

13.0 Avifauna

13.1 Scope of Assessment

Avifauna was selected as a Valued Environmental Component (VEC) because it provides important social, cultural, aesthetic, recreational, and economic value to the public, Indigenous communities, governments, and other affected parties and because of the potential interactions with Project activities and regulatory considerations. Some waterfowl and upland game bird species are ecologically important, however also have economic, cultural and traditional value to the public. Raptors, including owls, represent top avifauna predators and use both terrestrial and freshwater habitats. Some raptor species also have important cultural and traditional value to the public.

The Avifauna VEC includes consideration of waterbirds, shorebirds, waterfowl, raptors, marsh birds and other land birds, protected under the *Migratory Birds Convention Act* (MBCA) and the *NL Wild Life Act*. It also includes Species at Risk (SAR) and Species of Conservation Concern (SOCC).

The assessment of avifauna is related to other VECs:

- Changes to vegetation and wetlands (Chapter 12) from land clearing for the Project will reduce habitat availability.
- Changes in noise (Chapter 7), light (Chapter 6) and surface water (Chapter 9) could also affect avifauna habitat and bird health.
- Changes in avifauna may cause changes to other VECs, such as Traditional Land and Resource Use with respect to potential effects on hunting if the Project alters the distribution and abundance of avifauna species of cultural importance.

13.1.1 Regulatory and Policy Setting

This section identifies the primary regulatory requirements and policies of the federal and provincial authorities that influence the scope of the assessment on avifauna.

In addition to the *NL Environmental Protection Act* and associated *Environmental Assessment Regulations*, the Project is guided by the following federal and provincial legislation and guidance.

13.1.1.1 Federal Guidance

The MBCA, 1994 affords protection and conservation to migratory bird populations, individuals, and their nests. Most bird species in Canada are afforded protection under the Act, except for cormorants, upland gamebirds, raptors, kingfishers, corvids and icterid blackbirds. Those species not protected under the MBCA are afforded protection under provincial legislation described below. The MBCA is the enabling statute for the *Migratory Birds Regulations* (MBR), which were updated in May 2022 (MBR, 2022). Section 6 of this regulation states that without the authorization of a permit, the disturbance, destruction, or taking of a nest, egg, nest shelter, eider duck shelter, or duck box of a migratory bird, or possession of a migratory bird, carcass, skin, nest, or egg of a migratory bird are prohibited. Under the 2022 MBR, nests



for 18 bird species (e.g., herons, puffins, petrels) receive year-round protection (Schedule 1), and all other nests of migratory birds are protected when they contain a live bird or viable egg (S. 5(2)(b)).

The SARA provides protection for SAR in Canada. The legislation provides a framework to facilitate recovery of species listed as Threatened, Endangered or Extirpated and to prevent species listed as Special Concern from becoming Threatened or Endangered. Bird SAR and their habitats are protected under SARA which prohibits: 1) the killing, harming, or harassing of Endangered or Threatened SAR (sections 32 and 36); and 2) the destruction of critical habitat of Endangered or Threatened SAR (sections 58, 60 and 61).

13.1.1.2 Provincial Guidance

In NL, SAR are protected under the NL ESA. Designation under the Act follows the recommendations of the Species Status Advisory Committee (SSAC). The purpose of NL ESA is to:

- prevent listed species from being extirpated from NL
- provide for the recovery of species listed as Extirpated, Endangered, or Threatened as a result of human activity
- conserve species listed as Vulnerable to prevent them from becoming Endangered or Threatened

Prohibitions of NL ESA include Section 16, which states “a person shall not disturb, harass, injure, or kill an individual of a species designated as Threatened, Endangered or Extirpated”. Species are listed under the Endangered Species List Regulations.

The NL *Wild Life Act* affords protection of wildlife (including avifauna species) and prohibits the hunting, taking or killing of wildlife or classes of wildlife, whether in particular places or at particular times or by particular methods, except under license or permit. The Act, in combination with other provincial regulations and Acts including the *Wilderness and Ecological Reserves Act* and the NL ESA, protects the biodiversity and wildlife resources of NL from being compromised.

13.1.1.3 Species at Risk and Species of Conservation Concern

For this Project, Species at Risk (SAR) are defined as species that are:

- listed on Schedule 1 of SARA as Extirpated, Endangered, Threatened or Special Concern
- listed as Extirpated, Endangered, Threatened, or Vulnerable under the NL ESA

Species of Conservation Concern (SOCC) are defined for this assessment as those species that are not specified under federal or provincial legislation, but are considered rare in the province, or ones for which the long-term sustainability of their populations has been evaluated as tenuous. Following direction previously provided by the NL Department of Fisheries, Forestry and Agriculture– Wildlife Division (NLFFA-WD), vascular plant SOCC are defined as those species that are:

- assessed as Extirpated, Endangered, Threatened, or Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) but have not yet been added to Schedule 1 of SARA



- recommended for listing by the SSAC as Endangered, Threatened or Vulnerable but are not yet listed under the NL ESA
- ranked as provincially rare by the Atlantic Canada Conservation Data Centre (AC CDC) including species with provincial status (S-ranks) of S1 (Critically Imperiled), S2 (Imperiled) or combinations thereof (e.g., S1S2) upon review by the AC CDC (AC CDC 2023a)

13.1.2 Boundaries

13.1.2.1 Spatial Boundaries

The following spatial boundaries were used to assess Project effects, including residual environmental effects, on avifauna in areas surrounding the Project components (Figures 13.1 and 13.2):

- **Project Area:** The Project Area encompasses the immediate area in which the Project activities and components occur and is comprised of following distinct areas: the Port au Port wind farm, the Codroy wind farm, the Hydrogen/Ammonia Production and Storage Facility (hydrogen / ammonia plant), Port Facilities, and the 230 kV Transmission Lines, as well as associated infrastructure including roads, substations, and water supply infrastructure. The Project Area is the anticipated area of direct physical disturbance associated with the construction, operation and decommissioning, rehabilitation and closure of the Project. In addition to encompassing the immediate area in which Project components and activities will occur, the Project Area also includes a buffer of up to 300 m for access roads and turbines and a 350 m corridor to accommodate the 70 to 75 m wide RoW for the transmission line. These buffers allow flexibility for the micro-siting of Project components during detailed design, based on technical considerations as well as the avoidance of environmentally sensitive areas, where practicable.
- **Local Assessment Area (LAA):** The LAA for this VEC is 1.6 km around wind turbines and the hydrogen / ammonia plant, and 500 m around access roads, collector systems and transmissions lines.
- **Regional Assessment Area (RAA):** The RAA for this VEC was delineated using ecoregions (subregions) and watersheds. It includes the Port-au-Port Subregion, the St. George's Bay Subregion, the Codroy Subregion, and watersheds from within the Corner Brook Subregion that overlap with the Port au Port East wind farm. The RAA extends 250 m from land within the Port au Port Subregion, Corner Brook Subregion, and a portion of the St. George's Bay Subregion up to Stephenville Crossing. The remainder of the RAA does not extend from land because the Project Area is further inland.





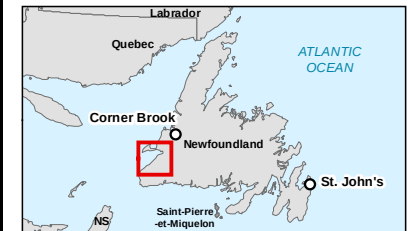
 Local Assessment Area	Other Features
Proposed Project Features	 Trans-Canada Highway
 Project Area	 Road
★ Hydrogen / Ammonia Plant Location	 Watercourse
● Transmission Line 230 kV	 Waterbody
	 Wetland
	 Forested Area



0 7.5 15 km
(At original document size of 8.5x11)
1:525,000

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: eBird, World Energy GH2, NRCan CanVec, OpenStreetMap
3. Background: NRCan CanVec



Project Location: Stephenville, NL
Prepared by NW on 2023-07-07
QR by AW on 2023-07-27

Client/Project: World Energy GH2
Project Nujio'qonik: 121417233_075b

Figure No.

13.1

Local Assessment Area



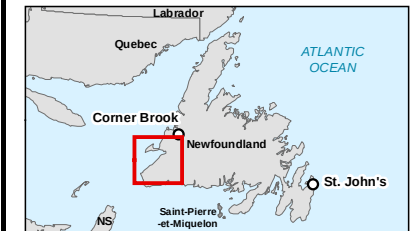
- Regional Assessment Area**
- Proposed Project Features**
- Project Area
 - Hydrogen / Ammonia Plant Location
 - Transmission Line 230 kV
- Other Features**
- Trans-Canada Highway
 - Road
 - Watercourse
 - Waterbody
 - Wetland
 - Forested Area



0 10 20 km
(At original document size of 8.5x11)
1:750,000

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: eBird, World Energy GH2, NRCan CanVec, OpenStreetMap
3. Background: NRCan CanVec



Project Location: Stephenville, NL
Prepared by NW on 2023-07-07
QR by AW on 2023-07-27

Client/Project: World Energy GH2
Project Nujio'qonik

Figure No.

13.2

Regional Assessment Area

13.1.2.2 Temporal Boundaries

The temporal boundaries for the assessment of potential effects on the avifauna include:

- Construction phase: Overall the construction phase of the Project will be from Q4 2023 through Q2 2027, pending EA approval and receipt of other required permits and approvals. Early civil works are planned to start Q4 2023 through Q3 2024. Construction of the Port au Port wind farm and associated infrastructure is expected to start in Q3 2024 with completion of the construction in Q4 2026. Construction of the Codroy wind farm and associated infrastructure is expected to start Q4 2025 with completion in Q1 2027. The hydrogen / ammonia plant will be constructed in phases from Q2 2024 to Q1 2026. Grid power sources are planned for hydrogen production in 2025 until March 2026, when the electrolyzer is commissioned.
- Operation and maintenance phase: Wind farm commissioning is anticipated to start Q1 2026 at the Port au Port wind farm and Q2 2027 at the Codroy wind farm. The 600 MW electrolyzer is expected to be commissioned in Q1 2026. The operational life of the Project is 30 years at each site.
- Decommissioning and rehabilitation phase: After a 30-year operational life, the decommissioning phase is anticipated to occur during 2057 and 2058. Decommissioning is anticipated to begin Q1 2057 at the Port au Port wind farm, with completion in Q3 2058 at the Codroy wind farm.

13.2 Existing Environmental Conditions

This section provides a brief overview of the existing conditions for avifauna, including the occurrence of SAR, SOCC within the LAA and RAA, which are reported in Chapter 5 of the Terrestrial Environment Baseline Study (BSA-3).

13.2.1 Methods

13.2.1.1 Background Review

Background data sources from government agencies and non-governmental organizations and from published literature were reviewed to compile information on the occurrence, abundance, distribution, and habitat associations of avifauna in the LAA. This included a review of avian SAR and SOCC that are known to occur or have potential to occur in the LAA and interact with the project. Sensitive habitats and areas where birds are known to congregate during key time periods (i.e., nesting, migration, winter) were also identified. The following background resources were reviewed to describe existing conditions for avifauna and avifauna habitat:

- COSEWIC Assessment and Status Update Reports
- Federal and Provincial Management Plans and Recovery Strategies
- AC CDC – observation data on SAR / SOCC in Atlantic Canada
- Christmas Bird Count (CBC)
- eBird Canada



- Newfoundland Breeding Bird Atlas
- Atlantic Canada Shorebird Survey
- Atlantic Colonial Waterbird Survey

13.2.1.2 Field Surveys

At the time of writing this assessment, the only field surveys that have been completed are winter coastal waterbird surveys. There were three components of the winter coastal waterbird survey program – a coastal waterbird land-based survey, a coastal waterbird aerial survey, and a Harlequin Duck/Purple Sandpiper aerial survey, which are described below. The purpose of these surveys was to assess the distribution and relative abundance of wintering coastal waterbirds (waterfowl and seabirds) along the coastline within the LAA and RAA.

Atlantic coastlines, including those of Newfoundland, provide important habitat for a diversity of bird species including several SAR. The eastern population of the Harlequin Duck (*Histrionicus histrionicus*) is listed as a Species of Special Concern on Schedule 1 of SARA and Vulnerable on the NL ESA. This species uses coastal habitats in Newfoundland during the non-breeding season. Harlequin Duck is often found in similar habitats as the Purple Sandpiper (*Calidris maritima*) which is identified as a priority species in the NL Bird Conservation strategy for Marine Biogeographic Unit 12 (EC 2013). Because Harlequin Duck is a SAR that has potential to be affected by the wind farm, it is a target species for the Project. Locations and numbers of Purple Sandpiper were also noted during the survey because the species will be present in similar habitats.

Winter Coastal Waterbird Land-based Survey

Land-based surveys were completed at ten locations throughout the Port au Port/Stephenville area on March 13, 2023 (Figure 4.3 in Stantec 2023). Survey locations were established in areas that were accessible by road with good visibility of the adjacent coastal waters. Locations of survey sites were selected to represent a variety of coastal habitats including beaches, coastal cliffs, and coastal wetlands. Survey sites were limited to areas of public land located adjacent to maintained roads.

The survey protocol was based on the British Columbia Coastal Waterfowl Survey Protocol (Birds Canada 2021). During surveys, birds observed in the coastal waters from the point count site were recorded. There was no time limit for the surveys and the survey ended once birds that were observable from each point count site were documented. For each bird observed, the surveyor recorded species, number observed, the distance and compass bearing from the observer to the bird or center of a flock of birds, and sex and age class of the bird. Observers also recorded whether the bird was sitting on the water or flying.



