a cumulative effect without additional study that takes into account the specific point sources of noise from each project and associated levels. It is feasible, however, to examine the modelled areas of effects in each of these studies and determine the likelihood of a cumulative effect that exceeds regulations.

Most of the sound produced in association with construction and operation of the Project is from the Production Facility, while operational sound associated with the freshwater pipelines is expected to be minimal. The loudest sounds within the LAA are expected to be sporadic and mostly during the construction period, or during flaring events. The greatest noise emissions from the Goldboro Gold Project are not expected to overlap the portion of the NSF LAA that is associated with the Facility (GHD, 2022, p. 113).

It is likely that both projects may be audible from some receptors given the right atmospheric conditions, however, the distance between the two primary noise sources makes them highly unlikely to produce a cumulative effect that exceeds regulatory guidelines.

13.3.3 Waterbodies & Watercourses

Surface water quality and quantity impacts are discussed in terms of pathways to cumulative effects with the Goldboro Gold Project. The Project's potential effects on the volume and quality of water in streams and waterbodies are outlined in Section 7.3.1.7. These effects are assessed to be of moderate magnitude that can be effectively mitigated through established practices such that residual effects are considered not significant.

Portions of the NSF REP Assessment Area associated with water pipelines are within the Goldboro Gold Project's LAA for surface waters as outlined in the project's EA (GHD, 2022, p. 233). Additionally, the NSF REP and Goldboro Gold Project are both within the following secondary watersheds:

- 1EQ-4
- 1EQ-SD29
- 1EQ-SD31
- 1EP-1
- 1EP-SD1

The Goldboro Gold Project's predicted residual effects on surface water resources in terms of quality and quantity were described as adverse, but not significant. Several streams were assessed for the potential impacts to water quality and quantity, and impacts for individual watercourses ranged from negligible to high. Most surface water effects associated with the Goldboro Gold Project are within secondary watershed 1EQ-SD31, which includes Gold Brook Lake and Gold Brook, where the overall impact to water levels were assessed as negligible.

Impacts to water quality to both Gold Brook Lake and Gold Brook were assessed as low and not significant through a variety of modelling and quantitative assessments. Effects on water quantity in neighbouring secondary watersheds 1EQ-4 and 1EP-1 are assessed as negligible.

Portions of the NSF REP span several secondary watersheds (above). The greatest change to water quantity is likely to occur due to water withdrawal from Ocean Lake and Meadow Lake, within secondary watersheds 1EQ-4 and 1EP-1, respectively. Whereas the Goldboro Gold Project is assessed as having a negligible effect on these secondary watersheds, it is not anticipated that a significant cumulative effect to water quantity will occur here. Reductions in flow to minor watercourses within the footprint of the NSF REP facility (Section 7.3.1.11) are not quantified herein, requiring further WBA to understand the magnitude of impact. Due to the non-significant changes within this secondary watershed (1EQ-SD31) from the Goldboro Gold Project, it is not anticipated that these reductions in water quantity will result in a significant cumulative effect. Due to the extensive planned use of mitigation techniques and water treatment as part of the NSF REP Project to prevent significant effects on water quality, a significant cumulative effect on water quality is not anticipated.

13.3.4 Fish & Fish Habitat

Fish and fish habitat impacts are discussed in terms of pathways to cumulative effects with the Goldboro Gold Project. The Project's potential direct effects on fish and fish habitat through habitat loss, and indirect effects such as through changes in surface water quantity and quality are outlined in section 7.3.2.6. Together, these anticipated effects are predicted to be of moderate magnitude, such that a small loss of aquatic habitat will occur and altered hydrology is expected but can be managed with routine measures.