Winter Coastal Waterbird Aerial Survey

The winter coastal waterbird aerial surveys were flown with a team of three biologists experienced in bird identification and who have been trained using the U. S. Fish and Wildlife Aerial Waterfowl Survey Training (Bowman and Canfield 2015). The survey was conducted using a Bell 206L Long Ranger helicopter on February 7 and March 14, 2023. Surveys were flown at an approximate altitude of 80 m and speed of 120 km/h. The route ran approximately 250 m from the coast, and species were recorded up to 250 m away from the flight path, covering a 500 m wide transect. The survey route extended from the mouth of Little Codroy River to Broad Cove just north of Fox Island River (408 km), along the west coast of the Island of Newfoundland (Figure 4.4 in BSA3). The survey route also included nearshore islands present along the survey route.

During the surveys, observers recorded species and number of birds observed on both sides of the aircraft as they were encountered. Observations and times were recorded using a dictaphone or entered into an iPhone equipped with a custom application.

Winter Harlequin Duck/Purple Sandpiper Aerial Survey

Winter Harlequin Duck/Purple Sandpiper aerial surveys were conducted along the same route as the winter coastal waterbird aerial surveys using the same equipment and methods; however, to increase detectability, surveys were flown at 30 m altitude and at a speed of between 80 and 100 km/h. The helicopter was flown parallel to the coast approximately 100 m from the shore. The winter Harlequin Duck/Purple Sandpiper aerial surveys were flown on February 8 and March 14, 2023, starting at the north end of the coastal transect. On February 8, the entire survey route was completed but the March 14 survey was cut short due to changes in weather conditions and limits of pilot flying hours. Only the area between Broad Cove to Stephenville was completed (Figure 4.4 in Stantec 2023), which is approximately 60% of the entire route.

During the surveys, observers recorded Harlequin Ducks and Purple Sandpipers that were observed along with their location. Surveyors called out the species and number of birds observed on their side of the aircraft as they were encountered. Observations and times were recorded using a dictaphone or entered into an iPhone equipped with a custom application.

13.2.1.3 Desktop Habitat Assessment

A desktop habitat assessment was completed using GIS. The Newfoundland Forest Inventory data set (NL Department of Forestry, Fisheries and Agriculture) was used to assess the presence of avian habitat within the Project Area, LAA, and RAA. Using the Forestry Inventory data, habitat was identified in the Project Area, LAA, and RAA, and the percentage of each habitat category was calculated. The area to be cleared for the Project was also calculated, to determine the amount and types of habitats being altered as a result of the Project.



13.2.2 Existing Conditions

13.2.2.1 Overview

To plan, implement and evaluate conservation actions across North America, partners from the United States, Mexico, and Canada developed a common, ecologically based set of ecoregions appropriate to birds throughout North America, called Bird Conservation Regions (BCRs) or Marine Biogeographic Units (MBUs) (BSC and NABCI 2014). BCR Plans identify priority species from all regularly occurring bird species in each BCR/MBU subregion. Species may be identified as priorities because they are vulnerable due to population size, distribution, population trend, abundance and threats (EC 2017). However, widely distributed and abundant species may also be included because they are representative of the national or regional avifauna and/or because they have a large proportion of their range and/or continental population in the subregion (EC 2017). The Project is located within BCR 8, which encompasses the Island of Newfoundland. BCR 8 is generally described as being largely forested consisting mainly of conifer stands (black spruce (*Picea mariana*), and balsam fir (*Abies balsamea*)); mixed wood stands with broadleaf trees (white and yellow birch (*Betula papyrifera* and *Betula alleghaniensis* respectively)) are relatively uncommon. Other habitat types within BCR 8 on the Island of Newfoundland include wetlands (primarily treed and open bogs), rock outcrops and barrens, numerous mid-sized lakes, and coastal landforms (EC 2013). The eastern coastlines and shores in BCR 8 are important for seabird breeding and wintering areas year-round and upland habitats support a diversity of landbirds (EC 2013). There are 37 priority species in BCR 8 on the Island of Newfoundland, which are described in BSA 3, and includes 20 species of landbirds, 6 species of shorebirds, 3 species of waterbirds, and 8 species of waterfowl, all of which have potential to be present within the RAA.

MBU 12 overlaps the Project. MBU12 within the Gulf of St. Lawrence, is one of the largest and most productive marine ecosystems in Canada (EC 2013). The portion of MBU 12 that encompasses the western coast of Newfoundland spans the Newfoundland Shelf waters that enter the Gulf of St. Lawrence on the eastern side of the Cabot Strait, continuing northeast along the west coast of the island. There are 29 priority species in MBU 12: 12 shorebirds, 9 waterbirds, and 8 waterfowl species (EC 2013). Twenty-three of these species are associated with the intertidal coast whereas the other 16 occur in marine waters (EC 2013). These species have potential to be present within the RAA.

NL is situated within the Atlantic Flyway, which is a major migratory route for avifauna in North America, providing staging habitats for landbirds and shorebirds migrating to and from breeding grounds (ABC 2022). There are many concentration points within or near the LAA where migrating birds congregate and stage before or after a long trans-oceanic flight (eBird 2022).

The RAA and LAA supports a diverse assemblage of bird species during the breeding season, spring and fall migration, and in winter. The avifauna groups that are present include passerines, waterfowl, waterbirds, shorebirds, raptors, and upland gamebirds.



Additional key results and findings of the Terrestrial Environment Baseline Study for avifauna (BSA 3) include:

- Two Important Bird Area / Important Bird and Biodiversity Areas (IBAs, BirdLife International 2023a) are within the RAA but outside of the LAA: NF040 Codroy Valley, between Searston, Saint Andrews, Doyles, and Upper Ferry, and NF041 Codroy Valley Estuary, which includes only the open waters and land up to high tide lines surrounding the estuary formed at the mouth of the Grand Codroy River (BSC 2017).
- Coastal areas within the LAA and RAA support many seabird, gull and tern colonies including Black-legged Kittiwakes (*Rissa tridactyla*), Black Guillemots (*Cepphus grylle*), Razorbills (*Alca torda*), Great Cormorants (*Phalacrocorax carbo*), and Double-crested Cormorants (*Nannopterum auritum*) (NL BBA 2022a; eBird 2022; ECCC 2020).
- The Port au Port Peninsula contains the largest seabird breeding colony on the western coast of Newfoundland. Cape St. George/Big Cove, which supports up to 20,000 Black-legged Kittiwakes, hundreds of Black Guillemots, Razorbills, Double-crested Cormorants (20-25 pairs), and Great Cormorants (200 pairs) (Montevecchi 2009, eBird 2022).
- Small coastal islands, the Stephenville Crossing area, peninsulas, and the outlets of large rivers provide nesting habitat for gull and tern colonies.
- Freshwater and marsh habitats within the LAA and RAA support breeding loons, waterfowl, shorebirds, herons, and raptors. Marsh habitat (and consequently marsh birds) is uncommon within the LAA and RAA.
- Forested habitats within the LAA are primarily coniferous softwood and mixedwood forests comprised of balsam fir and black spruce, with alder thickets throughout. There are some areas of deciduous hardwood stands within lower elevations of the Anguille Mountains/Codroy Valley and in a small region north of Stephenville. The forest types within the Project Area and LAA support a diverse assemblage of birds including but not limited to passerines, woodpeckers, corvids, waterfowl, and raptors.
- Shrub/scrub habitat within the Project Area and LAA such as thickets support breeding flycatchers, sparrows, and warblers.
- Open habitats within the Project Area and LAA, including meadows, grassland and agricultural habitats, support breeding birds such as Horned Lark (*Eremophila alpestris*), sparrows, swallows, shorebirds, and raptors.
- Barren habitats within western Newfoundland support two species of ptarmigan, the Willow Ptarmigan (*Lagopus lagopus*, ssp. *Alleni*) and Rock Ptarmigan (*Lagopus muta*).
- Many northern-breeding seabirds that do not breed in the RAA are found in the coastal waters during migration. These include those that breed in other parts of Newfoundland, such as Leach's Storm-Petrel (*Hydrobates leucorhous*), Atlantic Puffin (*Fratercula arctica*), and Manx Shearwater (*Puffinus puffinus*) and other northern-breeding seabirds such as jaegers, Northern Fulmars (*Fulmarus glacialis*), Dovekies (*Alle alle*) and murre.



- Many waterfowl species use the LAA and RAA during migration, particularly estuarine habitats along the coast such as the Grand Codroy Estuary and Stephenville Crossing and coastal waters.
- The Project Area and LAA supports many eastern North American shorebirds that breed in the high arctic and migrate across the island of Newfoundland through the Atlantic Flyway during the spring and fall (eBird 2022). Migrating shorebirds may be found in a variety of habitats during migration including mudflats, rocky shores, bogs, flooded areas, and beaches.
- Seabirds such as Black Guillemot, Dovekie, Black-legged Kittiwake, Razorbill and cormorants, and waterfowl species such as American Black Duck (*Anas rubripes*), Common Goldeneye (*Bucephala clangula*), Common and Red-breasted merganser (*Mergus merganser* and *Mergus serrator* respectively), Common Eider (*Somateria mollissima*), Greater Scaup (*Aythya marila*), Long-tailed Duck (*Clangula hyemalis*), and scoters may use coastal waters within the RAA during winter depending on ice conditions.
- During winter coastal waterbird aerial surveys completed in winter 2023, 3,956 individual birds of 23 species were counted on the survey route on February 8, 2023, and 3,430 individual birds of 21 species were counted on the survey route on March 14, 2023 (BSA 3). Large rafts of Common Eider were present near Cape Anguille (approximately 800 birds on first survey) and near Three Rock Cove on the Port au Port Peninsula (approximately 600 birds on second survey). Other species that were common during surveys included Common Goldeneye, Long-tailed Duck, Red-breasted Merganser, White-winged Scoter (*Melanitta deglandi*), Iceland Gull (*Larus glaucoides*), Herring Gull (*Larus argentatus*) and Bald Eagle (*Haliaeetus leucocephalus*). One Barrow's Goldeneye (*Bucephala islandica*; Vulnerable under NL ESA; Special Concern under SARA) was recorded during the winter coastal aerial surveys.
- During Harlequin Dick/Purple Sandpiper aerial surveys, 244 Purple Sandpipers were observed at 15 locations on February 8, 2023. During the March 2023 survey, which was only completed for the area between Broad Cove to Stephenville, 65 Purple Sandpipers were observed at 7 locations. No Harlequin Ducks were observed during either of the aerial surveys (BSA-3).

13.2.2.2 Species at Risk

The RAA has the potential to provide habitat for 21 SAR during the breeding season, migration, or winter (Table 13.1). Critical habitat for Bobolink is present within the LAA and critical habitat for Piping Plover is present within the RAA (Figure 13.3)

13.2.2.3 Species of Conservation Concern

An additional 19 SOCC may also be present within the RAA or LAA (Table 13.2), most of which are rare on the Island of Newfoundland because it is the northern or eastern extent of their range, or there is a lack of suitable habitat (e.g., deciduous forests, grasslands, cattail marshes).





- Piping Plover Critical Habitat (marine)
 - Bobolink Critical Habitat, Proposed (ECCC)
 - ★ Hydrogen / Ammonia Plant Location
 - Transmission Line 230 kV
 - Project Area
 - Local Assessment Area
- Transmission Line, Existing
 - Trans-Canada Highway
 - Road
 - Contour (100 m)
 - Watercourse
 - Waterbody
 - Wetland
 - Forested Area



0 10 20 km
(At original document size of 8.5x11)
1:600,000

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: Environment and Climate Change Canada, Canadian Wildlife Service; World Energy GH2; NRCan CanVec; OpenStreetMap
3. Background: NRCan CanVec



Project Location: Stephenville, NL
Prepared by SC on 2023-07-26
Revised by NW on 2023-07-27
QR by AW on 2023-07-27

Client/Project: World Energy GH2
Project Nujlo'qonik
121417233_087

Figure No.

13.3

Critical Habitat in the Local Assessment Area

Table 13.1 Species at Risk that may be Present Within the LAA and RAA.

Species		Status			Habitat Description	Presence in LAA and RAA			
Common Name	Scientific Name	NL ESA	COSEWIC	SARA		Spring	Summer	Fall	Winter
Bank Swallow	<i>Riparia riparia</i>	THR	THR	THR	An aerial insectivore that constructs nests in vertical banks, typically along watercourses and in coastal areas. Forages in open habitats including open water, wetlands, grasslands, agricultural areas, shrublands, and occasionally over wooded areas (SSAC 2009a). A common breeder within areas of suitable habitat throughout the Project Area. Colonies found on Port au Port Peninsula, Stephenville, Stephenville Crossing, throughout the Flat Bay and Jeffrey's regions, and in coastal areas adjacent to the proposed wind farms (eBird 2022).	✓	✓	✓	-
Barn Swallow	<i>Hirundo rustica</i>	VUL	SC	THR	An aerial insectivore that attaches its nests to structures such as barns, bridges and culverts. Before European colonization of North America, Barn Swallows nested on cliffs, rock overhangs, and caves (COSEWIC 2021a). They forage over open areas. Present in the LAA in small numbers where suitable nesting habitat is present. There are 12 eBird records in 6 years (from 2003 to 2022) and no confirmed nesting locations within the Project Area or LAA (eBird 2022).	-	✓	-	-
Barrow's Goldeneye – Eastern population	<i>Bucephala islandica</i>	VUL	SC	SC	A medium sized seabird which nests in tree cavities and exhibits strong fidelity to breeding and wintering areas. In winter, this diving duck primarily feeds on molluscs (Schmelzer 2006). Not confirmed to breed within the Project Area. Most of the population winters in the St. Lawrence Estuary and Gulf of St. Lawrence but may use coastal areas within the Project Area for molting or in winter (EC 2011). There are 156 eBird records between 2003 and 2022, most of which were observed between November and March near the Port au Port Peninsula and Flat Bay (eBird 2022).	✓	-	✓	✓



Table 13.1 Species at Risk that may be Present Within the LAA and RAA.

Species		Status			Habitat Description	Presence in LAA and RAA			
Common Name	Scientific Name	NL ESA	COSEWIC	SARA		Spring	Summer	Fall	Winter
Bobolink	<i>Dolichonyx oryzivorus</i>	VUL	SC	THR	A songbird that nests in grasslands and hayfields. Rare in Newfoundland, but can be found in hayfields, farmlands, salt marshes, and grassy fields (SSAC 2009b). Very rare within the Project Area. Very little suitable habitat available, and Newfoundland is at the edge of the species range (SSAC 2009b). There is only one record from eBird within the Project Area between 2003-2022 (eBird 2022).	✓	-	-	-
Common Nighthawk	<i>Chordeiles minor</i>	VUL	SC	SC	An aerial insectivore that is active at dawn and dusk. It nests on bare ground and is found in sand dunes, forest openings, burned areas, rocky/sandy habitats, grasslands, barrens and less commonly mixed and coniferous forest (NL BBA 2022b). Have not been confirmed nesting in Newfoundland, but there are eBird records for the island, which suggest small numbers of breeding birds (eBird 2022). May breed in the Codroy Valley region in very small numbers.	-	✓	✓	-
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	VUL	SC	SC	Found in boreal forests across Canada. It feeds mainly on invertebrates, including the Spruce Budworm (<i>Choristoneura fumiferana</i>), a forest pest that experiences cyclical outbreaks. A nomadic species with irruptive migration (COSEWIC 2016a). Live in large flocks during the non-breeding season. During breeding season, they prefer forested habitats that are dominated by fir species and white spruce. A year-round resident in Newfoundland, but numbers vary annually due to the irruptive nature of the species. Most of the eBird records are from winter (November-February) but there are a small number of breeding season records in eBird and the NL Breeding Bird Atlas within and near the Stephenville area (eBird 2022).	✓	✓	✓	✓



Table 13.1 Species at Risk that may be Present Within the LAA and RAA.

Species		Status			Habitat Description	Presence in LAA and RAA			
Common Name	Scientific Name	NL ESA	COSEWIC	SARA		Spring	Summer	Fall	Winter
Gray-cheeked Thrush	<i>Catharus minimus minimus</i>	THR	-	-	A medium sized migratory songbird found in conifer scrub habitat along the coast, regenerating fir stands (including regenerating clearcuts), and mature balsam fir forests. The subspecies <i>C. m minimus</i> is indigenous to the island of Newfoundland. Populations have disappeared from most coastal and low-elevation areas; the remaining population is concentrated in higher elevation habitats (NL BBA 2022b). Only one breeding season record in eBird within the Project Area (2003 to 2020) and no NL Breeding Bird Atlas records (eBird 2022; NL BBA 2022a). However, given the presence of suitable habitat, it may occur in higher elevation forested habitats within the LAA (D. Whitaker pers. comm.).	-	✓	-	-
Harlequin Duck	<i>Histrionicus histrionicus</i>	VUL	SC	SC	A small seabird that nests in fast flowing inland watercourses and winters along rocky coastlines (EC 2007). Has not been confirmed breeding within the Project Area, but individuals and breeding pairs have been observed during the breeding season (eBird 2022). Known to winter within suitable habitat along coastal areas within the LAA, but it is not known to support large numbers.	✓	-	✓	✓



Table 13.1 Species at Risk that may be Present Within the LAA and RAA.

Species		Status			Habitat Description	Presence in LAA and RAA			
Common Name	Scientific Name	NL ESA	COSEWIC	SARA		Spring	Summer	Fall	Winter
Horned Grebe – Western population and Magdalen Islands population	<i>Podiceps auritus</i>	-	SC/END	SC/END	A small waterbird that primarily breeds in freshwater ponds, marshes of shallow bays on lakes (COSEWIC 2009). Its breeding range includes British Columbia, Yukon, the Mackenzie River Valley in the Northwest Territories, the extreme southern part of Nunavut, the Prairies, northwestern Ontario and the Magdalen Islands (Quebec). They winter in greatest numbers in coastal areas (COSEWIC 2009). Does not breed in Newfoundland but is present in fall and winter (mostly November-December) records in coastal areas within the Project Area (eBird 2022). It is unknown whether these individuals are from the western population (Special Concern) or the Magdalen Islands population (Endangered).	-	-	✓	✓
Hudsonian Godwit	<i>Limosa haemastica</i>	THR	THR	-	A large, long-legged shorebird. It has one of the longest migration routes of any Western Hemisphere shorebird (COSEWIC 2019). Breeds in sub-Arctic and boreal regions of Canada and Alaska and winters in South America (COSEWIC 2019). A rare but regular fall migrant within the Project Area. There are 83 eBird records from 2003 to 2020, which are concentrated in the Port au Port Peninsula, Stephenville Crossing and Sandy Point areas (eBird 2022).	-	-	✓	-



Table 13.1 Species at Risk that may be Present Within the LAA and RAA.

Species		Status			Habitat Description	Presence in LAA and RAA			
Common Name	Scientific Name	NL ESA	COSEWIC	SARA		Spring	Summer	Fall	Winter
Ivory Gull	<i>Pagophila eburnea</i>	END	END	END	A medium sized gull with a circumpolar breeding distribution across the high arctic (COSEWIC 2006). The winter distribution is poorly understood but it is known to occur along the pack ice in Davis Strait, the Labrador Sea, Strait of Belle Isle, and northern Gulf of St. Lawrence and along the eastern shore of NL (COSEWIC 2006). Very rare within the Project Area in winter. Two confirmed sightings in the last 20 years, both in Stephenville Crossing (eBird 2022).	-	-	-	✓
Leach's Storm-petrel	<i>Hydrobates leucorhous</i>	THR	THR	-	This nocturnal pelagic seabird nests in burrows on islands in the North Atlantic and North Pacific and winters at sea in the Southern Hemisphere (Pollet et al. 2021). There are 47 colonies on the island of Newfoundland (COSEWIC 2020a), and east coast of Newfoundland has the largest colonies in the world (Robertson et al. 2006). Does not breed in western Newfoundland; closest breeding colony is at Wreck Island off the southern coast of NL, and at St. Paul Island, Nova Scotia. May occur in coastal waters off the LAA during fall migration (eBird 2022), and near land during strong onshore wind events (d'Entremont et al. 2021;).	-	-	✓	-



Table 13.1 Species at Risk that may be Present Within the LAA and RAA.

Species		Status			Habitat Description	Presence in LAA and RAA			
Common Name	Scientific Name	NL ESA	COSEWIC	SARA		Spring	Summer	Fall	Winter
Lesser Yellowlegs	<i>Tringa flavipes</i>	THR	THR	-	A medium sized shorebird that breeds primarily in boreal and taiga wetlands. Its breeding range in Canada extends from northern Yukon to western Labrador and it winters in South America (COSEWIC 2020b). Does not breed or winter in Newfoundland, but is present in coastal areas during fall, and less frequently spring migration. There are almost 200 records of this species from eBird (2003-2022) within the Project Area, concentrated in the Port au Port Peninsula. The key period for fall stopovers for this species is August and September (eBird 2022; ECCC 2020).	✓	-	✓	-
Olive-sided Flycatcher	<i>Contopus cooperi</i>	VUL	SC	SC	A medium sized migratory songbird that breeds throughout most of forested Canada (COSEWIC 2018). Breed in edge habitats, such as coniferous forests with open habitats, wetlands or disturbed forest (NL BBA 2022b). Known to breed within areas of suitable habitat in western Newfoundland, including the Project Area. There are 125 records in eBird from 2003-2022 in the Project Area in both the Port au Port Peninsula and Codroy Valley (eBird 2022).	-	✓	✓	-
Peregrine Falcon	<i>Falco peregrinus</i>	VUL	NAR	-	A medium sized falcon that breeds in all Canadian provinces and territories except Prince Edward Island (EC 2015a). Nest on cliff ledges along the coast or on rivers (NL BBA 2022b). No confirmed breeding records within the Project Area, and only two eBird sightings within the breeding season between 2003-2020. There are an additional eight records during fall (eBird 2022).	-	✓	✓	-



Table 13.1 Species at Risk that may be Present Within the LAA and RAA.

Species		Status			Habitat Description	Presence in LAA and RAA			
Common Name	Scientific Name	NL ESA	COSEWIC	SARA		Spring	Summer	Fall	Winter
Piping Plover	<i>Charadrius melodus</i>	END	END	END	A small shorebird that nests and feeds along sandy or gravelly coastal beaches in North America. Winter along the southern Atlantic coast of the United States and in the Caribbean (EC 2012). Nest in habitats with wide, sparsely vegetated sand or gravel beaches (NL BBA 2022b). There are several known and possible breeding sites near Stephenville, Stephenville Crossing, Black Banks Beach, Sandy Point and Codroy Valley Provincial Park (eBird 2022). Critical habitat identified by ECCC within the LAA at five locations between Stephenville and Flat Bay (EC 2012).	-	✓	✓	-
Red Crossbill (Type 8)	<i>Loxia curvirostra percna</i>	THR	THR	THR	Associated with mature conifer forests (COSEWIC 2016b). Red Crossbills in Newfoundland have their own subspecific designation (<i>L. c. percna</i>, "Type 8"). This subspecies is primarily restricted to the Island of Newfoundland, where it is found year-round in forests of red and white pine, mature black spruce, balsam fir, and white spruce. May be present in areas of suitable habitat throughout the Project Area and LAA, including the Codroy Valley. There are 23 eBird records of this species between 2003-2022 within the LAA (eBird 2022).	✓	✓	✓	✓



Table 13.1 Species at Risk that may be Present Within the LAA and RAA.

Species		Status			Habitat Description	Presence in LAA and RAA			
Common Name	Scientific Name	NL ESA	COSEWIC	SARA		Spring	Summer	Fall	Winter
Red Knot – Tierra del Fuego / Patagonia wintering population	<i>Calidris canutus rufa</i>	END	END	END	A medium sized shorebird that breeds in the Arctic and winters in South America. This subspecies passes through western Newfoundland during fall migration (Garland and Thomas 2009). Areas within the Port au Port Peninsula, Stephenville, Stephenville Crossing and Sandy Point are used as stopover locations for southbound Red Knots. Most of the observations are from August to October (eBird 2022).	-	-	✓	-
Red Knot – northeastern South American wintering population		END	SC	-		-	-	✓	-
Red Knot - Southeastern USA / Gulf of Mexico / Caribbean wintering population		END	END	-		-	-	✓	-
Red-necked Phalarope	<i>Phalaropus lobatus</i>	VUL	SC	SC	A medium sized shorebird, which breeds continuously along the coast from Alaska to Labrador and winters primarily off the coasts of Ecuador, Peru and Chile (ECCC 2022a). Occasionally observed in small numbers during fall migration within the LAA (eBird 2022). This includes the Port au Port Peninsula, Stephenville Crossing and Sandy Point.	-	-	✓	-



Table 13.1 Species at Risk that may be Present Within the LAA and RAA.