The potential for effects to fish and fish habitat by the Goldboro Gold Project is most prominent in the secondary watershed in which the project is primarily planned, 1EQ-SD31, according to the project's EA (GHD, 2022). No impacts are expected to secondary watershed 1EP-1, and a single road crossing is planned in 1EQ-4. Earlier study in this area associated with the Goldboro Gold Project found Atlantic salmon eDNA in secondary watershed 1EQ-4, but not 1EQ-SD31 (GHD, 2022). The streams found within or nearby the Facility in secondary watershed 1EQ-SD31 are characterized as first and second order streams which commence within the Assessment Area and provide no passage to upgradient fish habitat (Section 7.3.2.6).

The highest-magnitude impacts to fish and fish habitat associated with the NSF REP Project are likely to be within secondary watershed 1EQ-SD31 (Section 7.3.2.8), where Atlantic salmon have not been observed in this or prior studies. This secondary watershed's shore-direct drainage follows various pathways to the ocean. The runoff from the Goldboro Gold Project appears to predominantly flow eastward to the north of the Facility and then to the ocean via Seal Harbour Lake and East Brook (Drawing 7.13). The streams most affected by the Facility, meanwhile, predominantly flow south to the ocean via Betty's Cove Brook.

While there is a potential for the effects of these two projects to act cumulatively, it is not possible to conduct a quantitative analysis of the magnitude of this effect with available data. The diverging drainage pattern of the shore-direct flow paths suggests that there is unlikely that the effects of these two projects will interact in a fashion that they create a significant cumulative effect.

13.3.5 Wetlands

Wetland impacts are discussed in terms of pathways to cumulate effects with the Goldboro Gold Project. The Project's potential direct effects on wetlands through alterations, and indirect effects through changes in hydrology are outlined in Section 7.3.3. These effects are predicted to be of moderate magnitude due to the direct loss of wetland habitat throughout the Assessment Area, however watershed-scale changes are not anticipated and the effect is evaluated as not significant.

The Goldboro Gold Project is within the NSF REP's Assessment Area and itself will cause the loss of wetland habitat and possible indirect effects to others. Out of a total 222 wetlands delineated within the Goldboro Gold Project's assessment area, impacts are expected to 112 wetlands, 56 of which are direct effects, and 56 indirect (GHD, 2022, p. 295). These effects are limited to secondary watershed 1EQ-SD31, and impacts are not expected to neighbouring watersheds including those discussed above under waterbodies and watercourses. From a hydrological perspective, the relative isolation of the two projects both within separate secondary watersheds, and differing flow paths within the shared shore-direct draining watershed means there is a low likelihood for cumulative hydrologic effects between the two projects.

Both projects share similar landscape characteristics due to their proximity. Both the Goldboro Gold Project's EA (GHD, 2022) and this assessment find a high proportion of the landscape to be covered with wetlands that serve as potential habitat to a range of flora as well as terrestrial, aquatic, and avian fauna. No wetlands already designated or eligible for designation as WSS were found within the NSF REP Assessment Area. Fieldwork found that the work associated with the NSF REP, including both Facility and water pipeline, will likely result in modifications to approximately 1% of wetland area within the LAA (Section 7.3.3.6). This LAA includes portions of the Goldboro Gold Project, which itself is expected to result in direct modifications or loss to 5.8% of wetlands within that project's LAA (including a large portion of the NSF REP Assessment Area). Despite the loss of wetland habitat from both projects, the preponderance of wetland habitat in this area (12.15% of the NSF REP LAA per provincial records) means that the cumulative effect of habitat loss is not expected to be significant in terms of area of uniqueness lost.

13.3.6 Terrestrial Vegetation Communities and Flora

Terrestrial vegetation communities and flora are discussed in terms of pathways to cumulative effects with the Goldboro Gold Project and ongoing forestry. Iterative Project design has avoided known occurrences of priority species within the Assessment Area (section 7.4.1.6), and therefore the loss of individuals is not assessed as a potential cumulative effect. Clearing

vegetation for Project Infrastructure, especially water pipelines, is likely to result in loss or alteration of a small amount of habitat supporting priority flora species. Therefore, clearing vegetated areas for Project Infrastructure is assessed as a pathway to cumulative effects on habitat. Additionally, while direct losses of terrestrial fauna, bats, and avifauna are unlikely and thus not assessed, the loss of vegetated areas may represent a pathway to cumulative effects with other activities in the area. The Project's effects on terrestrial vegetation communities and flora are considered to carry a low magnitude and are assessed as not significant and carry a low magnitude. Additionally, effects on terrestrial fauna, bats, and avifauna were each determined to have a low residual magnitude and assessed as not significant.

Forestry is ongoing in the region on both private and Crown land. There is a high likelihood of future forestry operations that will apply various silvicultural prescriptions to the forests near the Project. Although harvests on Crown land are managed through a licensing process, the effects of these activities are not studied in detail before harvest treatments. Additionally, harvests on private land are generally not subject to prior scrutiny that would make the effects known and mitigatable. Because of this management system, it is not possible to predict the potential for pathways to cumulative effects with the Project.

The Goldboro Gold Project requires clearing of approximately 331.1 ha of forested land, or about 2.1% of the forested land within that project's LAA, with a total area of 15,489.8 ha. The forest type expected to see the greatest proportional loss of cover as a result of the project is mixedwood forest, with an expected loss of 8.69% (76.3 ha) of its cover type within the LAA (GHD, 2022, p. 426). The losses of forest area are generally confined to a compact area and do not sprawl over the landscape.

While the Facility is mostly within previously disturbed areas with low forest cover, the water pipelines cross through a variety of land cover classes including various forest types (Drawing 7.19A). These include softwood, mixedwood, and hardwood forests, as well as areas already recently cut. In total, the Project Assessment Area includes approximately 235.9 ha (22.9%) forested area, some of which will need to be cleared for Project Infrastructure, especially the water pipelines. The distributed nature of this impact, in narrow corridors that stretch between the Project's main facilities and source water supplies, mimics the fragmentation and disturbance that would be seen with the introduction of new roads. Unlike roads, however, the pipeline corridors will not see high-speed traffic and will have some low growth to stabilize the soil, providing a level of habitat. It is difficult to quantify the cumulative effect of the two projects' effects on forested areas as it relates to habitat loss and fragmentation. The similarity of the pipeline corridor to roads that are pervasive through such managed forests, and commonality of such forested land cover, strongly implies that the cumulative effect of habitat loss, while representing a legitimate loss of habitat for flora and fauna, is unlikely to be significant.

13.4 Cumulative Effects Conclusion

Following a scan of the Project's anticipated effects, six VCs were assessed for cumulative effects that may arise due to other activities in the Project' vicinity. Both forestry and a nearby

gold project are potential sources of effects that may act cumulatively with the Project's own effects. Effects of nearby forestry that are most likely to interact cumulatively with the Project are generally associated with the loss of habitat for a variety of flora and fauna. The difficulty in quantitatively assessing the effects of forestry make it prohibitively difficult to render a useful assessment of cumulative effects with the Project. The Goldboro Gold Project represents a more frequent source of potential cumulative effects due to the abutting nature of the two projects. Although all six assessed VCs had likely cumulative effects between the NSF REP and gold projects, none are expected to be significant. Following assessment, no VCs are expected to be subject to significant cumulative effects within the CEA LAA.

14.0 CONCLUSION

In accordance with A Proponent's Guide to Environmental Assessment (NSECC, 2025a), the studies, regulatory assessments and VC evaluations described within this EA Report have been considered both singularly and cumulatively, for all phases of the Project.

The results of this assessment indicate that in consideration of the Project's mitigative and protection measures, adverse residual effects are anticipated to not be significant.

15.0 CLOSURE

This EA Report was completed by Strum Consulting, an independent, multi-disciplinary team of consultants with extensive experience with submission of EARDs for undertakings within Atlantic Canada. Curriculum vitae for EA Report contributors and Strum Project Team members are provided in Appendix P. A list of the Project Team and their associated roles is provided below.

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