Species		Status			Habitat Description	Presence in LAA and RAA			
Common Name	Scientific Name	NL ESA	COSEWIC	SARA		Spring	Summer	Fall	Winter
Rusty Blackbird	<i>Euphagus carolinus</i>	VUL	SC	SC	A medium sized blackbird that breeds in forested wetlands in all Canadian provinces and territories (Wildlife Division 2020). Their distribution in Newfoundland is not well understood, but there are many records during the breeding season (eBird 2022). This species may breed in areas with suitable habitat in the Project Area and LAA, including the Stephenville area and Anguille Mountains (eBird 2022).	-	✓	✓	-
Short-eared Owl	<i>Asio flammeus</i>	THR	THR	SC	Medium sized owls that are most often active at dawn and dusk. Found in open habitats including tundra, grasslands, wetlands, and pastures (NL BBA 2022b). There are occasional records in the Port au Port Peninsula, Indian Head Park in Stephenville and Cape Anguille and the Codroy Valley area. However, is nomadic so could be present in areas of suitable habitat (COSEWIC 2021b). There are records at Shoal Point on the Port au Port Peninsula, Indian Head Park in Stephenville, Cape Anguille, and the Codroy Valley (eBird 2022).	✓	✓	✓	✓
Notes: THR = Threatened SC = Special Concern VUL = Vulnerable END = Endangered									



Table 13.2 Species of Conservation Concern that may be Present within the Project Area and / or LAA

Common Name	Scientific Name	S Rank	Habitat Description	Presence in LAA and RAA			
				Spring	Summer	Fall	Winter
Bay-breasted Warbler	<i>Setophaga castanea</i>	S2B, SUM	A neotropical migrant that breeds in boreal spruce-fir forests in eastern and central Canada (Venier et al 2020). Primarily feeds on insects and spiders, including spruce budworm (Venier et al 2020). Expected to breed in the Project Area or LAA within the Codroy Valley and the Stephenville area (eBird 2022) and potentially other areas with suitable habitat.	-	✓	✓	-
Blackburnian Warbler	<i>Setophaga fusca</i>	S2B, SUM	A neotropical migrant that breeds in coniferous and mixed woodland from central Alberta and Manitoba to Newfoundland (Morse 2020). Primarily feeds on insects, including spruce budworm. Within the Project Area and LAA, five eBird records in the Stephenville area during the breeding season and is known to breed within the Codroy Valley (eBird 2022).	-	✓	✓	-
Black-headed Gull	<i>Chroicocephalus ridibundus</i>	S1B, S2N, SUM	Primarily breeds outside of North America but is a rare, regular visitor (Burger et al. 2020) that historically bred across the island of Newfoundland. Recent breeding records in the LAA are restricted to a small colony nesting in the Stephenville Crossing estuary (eBird 2022).	✓	✓	✓	✓
Cape May Warbler	<i>Setophaga tigrina</i>	S2B, SUM	A small insectivorous songbird that breeds in boreal coniferous forests across northern Canada where it feeds on spruce budworms (Baltz and Latta 2020). Cape May Warblers winter primarily in Central America. Considered a rare breeder in NL, but its distribution is not well understood. A small number of eBird records within the Port au Port Peninsula during the breeding season (eBird 2022).	-	-	✓	✓
Caspian Tern	<i>Hydroprogne caspia</i>	S2B, SUM	A large fish-eating tern that typically nests in colonies; it has a scattered distribution throughout North America (Cuthbert and Wires 2020). More than 200 eBird records from the breeding season (2003-2023), including within the Project Area and LAA (eBird 2022) at Shoal Point on the Port au Port Peninsula and Stephenville Crossing.	✓	✓	✓	-



Table 13.2 Species of Conservation Concern that may be Present within the Project Area and / or LAA

Common Name	Scientific Name	S Rank	Habitat Description	Presence in LAA and RAA			
				Spring	Summer	Fall	Winter
Chipping Sparrow	<i>Spizella passerina</i>	S2S3B, SUM	Widely distributed across North America and prefers open woodlands, edges of forest openings, edges of rivers and lakes, and brushy, weedy fields (Middleton 2020). Reaches the edge of its range in southwestern NL (Middleton 2020). A small number of breeding season records within the LAA, mainly near Stephenville (eBird 2022).	-	✓	✓	-
Gray Catbird	<i>Dumetella carolinensis</i>	S1?B, SUM	Found in dense shrubby habitat across southern Canada (Smith et al 2020). Rare in NL; only eight eBird records from 2003-2022 (eBird 2022). May be present in the LAA in the Stephenville area.	-	✓	✓	-
Great Blue Heron	<i>Ardea herodias</i>	S2B, SUM	Widely distributed wading bird in North America. May nest alone or in colonies and builds its nests in trees or shrubs near water (Vennesland and Butler 2020). Many breeding season records in the Project Area and LAA (eBird 2022); may be nesting in the LAA in areas of suitable habitat.	✓	✓	✓	-
Hooded Merganser	<i>Lophodytes cucullatus</i>	S2B, S3M	A small diving duck that nests in tree cavities in the Pacific Northwest and eastern Canada (Dugger et al. 2020). Observed in pairs in the Project area during the summer (eBird 2022) but has not been confirmed to be breeding in the Project Area and LAA. More likely to be encountered during fall migration (eBird 2022).	✓	✓	✓	✓
Least Flycatcher	<i>Empidonax minimus</i>	S2S3?B, SUM	A small flycatcher that breeds in deciduous and mixed forests across most forested areas in Canada and reach the edge of their range in southwestern Newfoundland (Tarof and Briskie 2020). Rare within the Project Area and LAA with only four eBird records within the breeding season from 2003 to 2022.	-	✓	✓	-



Table 13.2 Species of Conservation Concern that may be Present within the Project Area and / or LAA

Common Name	Scientific Name	S Rank	Habitat Description	Presence in LAA and RAA			
				Spring	Summer	Fall	Winter
Manx Shearwater	<i>Puffinus puffinus</i>	S1B, S1M	This pelagic burrow-nesting seabird primarily breeds on small islands in Europe with one Canadian breeding location on islands off the Burin peninsula of Newfoundland (Lee et al. 2020). Does not breed in the Project Area or LAA but may be present in shallow waters during fall migration (eBird 2022).	-	-	✓	-
Northern Fulmar	<i>Fulmarus glacialis</i>	S1B, S1M	A seabird that nests throughout arctic and boreal regions of the North Atlantic and winters at sea (Mallory et al. 2020). Nests throughout NL in small numbers at seabird colonies, and historically bred in the Gulf of St. Lawrence (Stenhouse and Montevecchi 1999). Does not breed in the Project Area or LAA but may occasionally be present in nearby waters (eBird 2022), particularly in winter.	✓	✓	✓	✓
Northern Gannet	<i>Morus bassanus</i>	S2B, S2M	A plunge diving seabird that breeds in large colonies in the North Atlantic (Mowbray 2020). Three colonies (including the largest Northern Gannet colony in the world, Bonaventure Island) are in the Gulf of St. Lawrence west of the Project Area. The closest colony in Newfoundland is at Cape St. Mary's on the Avalon peninsula. Does not breed within the Project Area or LAA but is regularly seen in the waters off the LAA (eBird 2022). The foraging ground for all three of the Gulf of St. Lawrence colonies includes the waters around western Newfoundland.	✓	✓	✓	✓
Northern Parula	<i>Setophaga americana</i>	S1B?, SUM	A small warbler that breeds mature deciduous or mixedwood forests with bog or swamp habitat. In Canada, it breeds from southeastern Manitoba to the Maritime provinces (Moldenhauer and Regelski 2020). Not expected to be present within the Project Area or LAA but may breed in the Codroy Valley (eBird 2022).	-	✓	✓	-



Table 13.2 Species of Conservation Concern that may be Present within the Project Area and / or LAA

Common Name	Scientific Name	S Rank	Habitat Description	Presence in LAA and RAA			
				Spring	Summer	Fall	Winter
Pied-billed Grebe	<i>Podilymbus podiceps</i>	S1B, SUM	Has a wide distribution in North America; in Canada it is found from British Columbia to NL. During the breeding season is typically found in freshwater marshes or riparian habitats (Muller and Storer 2020). No breeding records within the Project Area or LAA and is a rare fall and winter migrant (eBird 2022). The only breeding site in NL is at Shoal Pond in the Codroy Valley.	-	-	✓	✓
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	S1B, SUM	Common throughout most of southern and central Canada in marsh and upland habitats (Yasukawa and Searcy 2020). Reaches the edge of its range in NL; no recent breeding records in the LAA. However, there are numerous records of the species in the Stephenville area (eBird 2022).	✓	✓	✓	-
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	S1B, SUM	Found in central and eastern Canada from Alberta to Prince Edward Island and Nova Scotia in woodlands, parks and gardens (Weidensaul et al. 2020). Only known to consistently breed in two locations in Newfoundland and Labrador, both of which are in the LAA. There are records near Stephenville and throughout the Codroy Valley (eBird 2022, NL BBA 2022a).	-	✓	✓	-
Veery	<i>Catharus fuscescens fuliginosus</i>	S2B, SUM	A neotropical migrant thrush that breeds in Canada from interior British Columbia to the Maritime provinces and southwestern Newfoundland (Heckscher et al. 2020). This subspecies is indigenous to the island of Newfoundland. Found in damp, deciduous forests with thick understory ((Heckscher et al. 2020). No records within the Project Area or LAA from eBird between 2003-2022 (eBird 2022). Known to be present in the Codroy Valley but could be present elsewhere in suitable habitat, particularly the Anguille Mountains.	-	✓	✓	-



Table 13.2 Species of Conservation Concern that may be Present within the Project Area and / or LAA

Common Name	Scientific Name	S Rank	Habitat Description	Presence in LAA and RAA			
				Spring	Summer	Fall	Winter
Willet	<i>Tringa semipalmata</i>	S1B, SUM	Nests in wetland habitats along the Atlantic coast from NL to Venezuela (Lowther et al. 2020) One of the only breeding locations in Newfoundland and Labrador occurs within the LAA in the St. George's Bay Region (eBird 2022, NL BBA 2022a). Nesting locations include the salt marshes of the Stephenville Crossing estuary, Turf Point causeway in the community of Saint George's, and along the Flat Island/Sandy Point peninsula (eBird 2022).	✓	✓	✓	-
Notes: S-ranks S1 – Critically imperiled in the province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the province. S2 – Imperiled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the province. S3 – Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation. S4 – Apparently Secure – Uncommon but not rare; some cause for long-term concern due to declines or other factors. 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). Qualifiers: B – Breeding – Conservation status refers to the breeding population of the species in the province. SU – Currently unrankable due to lack of information or due to substantially conflicting information about status or trends. N – Conservation status refers to the non-breeding population of the species in the province. M – 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. ? – Denotes inexact or uncertain numeric rank (? Qualifies the character immediately preceding it in the S-rank).							



13.2.2.4 Avifauna Habitat Assessment

The desktop habitat assessment identified 13 habitat types in the RAA (Table 13.3). Land cover classes were quantified using Forest Inventory geospatial data (NLDDFA 2018). This dataset is generated using aerial images of the forest that are captured in digital format using fixed-wing aircraft. Digital images are then processed using specialized computer software so that interpreters can define the height, species, age, and productivity of forest stands. Information derived from the images are ground truthed and information is entered into a geographic information system (GIS). Forest Inventory data is at a coarse scale and each category may contain multiple habitat types. For example, land classified as barrens contains multiple vegetated communities and there are wetland classes (e.g., fens) that are not represented in the dataset but are present on the landscape.

Approximately 80% of the Project Area consists of upland, 9% consists of bogs and 4% is open water. Within the LAA, approximately 69% consists of upland, 14% is lowland and 10% is open water. Upland areas are dominated by softwood forests (i.e., Balsam Fir, Black Spruce, White Spruce (*Picea glauca*) Forests). Mixedwood Forests (primarily balsam fir/white birch) are uncommon (8.7%) and hardwood forests make up less than 2% of the RAA. Lowland sites consist predominantly of open and treed bogs and lakes/ponds. Though not an official Project Boundary, the assessment references the “Project footprint”, which is the anticipated area of direct physical disturbance associated with construction, operation and decommissioning, within the Project Area. An alternate cleared area, described in Chapter 3, is not assessed but is also within the Project Area. The Project footprint is likely to change in some parts of the Project Area as a result of micro-siting, following biophysical surveys. The Project footprint represents 5.29% of the LAA and 1.12% of the RAA. The Project Area, which is not expected to be completely directly disturbed but represents the extent where clearing is possible, represents 36.56% of the LAA and 7.71% of the RAA.

Land cover within the RAA for the Codroy wind farm differs from that of the Port-au-Port RAA. Specifically, there is a higher percentage of hardwood forest in Codroy (approximately 3.3%) as compared to Port-au-Port (approximately 0.2%). The Codroy RAA also has a higher percentage of mixed forest (approximately 11.5%) than does the Port-au-Port RAA (approximately 1.3%).

Land cover classes considered as habitat for each bird species or species group are summarized in Table 13.4 and were established using relevant scientific literature, life history information, and professional judgement.



Table 13.3 Land Cover Composition in the Project Area (PA) Local Assessment Area (LAA) and Regional Assessment Area (RAA)

Land Cover Category	Land Cover Class ¹	RAA km ² (%)	LAA km ² (%)	Project Area km ² (%)	Project Area Component			
					Port au Port Wind Farm	Codroy Wind Farm	Hydrogen/Ammonia Plant	230 kV Transmission Line
					km ² (%)	km ² (%)	km ² (%)	km ² (%)
Upland	Agriculture	42.25 (1.16)	5.64 (0.75)	0.52 (0.18)	0.10 (0.09)	0 (0)	0 (0)	0.44 (0.77)
	Anthropogenic ²	80.88 (2.21)	16.54 (2.2)	5.62 (2.0)	0.73 (0.62)	0.68 (0.56)	0.65 (32.94)	4.54 (7.99)
	Soil Barren	210.40 (5.76)	70.32 (9.36)	35.37 (12.57)	6.77 (5.75)	27.74 (22.92)	0.20 (10.15)	1.28 (2.25)
	Rock Barren	42.82 (1.17)	12.05 (1.60)	3.42 (1.21)	3.32 (2.83)	0.03 (0.03)	0 (0)	0.29 (0.52)
	Coniferous Scrub	628.73 (17.22)	177.84 (23.67)	78.64 (27.93)	39.54 (33.62)	32.81 (27.11)	0.05 (2.43)	10.08 (17.73)
	Deciduous Scrub	59.21 (1.62)	10.96 (1.46)	3.91 (1.39)	0.84 (0.71)	1.99 (1.64)	0.37 (18.83)	0.80 (1.41)
	Hardwood	58.96 (1.61)	5.56 (0.74)	1.57 (0.56)	0 (0)	1.34 (1.11)	0 (0)	0.46 (0.81)
	Mixedwood	318.12 (8.71)	44.46 (5.92)	10.96 (3.89)	0.89 (0.75)	5.77 (4.76)	0.04 (1.84)	6.03 (10.61)
	Softwood	1363.37 (37.34)	303.76 (40.42)	104.99 (37.30)	53.53 (45.51)	35.76 (29.54)	0.05 (2.65)	23.18 (40.78)
	Forest - unclassified	126.14 (3.45)	23.88 (3.84)	9.24 (3.28)	6.78 (5.77)	0.94 (0.78)	0.08 (0.04)	1.68 (2.95)
Wetland	Bog	345.13 (9.45)	51.99 (6.92)	22.42 (7.97)	4.67 (3.97)	13.25 (10.94)	0.10 (5.15)	4.75 (8.35)
Aquatic	Lake/Pond	83.75 (2.29)	7.67 (1.02)	4.34 (1.54)	0.39 (0.33)	0.70 (0.58)	0.43 (22.06)	2.92 (5.14)
	River	39.34 (1.17)	1.88 (0.25)	0.45 (0.16)	0.05 (0.05)	0.04 (0.03)	0 (0)	0.36 (0.52)
	Marine ³	247.56 (6.78)	13.62 (1.81)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Other	Sand	4.04 (0.11)	0.22 (0.03)	0.02 (0.01)	0 (0)	0 (0)	0 (0)	0.02 (0.03)
Total		3651.19	751.44	281.50	117.61	121.05	1.97	56.86

Notes:

1. Based on Forest Inventory data (NL DFFA 2018)
2. Anthropogenic habitat includes cleared land, roadside right-of-way, transmission line right-of-way and residential land
3. Marine includes open ocean and coastal mudflats that are exposed at low tide



Table 13.4 Land Cover Classes used to Quantify Breeding Habitat for Bird Species Groups and Species at Risk

Land Cover Category	Land Cover Class ¹	All Birds	Waterbirds	Shorebirds	Waterfowl	Raptors	Upland Gamebirds	Landbirds	Evening Grosbeak	Gray-cheeked Thrush	Harlequin Duck	Hudsonian Godwit	Lesser Yellowlegs	Olive-sided Flycatcher	Piping Plover	Red Crossbill	Red Knot	Rusty Blackbird	Short-eared Owl
Upland	Soil Barren	✓	–	–	–	–	✓	✓	–	–	–	–	–	–	–	–	–	–	✓
	Rock Barren	✓	–	–	–	–	✓	✓	–	–	–	–	–	–	–	–	–	–	✓
	Coniferous Scrub	✓	–	–	–	–	✓	✓	–	✓	–	–	–	–	–	–	–	–	–
	Deciduous Scrub	✓	–	✓	–	–	✓	✓	–	–	–	–	–	–	–	–	–	–	–
	Hardwood Forest	✓	–	–	✓	✓	✓	✓	–	–	–	–	–	–	–	–	–	–	–
	Mixedwood Forest	✓	–	–	–	✓	✓	✓	✓	–	–	–	–	✓	–	–	–	–	–
	Softwood Forest	✓	–	–	–	✓	–	✓	✓	✓	–	–	–	✓	–	✓	–	✓	–
	Forest - unclassified	✓	–	–	✓	✓	✓	✓	✓	✓	–	–	–	✓	–	✓	–	✓	–
	Anthropogenic ²	✓	✓	✓	✓	✓	–	✓	–	–	–	–	–	–	–	–	–	–	✓
Wetland	Bog	✓	✓	✓	✓	✓	–	✓	–	–	–	–	–	✓	–	–	–	✓	✓
Aquatic	River	✓	✓	✓	✓	–	–	✓	–	–	–	–	✓	–	–	–	–	–	–
	Lake/Pond	✓	✓	✓	✓	✓	✓	✓	–	–	–	–	✓	–	–	–	–	–	–
	Marine ³	✓	✓	✓	✓	–	–	–	–	–	✓	✓	✓	–	✓	–	✓	–	–
Other	Sand/Beaches	✓	✓	✓	–	–	–	✓	–	–	–	✓	✓	–	✓	–	✓	–	–
Notes: 1. Based on Forest Inventory data (NL DFFA 2018) 2. Anthropogenic habitat includes cleared land, roadside right-of-way, transmission line right-of-way and residential land 3. Marine includes open ocean and coastal mudflats that are exposed at low tide																			



13.3 Assessment Criteria and Methods

This section describes the criteria and methods used to assess environmental effects on Avifauna. Residual environmental effects (Section 13.5) are assessed and characterized using criteria defined in Section 13.3.1, including direction, magnitude, geographic extent, timing, duration, frequency, reversibility, and ecological or socio-economic context. The assessment also evaluates the significance of residual effects using threshold criteria or standards beyond which a residual environmental effect is considered significant. The definition of a significant effect for avifauna is provided in Section 13.3.2. Section 13.3.3 identifies the environmental effects to be assessed for avifauna, including effect pathways and measurable parameters. This is followed by the identification of potential Project interactions with this VEC (Section 13.3.4). Analytical assessment techniques employed for the assessment of potential Project-related environmental effects on avifauna are provided in Section 13.3.5. The assumptions that were made to support a conservative approach to the assessment of residual effects on avifauna are described in Section 13.3.6.

13.3.1 Residual Effects Characterization

Table 13.5 presents definitions for the characterization of residual environmental effects on avifauna. The criteria are used to describe the potential residual effects that remain after mitigation measures have been implemented. Quantitative measures have been developed, where possible, to characterize residual effects. Qualitative considerations are used where quantitative measurement is not possible.

Table 13.5 Characterization of Predicted Environmental Effects of the Undertaking on Avifauna

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Nature	The long-term trend of the residual effect	• Neutral – no net change in the measurable parameter(s) for avifauna relative to baseline • Positive – a residual effect that moves measurable parameters in a direction beneficial to avifauna relative to baseline • Adverse – a residual effect that moves measurable parameters in a direction detrimental to avifauna relative to baseline



Table 13.5 Characterization of Predicted Environmental Effects of the Undertaking on Avifauna

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Magnitude	The amount of change in measurable parameter(s) of the VEC relative to existing conditions	• Negligible – No measurable change • Low: <u>Change in habitat:</u> disturbance/habitat loss results in measurable change in breeding bird density, but no change in breeding bird diversity (i.e., no loss of sensitive species). <u>Change in mortality:</u> observed mortality to migratory birds or bird nests, but at levels not anticipated to have a measurable effect on breeding density or diversity of local species populations • Moderate: <u>Change in habitat:</u> disturbance/habitat loss results in measurable change in breeding bird density with change in breeding bird diversity (i.e., displacement of sensitive species). <u>Change in mortality:</u> observed mortality to migratory birds or bird nests at levels that reduce breeding density or nesting success, but not anticipated to affect sustainability of local species populations. • High: <u>Change in habitat:</u> disturbance/loss of habitat results in measurable change in breeding bird density and results in displacement of multiple species. <u>Change in mortality:</u> Observed mortality to migratory birds or bird nests at levels that reduce breeding density or success and may affect sustainability of some local species populations.
Geographic Extent	The geographic area in which a residual effect of a defined magnitude occurs	• Project Area – residual effect is restricted to the Project Area • LAA – residual effect extends into the LAA • RAA – residual effect extends into the RAA
Timing	Considers when the residual environmental effect is expected to occur, where applicable or relevant to the VEC.	• No Sensitivity – The residual effect does not occur during critical life stage (e.g., nesting period or during key periods staging periods for shorebirds) or timing does not affect avifauna and avifauna habitat. • Moderate Sensitivity – The residual effect may occur during a lower sensitive period of a critical life stage; (e.g., several days prior to bird nesting period or key staging periods) or end (e.g., periods when birds have fledged but remain in proximity to their nest or near end of key staging period). • High Sensitivity – Residual effect occurs during a critical life stage (e.g., during breeding season or during key staging period).



Table 13.5 Characterization of Predicted Environmental Effects of the Undertaking on Avifauna

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Duration	The period of time required until the measurable parameter(s) or the VEC returns to its existing (baseline) condition, or the residual effect can no longer be measured or otherwise perceived	• Short-term – Residual effect is restricted to the duration of the construction phase (4 years) or the duration of the decommissioning and rehabilitation phase (1 year). • Medium-term – Residual effect extends beyond the construction phase OR includes both the construction and decommissioning and rehabilitation phase. • Long-term – Residual effect extends through the operation and maintenance phase of the Project (30 years) or extend beyond the life of the Project.
Frequency	Identifies how often the residual effect occurs during the Project, during a specific phase of the Project, or during another specified time period	• Single event • Multiple irregular event – Occurs at no set schedule. • Multiple regular event – Occurs at regular intervals. • Continuous – Occurs continuously.
Reversibility	Describes whether a measurable parameter(s) or the VEC can return to its existing condition after the Project activity ceases, including through active management techniques	• Reversible – Residual effect is likely to be reversed after activity completion and rehabilitation. • Irreversible – Residual effect is unlikely to be reversed.
Ecological / Socio-economic Context	Existing conditions and trends in the area where the residual effect occurs	• Undisturbed – Area is relatively undisturbed or not adversely affected by human activity. • Disturbed – Area has been substantially previously disturbed by human development or human development is still present.

13.3.2 Significance Definition

A significant residual adverse effect on avifauna is defined as a residual Project-related change to the environment that threatens the long-term persistence, viability, or recovery of an avifauna species population in the RAA, including effects that are contrary to or inconsistent with the goals, objectives or activities of recovery strategies, action plans and management plans.

13.3.3 Potential Environmental Effects, Project Pathways, and Measurable Parameters

Table 13.6 lists the potential Project effects on avifauna and provides a summary of the Project effect pathways and measurable parameters and units of measurement to assess potential effects. Potential environmental effects and measurable parameters were selected based on review of recent environmental assessments for large development projects in NL, renewable energy projects in other parts of Canada, comments provided during engagement, and professional judgment.



Table 13.6 Environmental Effects, Effect Pathways, and Measurable Parameters for Avifauna

Environmental Effect(s)	Effect Pathway(s)	Measurable Parameter(s) and Units of Measurement
Change in habitat	• Direct loss or alteration of bird habitat (e.g., vegetation clearing) • Indirect loss or alteration of bird habitat (e.g., sensory disturbance, edge effects)	Amount (ha) of avifauna habitat directly lost or altered for: • general bird habitat • waterbirds (seabirds, gulls, terns) • shorebirds • waterfowl • raptors • landbirds • upland gamebirds • SAR including: – Evening Grosbeak (<i>Coccothraustes vespertinus</i>) – Gray-cheeked Thrush (<i>Catharus minimus minimus</i>) – Harlequin Duck (<i>Histrionicus histrionicus</i>) – Hudsonian Godwit (<i>Limosa haemastica</i>) – Lesser Yellowlegs (<i>Tringa flavipes</i>) – Olive-sided Flycatcher (<i>Contopus cooperi</i>) – Piping Plover (<i>Charadrius melodus</i>) – Red Crossbill (<i>Loxia curvirostra perna</i>) – Red Knot (<i>Calidris canutus rufa</i>) – Rusty Blackbird (<i>Euphagus carolinus</i>) – Short-eared Owl (<i>Asio flammeus</i>) • Qualitative evaluation¹ of the amount of habitat directly lost or altered for: – Bank Swallow (<i>Riparia riparia</i>) • Qualitative evaluation of the amount of indirect habitat loss or altered for the bird groups and species listed above. • Area (ha) of formally defined SAR critical habitat directly or indirectly affected, if present • Number of formally defined SAR residences (e.g., Bank Swallow nests) directly or indirectly affected



Table 13.6 Environmental Effects, Effect Pathways, and Measurable Parameters for Avifauna

Environmental Effect(s)	Effect Pathway(s)	Measurable Parameter(s) and Units of Measurement
Change in mortality	- Construction and operations could result in a direct increase in mortality risk or number of bird fatalities (including nests/eggs) through vegetation clearing activities, vehicular collisions, wind turbine strikes, transmission line strikes - Indirect increase in mortality risk or number of bird fatalities (e.g., altered predator-prey dynamics, behavioural changes, increase in hunting and/or poaching because of improved access)	Estimated change in mortality risk for: - waterbirds (seabirds, gulls, terns) - shorebirds - waterfowl - raptors - landbirds - SAR including: - Bank Swallow (<i>Riparia riparia</i>) - Barn Swallow (<i>Hirundo rustica</i>) - Barrow's Goldeneye (<i>Bucephala islandica</i>) - Bobolink (<i>Dolichonyx oryzivorus</i>) - Evening Grosbeak (<i>Coccothraustes vespertinus</i>) - Gray-cheeked Thrush (<i>Catharus minimus minimus</i>) - Harlequin Duck (<i>Histrionicus histrionicus</i>) - Horned Grebe (<i>Podiceps auritus</i>) - Hudsonian Godwit (<i>Limosa haemastica</i>) - Ivory Gull (<i>Pagophila eburnea</i>) - Leach's Storm Petrel (<i>Hydrobates leucorhous</i>) - Lesser Yellowlegs (<i>Tringa flavipes</i>) - Olive-sided Flycatcher (<i>Contopus cooperi</i>) - Peregrine Falcon (<i>Falco peregrinus</i>) - Piping Plover (<i>Charadrius melodus</i>) - Red Crossbill (<i>Loxia curvirostra perna</i>) - Red-necked Phalarope (<i>Phalaropus lobatus</i>) - Red Knot (<i>Calidris canutus rufa</i>) - Rusty Blackbird (<i>Euphagus carolinus</i>) - Short-eared Owl (<i>Asio flammeus</i>) will be assessed qualitatively through: - risk of collisions with Project vehicles, equipment, and infrastructure - wind turbine and transmission line strikes - flaring events at hydrogen / ammonia plant - fatal attraction to lights Qualitative evaluation of indirect mortality risk: - Increase in predation, hunting and/or poaching because of improved access or other habitat changes - Hunting pressure (e.g., year-round access or access to new areas)
Note: 1. Bank Swallow habitat cannot be quantified using available habitat data.		



The Project will result in a direct loss of habitat for avifauna, including SAR, through vegetation clearing for access roads, turbines, transmission lines and other Project components. Water intake for the hydrogen / ammonia plant may also result in changes in water levels in adjacent wetlands, and ponds, which could cause a direct change in habitat. Vegetation clearing also results in the creation of habitat edges and subsequently can create edge effects. Edge effects can include changes in microclimate (e.g., Murcia 1995) and vegetation structure (e.g., Harper et al. 2005) which can in turn result in changes in the bird community in those habitats.

The Project can also result in indirect effects on habitat through sensory disturbance (e.g., noise, light pollution, dust, and vibrations). Sensory disturbance from noise, lighting, increased traffic volumes and dust deposition may cause avifauna to avoid or abandon habitat and may cause stress or other physiological effects.

The Project can result in a direct increase in mortality risk for avifauna, including individuals and nests. Increased mortality may be caused by land clearing, vehicular collisions, wind turbine strikes, transmission line strikes, and collisions with other Project infrastructure. Flaring events at the hydrogen / ammonia plant also has potential to result in bird mortality events. The development of access roads and the creation of edge habitats from vegetation clearing can indirectly result in avifauna mortality through increasing access to avifauna by predators, nest parasites and hunters. Sensory disturbance can also result in decreased nesting success.

13.3.4 Project Interactions with Avifauna

Table 13.7 uses checkmarks to indicate the routine Project activities that could interact with the VEC and result in the identified environmental effect(s) to be assessed. Immediately following Table 13.7, environmental effects pathways are briefly described for potential routine Project-related environmental effects and justification is provided in cases where no Project interaction with the VEC (and therefore no potential environmental effect on the VEC) is predicted.



Table 13.7 Project Interactions with Avifauna, Environmental Effects, and Environmental Effect Pathways

Project Activities	Environmental Effect(s) to be Assessed	
	Change in Habitat	Change in Mortality
Construction		
Site Preparation and Civil Works (including turbine foundations, road construction, quarries, clearing, grubbing, blasting, cement production, and watercourse crossings)	✓	✓
Transportation of Resources and Equipment (includes trucking, shipping and barging of materials)	-	✓
Construction / Installation, Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure	-	✓
Installation and Commissioning of Wind Turbines	-	✓
Installation and Commissioning of Collector Systems	-	✓
Installation and Commissioning of Transmission Lines and Substations (including marine cable crossing)	✓	✓
Installation and Commissioning of Hydrogen / Ammonia Production, and Storage Facilities and Associated Infrastructure (including Industrial water supply infrastructure)	-	✓
Restoration of Existing Port Facilities (including pile driving and dredging)	✓	✓
Emissions, Discharges, and Wastes ¹	✓	✓
Employment and Expenditures ²	-	✓
Operation and Maintenance		
Presence, Operation, and Maintenance of Wind Farms (including wind turbines, access roads, and collector systems)	-	✓
Presence, Operation, and Maintenance of Transmission Lines and Substations	-	✓
Presence, Operation, and Maintenance of Hydrogen / Ammonia Production, and Storage, Facilities and Associated Infrastructure (includes marine discharge from treatment plant)	✓	✓
Presence, Operation, and Maintenance of Port Facilities (includes loading of ammonia and vessel maneuvering within Port)	-	-
Emissions, Discharges, and Wastes ¹	✓	✓
Employment and Expenditures ²	-	✓
Decommissioning and Rehabilitation		
Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure	✓	✓
Decommissioning and Rehabilitation of Wind Farms (including wind turbines, access roads, and collector systems)	✓	✓



Table 13.7 Project Interactions with Avifauna, Environmental Effects, and Environmental Effect Pathways

Project Activities	Environmental Effect(s) to be Assessed	
	Change in Habitat	Change in Mortality
Decommissioning and Rehabilitation of Transmission Lines and Substations	✓	✓
Decommissioning and Rehabilitation of Hydrogen / Ammonia Production, and Storage, Facilities and Associated Infrastructure	✓	✓
Decommissioning and Rehabilitation of Port Facilities	✓	✓
Emissions, Discharges, and Wastes ¹	✓	✓
Employment and Expenditures ²	-	✓
Notes: ✓ = Potential interaction – = No interaction ¹ Emissions (e.g., light, noise, vibration, air contaminants and GHGs), discharges (e.g., wastewater and other liquid effluents), and hazardous and non-hazardous wastes are generated by many Project activities. Rather than acknowledging this by placing a checkmark against each of these activities, “Emissions, Discharges, and Wastes” is listed as a separate item under each phase of the Project. ² Project employment and expenditures are generated by most Project activities and are the main drivers of many potential socio-economic effects. Rather than acknowledging this by placing a checkmark against each of these activities, “Employment and Expenditures” is listed as a separate item under each phase of the Project.		

In the absence of mitigation, the Project may interact with avifauna in the following ways:

Construction:

- Site preparation and civil works including clearing vegetation, stripping soils, grubbing and grading for access roads and turbine pad construction will result in a change of habitat for avifauna. Habitat will be directly lost for avifauna during vegetation clearing for species groups and SAR in areas where suitable habitat is present and indirectly through edge effects and altered predator-prey dynamics. It could also result in changes in mortality risk due to loss of nests and mortality of individuals due to interactions with construction vehicles and equipment.
- Installation and commissioning of transmission lines and substations (including marine cable crossing) could result in change in habitat for avifauna, including those present in marine habitats (e.g., waterbirds, waterfowl), as well as result in changes in mortality risk due to loss of nests and mortality of individuals due to interactions with construction vehicles and equipment.
- Restoration of existing port facilities could result in change in habitat for avifauna that are present in marine habitats (e.g., waterbirds, waterfowl), and change in mortality from bird interactions with equipment.



- Emissions, discharges, and wastes could result in indirect loss of habitat from noise, light and human disturbance, or a change in mortality if sensory disturbance results in decreased nest success or increased adult mortality.
- Transportation of resources and equipment could affect a change in mortality due to collisions with construction vehicles and equipment.
- Construction / installation, presence, operation, and maintenance of temporary workforce accommodations and associated infrastructure, and installation and commissioning of wind turbines, collector systems, and hydrogen / ammonia production, and storage facilities and associated infrastructure, could result in change in mortality from loss of nests during installation of facilities or through bird collisions with equipment and vehicles.
- Employment and expenditures could result in a change in mortality risk occur if the presence of Project workers increases harvesting pressure on waterfowl and gamebirds.

Operation and Maintenance

- Presence, operation, and maintenance of wind farms (including wind turbines, access roads, and collector systems) could result in a change in mortality, due to wind turbine strikes and collisions with collector systems.
- Presence, operation, and maintenance of transmission lines and substations could result in change in mortality due to collisions with transmission lines and loss of nests during vegetation maintenance.
- Presence, operation, and maintenance of hydrogen / ammonia production, and storage, facilities and associated infrastructure (includes marine discharge from treatment plant) could result in change in water levels, which could cause a direct change in habitat; and change in mortality from interactions with flaring events and bird collisions with facilities and associated infrastructure.
- Emissions, discharges, and wastes during operation and maintenance can result in indirect loss of habitat from noise, light and human disturbance, and could result in a change in mortality if sensory disturbance results in decreased nest success or increased adult mortality.
- Employment and expenditures could result in a change in mortality risk occur if the presence of Project workers increases harvesting pressure on waterfowl and gamebirds.

Decommissioning and Rehabilitation

- Presence, operation, and maintenance of temporary workforce accommodations and associated infrastructure; decommissioning and rehabilitation of wind farms; decommissioning and rehabilitation of transmission lines and substations and decommissioning and rehabilitation of hydrogen / ammonia production, and storage, facilities and associated infrastructure could result in a change in habitat, and could result in change in mortality risk due to loss of nests and mortality of individuals due to interactions with construction vehicles and equipment.
- Decommissioning and restoration of existing port facilities (including pile driving and dredging) could result in a change in habitat for avifauna in marine or coastal environments and could result in change in mortality from bird interactions with equipment.



- Emissions, discharges, and wastes during decommissioning and rehabilitation could result in an indirect change in habitat due to sensory disturbance or change in mortality if sensory disturbance results in decreased nest success or increased adult mortality.
- Employment and expenditures could result in a change in mortality risk occur if the presence of Project workers increases harvesting pressure on waterfowl and gamebirds.

The following Project activities are not expected to interact with avifauna:

Construction

- Transportation of resources and equipment, construction / installation, presence, operation, and maintenance of temporary workforce accommodations and associated infrastructure; installation and commissioning of wind turbines; installation and commissioning of collector systems; installation and commissioning of hydrogen / ammonia production, and storage facilities and associated infrastructure and employment and expenditures are not expected to cause change in avifauna habitat during construction as there are no pathways that are not discussed in emissions, discharges, and wastes (i.e., sensory disturbances). Changes to habitat associated with these components would occur as a result of site preparation.

Operation and Maintenance

- Presence, operation, and maintenance of wind farms; presence, operation, and maintenance of transmission lines and substations; presence, operation, and maintenance of port facilities; and employment and expenditures are not expected to result in additional changes to habitat beyond the construction phase that are not discussed in emissions, discharges, and wastes (i.e., sensory disturbances).
- With mitigation, including avoidance of vegetation management during the breeding season, presence, operation, and maintenance of transmission lines and substations will not result in indirect effects on habitat.
- Presence, operation, and maintenance of port facilities are not expected to cause a change in avian mortality as direct interactions with birds are unlikely other than mortality due to light attraction, which is covered under emissions, discharges, and wastes.

Decommissioning and Rehabilitation

- Employment and expenditures are not expected to result in a change in habitat during decommissioning and rehabilitation as there are no known pathways.



13.3.5 Analytical Assessment Techniques and Level of Knowledge

13.3.5.1 Change in Habitat

Change in habitat was assessed by comparing direct and indirect changes in habitat availability from baseline conditions to the residual condition in the LAA for each Project phase (i.e., construction, operation and maintenance, decommissioning and rehabilitation), for bird groups and key bird SAR. Change in habitat for avian SAR with very few records of occurrence or for species that are found primarily in open ocean were not assessed, including:

- Barn Swallow (*Riparia riparia*)
- Barrow's Goldeneye (*Bucephala islandica*)
- Bobolink (*Dolichonyx oryzivorus*)
- Common Nighthawk (*Chordeiles minor*)
- Horned Grebe (*Podiceps auratus*)
- Ivory Gull (*Pagophila eburnea*)
- Leach's Storm Petrel (*Hydrobates leucorhous*)
- Peregrine Falcon (*Falco peregrinus*)
- Red-necked Phalarope (*Phalaropus lobatus*)

Direct change in habitat (e.g., vegetation clearing) was calculated as the loss of habitat due to clearing in the Project Area. In general, once vegetation clearing is completed during the construction component, areas that are cleared for turbines, access roads and the hydrogen / ammonia plant will provide no suitable bird habitat, except for a few species that may take advantage of developed sites (e.g., Killdeer (*Charadrius vociferus*)). Areas that are cleared for transmission and collector lines; however, will provide some habitat for bird species that use forest edges or open habitats (e.g., American Robin (*Turdus migratorius*), Canada Jay (*Perisoreus canadensis*)). Indirect change in habitat (e.g., sensory disturbance) was assessed qualitatively as the area of reduced habitat effectiveness; effects are confined to the LAA.

13.3.5.2 Change in Mortality Risk

Change in mortality risk was assessed qualitatively through evaluating the relative change in direct e.g., wind turbine strikes, transmission line strikes, vehicle collisions) and indirect sources of mortality (increased hunting pressure) compared to the existing condition. The qualitative assessment included a combination of literature review and professional judgement to predict effects. Change in mortality risk was assessed for each bird species group and SAR.



13.3.6 Assumptions and Conservative Approach

A conservative approach is used to address uncertainty in the environmental effects assessment, which increases confidence in the final determination of significance. This includes the following assumptions:

- The assessment used a habitat-based approach, which focuses on identifying habitat types affected by the Project relative to the availability of those habitats in the LAA and RAA. This approach is considered conservative as it assumes that bird species are present if the habitat is available.
- Relatively broad habitat classes were used for rankings, which may result in an overestimation of suitable habitat. In practice, species may only use a portion of habitats identified (e.g., forest is not mature enough, patch size is too small).
- All habitat within the Project Area will be lost, resulting in a direct loss of habitat; however in practice, not all vegetation will be cleared within the Project Area

13.4 Mitigation Measures

A series of environmental management plans will be developed by WEGH2 to mitigate the effects of Project development on the environment. A full list of mitigation measures to be applied throughout Project construction, operation and maintenance, and decommissioning and rehabilitation is provided in Section 26.2. Key measures to mitigate the potential effects of the Project on avifauna are listed in Table 13.8, by category and Project phase.

Table 13.8 Mitigation Measures: Avifauna

ID #	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
4	Mitigation	Sensitive areas (e.g., wetlands, rare plant occurrences, hibernacula, mineral licks, roosts) identified prior to Project activities will be flagged and appropriate buffers maintained around these areas, where feasible.	X	-	-
5	Mitigation	Clearing for temporary road construction will be limited to the width required for road embankment, drainage requirements, and safe line of sight requirements. Trees will be cut close to ground level, and only large tree stumps will be removed, where practicable. Low ground shrubs will be left in place for soil stability and erosion protection purposes, where possible.	X	-	-
8	Mitigation	Project staff and contractors will adhere to the waste management procedures to be included in the EPP and the Waste Management Plan.	X	X	X
9	Mitigation	Construction areas will be kept clear of rubbish and debris. Rubbish and debris will be appropriately stored and managed.	X	-	-



Table 13.8 Mitigation Measures: Avifauna

ID #	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
10	Mitigation	Waste materials and debris will be collected and stored in acceptable containers on-site and disposed of off-site in an environmentally acceptable and approved site. Materials that can be recycled will be sorted and taken to an approved facility.	X	X	X
11	Mitigation	Volatile wastes and materials, such as fuel, mineral spirits, oil, or paint thinner will be stored appropriately and will not be permitted to enter into waterways or storm drains. They will be disposed of at an approved site.	X	X	X
12	Mitigation	Where portable toilets are required, waste will be removed from the site by the supplier in a timely manner for appropriate disposal. These toilets will be located more than 30 m from the boundaries of wetlands or watercourses.	X	X	X
13	Mitigation	Burning of rubbish and waste materials on-site will not be permitted. Rubbish and waste materials will not be buried on-site.	X	X	X
14	Mitigation	Bulk fuel and lubricants will be stored in secure areas (i.e., with bund walls and impervious flooring) that have the capacity to trap more than the volume of petroleum hydrocarbons being stored; this will serve as a secondary containment should the primary containment fail. Other petroleum hydrocarbon products will not be stored in large quantities on-site, and secondary containment (e.g., drip trays) will be used in areas of storage and transfer.	X	X	X
15	Mitigation	Hazardous products will be stored according to industrial requirements and standards, and safely secured so that access is limited to authorized personnel.	X	X	X
16	Mitigation	Fueling and servicing will be conducted using appropriate containment equipment, including spill kits.	X	X	X
17	Mitigation	Fueling and servicing areas will be sited more than 100 m away from watercourses, coastlines, waterbodies, and wetlands.	X	X	X
18	Mitigation	The potential for spills will be reduced through the use of standard good practices, such as the use of appropriate containers, and avoiding overfilling.	X	X	X
19	Mitigation	Vehicles, heavy equipment, and machinery will be properly maintained to reduce the risk of leakage. Routine preventative maintenance and inspection of hydraulic equipment and machinery will be undertaken to avoid a hazardous material release.	X	X	X
20	Mitigation	Project footprint and disturbed areas will be limited to the extent practicable.	X	X	X



Table 13.8 Mitigation Measures: Avifauna

ID #	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
21	Mitigation	The limits for approved clearing, grubbing and topsoil overburden removal will be clearly identified (flagging/survey stakes) in the field prior to the commencement of work.	X	-	-
22	Mitigation	Project vehicles, heavy equipment, machinery, and associated exhaust systems and mufflers (and/or other appropriate sound attenuation devices) will be regularly inspected and maintained so that they remain operating in accordance with manufacturer's recommendations.	X	-	-
23	Mitigation	Project vehicles, heavy equipment, and machinery will be shut down when stationary for long periods of time. The idling of vehicles and equipment will be avoided whenever practical.	X	-	-
24	Mitigation	Dust from Project activities will be controlled where required by using applications of water or other approved agents. Waste oil will not be used for dust controls.	X	-	-
26	Mitigation	Re-seeding of areas will follow standard methods in compliance with permit conditions. These methods will be included the Project EPP.	-	-	X
27	Mitigation	Specific stockpiles of topsoil, overburden, and other potentially dust-generating materials will be kept covered, where practical, and used as soon as practical, or will be appropriately temporarily vegetated.	X	-	-
29	Mitigation	Project vehicles will drive within the speed limit to reduce engine noises as vehicles travel on roadways within adjacent communities, and horns will be used only as necessary for safety purposes.	X	-	-
32	Mitigation	An Explosives and Blasting Management Plan will be developed by the blasting contractor to provide direction for the safe storage, handling and use of explosives and explosive components at the Project site, to address the safety of the public and Project personnel, and protection of both the environment and Project components.	X	-	-
33	Mitigation	Areas to be cleared will have sediment and erosion control measures implemented per the site-specific Erosion & Sediment Control Plan prior to the initiation of clearing activities. The sediment and erosion control measures will be adapted to suit the field conditions associated with the specific construction activities as construction proceeds.	X	-	-
34	Mitigation	Construction areas will be routinely monitored to identify areas of potential erosion and to apply appropriate mitigation. Best practice erosion and sediment control measures will be implemented, as required.	X	-	-



Table 13.8 Mitigation Measures: Avifauna

ID #	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
35	Design	The drainage system for the site will be designed to appropriately manage stormflows considering impacts to on-site downstream watercourses, and coastlines, and infrastructure. Additionally, the site drainage system will consider the variable and seasonal up-stream drainage needs to provide adequate access to downstream watercourses without adverse impact on the plant site or other nearby infrastructure.	X	-	-
37	Mitigation	For work during the nesting season, pre-clearing surveys will be conducted for active migratory bird nests and buffer / set-back distances from active nests will be established.	X	-	-
38	Mitigation	The discovery of nests by staff will be reported to the Environmental Advisor at site and appropriate action or follow-up will be guided by the Project EPP.	X	-	-
39	Mitigation	Environmental personnel responsible for site monitoring during construction will receive training to recognize SAR / SOCC that may be present in Project Area.	X	-	-
40	Mitigation	WEGH2 will work with Wildlife Division to manage interactions with identified sensitive areas.	X	X	X
41	Mitigation	Artificial lighting will be limited to the amount required for safety and security purposes, and will be directional, or otherwise designed, to reduce spill-over light, wherever feasible, without compromising site safety or security. Lights will be side-shielded and directed downward to reduce the attraction of birds, where possible.	X	-	-
43	Mitigation	To reduce the risk of introducing or spreading exotic and/or invasive vascular plant species, equipment will arrive at the construction site clean and free of soil and vegetative debris. Equipment will be inspected by Project personnel or designate and either approved for use or cleaned, re-inspected and approved for use.	X	X	X
44	Mitigation	To avoid attracting wildlife, wastes will be securely stored, frequently removed from site, and properly disposed of in an environmentally acceptable manner at an approved site.		X	-
65	Mitigation	Project drivers will be cautioned to obey the speed limit and other traffic laws.	-	X	-
70	Mitigation	Waste generated on-site will be removed on a regular basis and disposed of appropriately at an approved facility.	-	X	-
72	Mitigation	Turbine lighting levels will be at, or above, the minimum allowed by Transport Canada for aeronautical safety, and white or red strobe lights may be used with the minimum intensity and flashes per minute allowable.	X	X	-



Table 13.8 Mitigation Measures: Avifauna

ID #	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
73	Mitigation	A post-construction wildlife mortality monitoring program will be established, and carcass searches will be conducted at the turbines between April and October. Surveys will be designed to account for searcher efficiency and scavenger rates. The mortality monitoring program will be developed in consultation with the Government of NL Wildlife Division and the CWS.	X	-	-
74	Mitigation	An adaptive management framework will be used to introduce new mitigation measures if high fatality rates are observed. Mitigation measures such as an increase in cut-in speeds, or other effective mitigation measures from operational wind power projects, will be considered.	X	X	X
77	Mitigation	Best practices for the proper handling, storage, and disposal of spilled hazardous chemicals and fuels will be included in the EPP and implemented by the Project personnel and contractors.	X	X	X
80	Mitigation	Emergency response plans will be developed, including spill prevention and response, emergency response measures, training, responsibilities, clean-up equipment and materials, and contact and reporting procedures.	X	X	X
81	Mitigation	Appropriate Project personnel will be trained in fuel handling, equipment maintenance, and fire prevention and response measures.	X	X	X
82	Design	Fire prevention and suppression systems will be maintained on site and will consider proper suppression systems for the various potential ignition sources.	X	X	X
83	Mitigation	Spill response kits will be available on-site. Project vehicles will be equipped with appropriately sized spill kits.	X	-	-
84	Mitigation	In the event of a spill, dry clean up and mopping techniques will be used, as appropriate. The area will not be "washed down" as this could cause the spills to spread to the surrounding environment and potentially enter drainage works or environmentally sensitive areas.	X	-	-
85	Mitigation	Soil that may have become contaminated will be remediated. This may be done on-site or removed from site for disposal at an approved location.	X	-	-
124	Design	Proposed design will be submitted to Navigation Canada for evaluation and approval, where warning lights on the 230kV structures along the transmission path may be required.	X	-	-
125	Design	Transmission line configurations, designed to limit overall height, will be used where practicable.	X	-	-
136	Mitigation	Site-specific erosion and sedimentation control plans will be developed during detailed design phase of the Project and will be implemented.	X	-	-



Table 13.8 Mitigation Measures: Avifauna

ID #	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
137	Mitigation	To address the risk of slope instability, a detailed terrain mapping assessment, including ground-truthing, for the final Project Area will be completed to identify both construction constraints and geohazards that may impact the Project. Slope stability assessments will be completed as part of the design, particularly at locations where there is proposed re-grading and glacio-fluvial deposits that are susceptible to erosion and undermining as seen in Stephenville.	X	-	-
138	Mitigation	To address the risk of subsidence a detailed terrain mapping assessment using LiDAR from the Project Area to assess for karst formation that may be present will be completed.	X	-	-
148	Mitigation	Wildlife surveillance will be conducted prior to, and post, noise elevated activities. Activities may be delayed until wildlife have been allowed to leave the area as directed by the OSEM.	X	-	-
149	Mitigation	Blasting patterns and procedures will be used to reduce shock or instantaneous peak noise levels, in accordance with a Blast Management Plan that will be developed for the Project.	X	-	-
150	Mitigation	Explosives will be used in a manner that will reduce damage or defacement of landscape features, trees, ecologically sensitive areas such as wetlands, and other surrounding objects, by controlling through standard best practice (including precisely calculated explosive loads and adequate stemming), the scatter of blasted material beyond the limits of activity. Outside of cleared areas, inadvertently damaged trees will be cut, removed, and salvaged, if merchantable (refer to Section, "Clearing of Vegetation"). Fly rock, which inadvertently enters a waterbody, watercourse, or ecologically sensitive area and that can be recovered without further damage to the environment, will be removed. Instances where larger fly rocks (boulders) enter these areas or deep waterbodies, recovery of this will be discussed with the OSEM.	X	-	-
151	Mitigation	Time delay blasting cycles or blasting mats will be used, if necessary, to control the scatter of blasted material.	X	X	X
158	Mitigation	Previous testing on selected samples of bedrock has shown the samples to be Non-Potentially Acid Generating (NPAG). As a precautionary measure, the OSEM will inspect all areas of blasted rock and rock stockpiles so no evidence of PAG material exists.	X	X	X
159	Design	Proposed ecological reserves on the Port au Port Peninsula and Codroy area will be avoided to the extent possible.	X	X	X
183	Mitigation	Project personnel will not be permitted to hunt / fish / harvest while staying at the workforce accommodation camp(s) and/or performing work on the Project and will not be permitted to bring firearms or angling gear to the workforce accommodation camp(s).	X	X	X



Table 13.8 Mitigation Measures: Avifauna

ID #	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
240	Mitigation	Tree clearing will be completed in accordance with permit conditions, including any timing windows/restrictions.	X	X	X
250	Engagement	Develop a Species at Risk Impacts Mitigation and Monitoring Plan (SAR IMMP) in consultation with NLDFFA post-EA release and prior to the issuance of an Economic Activity Permit. The SAR IMMP will include mitigation, monitoring, and adaptive management frameworks for possible impacts on SAR risk including, but not limited to, plants, bats and provincially managed bird species such as raptors. The Plan will be updated when species that occur within the Project footprint are designated and listed after the Project approval dates, or if currently listed species move into the Project Area.	X	-	-
265	Mitigation	An Avifauna Management Plan will be developed and implemented for the Project, and will include such measures as conducting pre-clearing surveys for active migratory bird nests during the breeding bird season, and buffer / set-back distances from active nests.	X	X	-
318	Mitigation	Environmental personnel responsible for site monitoring during construction will receive training to recognize Great Blue Heron nests that are protected year-round on Schedule 1 of the Migratory Bird Regulations, 2022	X	-	-
319	Mitigation	When possible, flashing lights will be used as opposed to fixed lighting, while adhering to Transport Canada's requirements.	X	X	-
340	Mitigation	Vegetation removal and herbicide application will be in accordance with relevant permit conditions and regulatory requirements, including prescribed timing windows.	X	-	X
* Note: "ID #" denotes the master identification number for mitigation in Appendix 26-A. "C" denotes the construction phase of the Project. "O" denotes the operation and maintenance phase of the Project. "D" denotes the decommissioning and rehabilitation phase of the Project. "X" denotes the Project phase for the mitigation measure					



13.4.1 Application of the Precautionary Principle to Project Mitigation Measures

The mitigation measures in Section 13.4 have been selected in consideration of the environmental effects pathways and include standard proven mitigation measures for the terrestrial and marine environments. The precautionary principle was used in determining mitigation measures for the Project.

As a result of using the precautionary principle, it is expected that the mitigation measures presented are more than adequate for reducing effects to acceptable levels that are below thresholds for what would be considered an unacceptable effect.

13.5 Residual Environmental Effects

13.5.1 Change in Habitat

13.5.1.1 Construction

Direct habitat loss for avifauna will occur during the construction phase as a result of land clearing and land conversion. This will occur during the site preparation and civil works project activities. Vegetated habitat will be cleared for temporary workforce accommodations, roads, transmission lines and substations, collector lines, turbines, the hydrogen / ammonia plant, and other Project infrastructure.

For the purposes of the assessment, a conservative estimate of vegetation clearing in the Project Area will result in a loss of 40.72 km², a 5.4% decrease in habitat from existing conditions in the LAA (Table 13.9). The likely habitat loss is the Project footprint, which represents 5.29% of the LAA and 1.12% of the RAA. This conservative approach to the assessment results in a worst case scenario for potential project effect on birds. Most of the habitat that will be lost is potential bird habitat except for about 1 km² of anthropogenic and agricultural habitat, which may still provide habitat for avifauna but to a lesser extent. The Project will remove 36.36 km² of upland habitats, and 3.3 km² of wetland/aquatic habitats (Table 13.9). Species most likely to be affected by a direct loss of habitat are those that inhabit coniferous scrub and coniferous forest (softwood) habitats – primarily landbirds, raptors, and some gamebird species. Effects on species groups (i.e., waterbirds, shorebirds, waterfowl, raptors, landbirds, upland gamebirds) and SAR are described in greater detail below.

Construction of turbine pads, access roads, substations will result in a loss of avifauna habitat because the habitat will no longer be suitable. Construction of the Codroy wind farm will result in a greater loss of bog, soil barren and mixedwood forest compared to the Port au Port wind farm. Construction of the Port au Port wind farm will result in a greater loss of coniferous scrub, rock barren and softwood forest. Clearing of vegetation for collector lines and transmission lines will result in a change in avifauna habitat but will provide habitat for bird species that use forest edges or open habitats.

An indirect loss of change in avifauna habitat may occur through sensory disturbance (i.e., noise and light), dust deposition, edge effects and habitat fragmentation. In areas where vegetation is cleared for the Project, new edges may be created. Clearing of upland forest areas can result in changes to habitat that was previously forest interior with respect to abiotic factors. Edge effects can include changes in



microclimate, vegetation structure, and changes to avifauna presence, abundance or behavior (Harper et al. 2005; Murcia 1995). The effects of the creation of new edges varies by species - some bird species prefer edge habitat (e.g., American Robin, White-throated Sparrow (*Zonotrichia albicollis*)) and may increase in abundance along edges. Habitat interior specialists (e.g., Swainson's Thrush (*Catharus ustulatus*), Black-throated Green Warbler (*Setophaga virens*), on the other hand will avoid edge habitats and may decrease in abundance in these habitats (Whitaker and Montevecchi 1997).

Indirect effects on habitat through sensory disturbance (e.g., noise, light pollution, dust and vibrations) can result in indirect habitat loss. Sensory disturbance from noise of blasting and heavy equipment, site lighting, increased traffic volumes, presence of workers and dust deposition may trigger an avoidance response (Marques et al. 2021) or may cause stress or other physiological effects. These effects are generally considered greatest if disturbance occurs during critical periods such as the breeding season, but Project lighting can also cause adverse effects on migrating avifauna; the zone of influence varies with factors such as weather, intensity, and position (height) of the light source, and ambient light conditions (Poot et al. 2008; Jones and Francis 2003; Montevecchi 2006). Light pollution can cause birds to modify their daily rhythms, including timing of singing (Dominoni 2015), and changes to reproductive timing (Dominoni et al. 2013). It is well known that artificial light can cause disorientation in nocturnally migrating birds, as they may become attracted to the light (Spoelstra and Visser 2013; Van Doren et al. 2017). Mitigation will be implemented to lessen the effect of noise and light pollution.

Displacement may occur during both the construction and operational phases of wind farms, but there is evidence to suggest that wind farm construction can have greater effects on some bird species than wind farm operation (Pearce-Higgins et al. 2012). Displacement of birds from areas adjacent to wind turbines (i.e., decreased density) varies by location, species group, habitat, and site. In an analysis of 71 peer-reviewed studies of bird displacement by wind turbines, 40.6% found displacement effects, 7.7% found attraction; and just over half of the peer-reviewed studies did not detect displacement (Marques et al. 2021). There is also a large range in the mean distance that birds are displaced from wind turbines from hundreds of metres up to kilometers (Marques et al. 2021). A large-scale study of effect of wind turbines on grassland birds across 36 states in the United States found that at 1,600 meters from turbines, the effects on breeding birds become largely insignificant (Miao et al. 2019). For this Project, effects of sensory disturbance are expected to mostly be restricted to the LAA, although displacement effects could extend further for species that are migrating through the RAA.



Table 13.9 Estimated Change in Land Cover Compensation in the LAA

Land Cover Category	Land Cover Class ¹	Existing Condition (LAA)	Direct Change in Habitat (Project Area)	
		km ²	km ²	%
Upland	Agriculture	5.64	-0.10	-1.77
	Anthropogenic ²	16.54	-0.94	-5.68
	Soil Barren	70.32	-4.6	-6.54
	Rock Barren	12.05	-0.42	-3.49
	Coniferous Scrub	177.84	-10.89	-6.12
	Deciduous Scrub	10.96	-0.84	-7.66
	Hardwood	5.56	-0.44	-7.91
	Mixedwood	44.46	-2.36	-5.31
	Softwood	303.76	-15.62	-5.14
	Forest - unclassified	23.88	-1.16	-4.86
Wetland	Bog	51.99	-2.56	-4.92
Aquatic	Lake/Pond	7.67	-0.68	-8.87
	River	1.88	-0.08	-4.26
	Marine ³	13.62	0	0
Other	Sand	0.22	0	0
Total		751.44	-40.72	-5.42
Notes:				
1. Based on Forest Inventory data (NL DFFA 2018)				
2. Anthropogenic habitat includes cleared land, roadside right-of-way, transmission line right-of-way and residential land				
3. Marine includes open ocean and coastal mudflats that are exposed at low tide				

Waterbirds

There will be no direct habitat loss for seabirds, gulls, terns that breed in or migrate through the LAA as nesting and staging areas are located outside of the Project Area in coastal areas. This includes waterbird SOCC (Caspian Tern, Manx Shearwater, Northern Fulmar, Northern Gannet, Pied-billed Grebe).

Other waterbirds that are present in freshwater lakes and marshes such as Common Loon (*Gavia immer*), Sora (*Porzana carolina*) and American Bittern (*Botaurus lentiginosus*) could experience direct habitat loss. Sora and American Bittern are found in marsh habitats with cattails and long grasses and Common Loons nest in vegetation at the edge of small ponds. The distribution of these species within the LAA is not well known. Construction of the Project will result in a direct loss of 3.32 km² of wetland and aquatic habitat within the LAA, a 4.4% change from existing conditions. However, most of this habitat (i.e., identified wetlands) consist of open and treed bogs, which is generally not suitable breeding habitat for waterbirds.



Restoration of existing port facilities during construction may result in a direct habitat loss for waterbirds that use the port for nesting or roosting. The port is used by gulls, loons, and cormorants.

Other effect pathways, including dust deposition, and sensory disturbance, have the potential to reduce habitat availability for waterbirds, but effects will be greatest in areas where the Project Area is immediately adjacent to marshes and ponds that may support waterbirds. Sensory disturbance during installation of port facilities may displace a small number of waterbirds during construction, however, the large gull and tern colonies are located on coastal islands, peninsulas, and estuaries, most of which are greater than 1.5 km from wind turbines and associated infrastructure so effects (if any) will be relatively small.

Overall, the direct and indirect habitat loss or alteration of waterbird habitat due to the Project are relatively small and are unlikely to result in a measurable change in the abundance of breeding and migrating waterbirds in the LAA. The residual effects of the construction phase on waterbird habitat are expected to be adverse, low in magnitude, restricted to the LAA, occur during times of no to high sensitivity, be short (indirect loss) to long-term (direct habitat loss) in duration, and continuous. Loss of wetland habitat is expected to be irreversible (Section 13.5.3.1).

Shorebirds

The RAA and LAA provides habitat for breeding shorebirds and for migrating shorebirds that use the area for staging and refueling during spring and fall migration. Four species of shorebirds are common in wetland habitats in the Project Area and LAA including but not limited to ponds, streams, wet meadows, bogs, wet thickets, swamps and marshes: Spotted Sandpiper (*Actitis macularius*), Least Sandpiper (*Calidris minutilla*) and Wilson's Snipe (*Gallinago delicata*) are abundant throughout the Project Area in wetland habitats (eBird 2022). Construction of the Project will result in a direct loss of 3.32 km² of wetland and aquatic habitats that may be used by breeding shorebirds within the LAA, a 4.4% change from existing conditions. American Woodcock (*Scolopax minor*) prefers early successional habitats such as deciduous thickets, young hardwood forests, open fields, and bogs. This species, which appears to be uncommon within the RAA may also experience direct habitat loss from clearing of wetland and to a lesser extent deciduous scrub (0.84 km²).

Semipalmated Plovers (*Charadrius semipalmatus*), which nest in isolated areas at Shoal Point, Stephenville Crossing (near Mattis Point), and in the Codroy Valley (NL BBA 2022a; eBird 2022) will not experience direct habitat loss. Similarly, Willet (*Tringa semipalmata*; a SOCC), which nests in salt marshes of the Stephenville Crossing estuary, Turf Point causeway in the community of Saint George's, and along the Flat Island/Sandy Point peninsula (eBird 2022) will not experience direct habitat loss.

Killdeer is a common shorebird species that nests on the ground, commonly in anthropogenic areas but also in natural habitats where there are fields or on gravel. Habitat for Killdeer may be created by the Project because this species has been known to nest on gravel roads and turbine pads, including close to turbines (A. Taylor pers. comm), however, nests located on roads are at risk of being destroyed. With the implementation of mitigation, including regular pre-construction nest surveys during the breeding season, timing windows and buffer zones around active nests, loss of habitat for Killdeer is not anticipated.



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Breeding shorebirds may also experience indirect habitat loss through sensory disturbance during construction. Pearce-Higgins et al. (2012) found that Common Snipe populations (*Gallinago gallinago*) showed a decline of 53% during construction of a wind farm. Based on this, a reduction in breeding habitat for some shorebird species may occur during construction.

Many eastern North American shorebirds that breed in the high arctic migrate across the LAA and RAA during the spring and fall (eBird 2022). Numerous species of migrating shorebirds may be found in a variety of habitats during migration including mudflats, rocky shores, bogs, fields, flooded areas, and beaches. There will be no direct loss to habitat for migrating shorebirds and indirect loss via sensory disturbance during construction is likely to be negligible because most shorebird staging areas are located > 1.5 km from the Project Area. The Port Harmon Beach and retention pond, located adjacent to the hydrogen / ammonia plant which supports shorebirds during spring and fall, could experience a small loss of habitat (from disturbance) for staging shorebirds during construction of the plant and port facilities. However, with the implementation of mitigation, including pre-construction surveys, timing windows to avoid times when large numbers of shorebirds are present and set-backs, indirect effects on staging shorebirds are not expected.

The RAA and parts of the LAA are used by wintering Purple Sandpiper. During the February 2023 survey, 244 Purple Sandpipers were observed at 15 locations in the RAA on rocky shores. There will be no direct habitat loss for wintering Purple Sandpipers and indirect habitat loss during construction is not expected because wintering locations are all in coastal areas outside of the LAA.

The residual effects of the construction phase on shorebird habitat are expected to be adverse, low (migrating and wintering shorebirds) to moderate (breeding shorebirds) in magnitude, restricted to the LAA, occur during times of no to high sensitivity, be short (indirect loss) to long-term (direct habitat loss) in duration and continuous. Loss of terrestrial habitat is reversible whereas loss of wetland habitat is irreversible (Section 13.5.3.1).

Waterfowl

The LAA and RAA supports a diversity of waterfowl species during the breeding season, the most numerous of which are: Canada Goose (*Branta canadensis*), Mallard (*Anas platyrhynchos*), American Black Duck, Northern Pintail (*Anas acuta*), Green-winged Teal (*Anas crecca*), Ring-necked Duck (*Aythya collaris*), American Wigeon (*Mareca americana*) and Red-breasted Merganser (*Mergus serrator*), which may be found in areas of appropriate freshwater marshes, ponds, lakes and rivers within the LAA and RAA (NL BBA 2022a, eBird 2022). Construction of the Project will result in a direct loss of 3.32 km² of wetland and aquatic habitat within the LAA, a 4.4% change from existing conditions. Construction will also result in an increase in sensory disturbance, which can reduce habitat quality. Research on effects of anthropogenic disturbance on the breeding success of waterfowl ranges from positive (Roy 2018; Skaggs et al. 2020) to neutral or a weak negative effect (e.g., Kemkin et al. 2019; Singer et al. 2020). The sensory disturbance from construction is a change from the existing conditions and considered an adverse effect.

Coastal areas, including estuaries, open ocean and freshwater coastal habitats in the RAA and parts of the LAA are important for migrating waterfowl. The LAA supports some species of European migrants, and North American species such as American Wigeons and Greater and Lesser scaup (*Aythya affinis*),



mergansers, goldeneyes, scoters, eiders, Long-tailed Ducks (*Clangula hyemalis*), and Buffleheads (*Bucephala albeola*). Estuarine habitats along the coast, including the Codroy Valley Estuary IBA and the Stephenville Crossing estuary, are of particular importance for migrating waterfowl. Construction of the Project will not result in the direct loss or alteration of aquatic habitats that support migrating waterfowl. Indirect habitat loss from sensory disturbance could affect staging waterfowl in areas that are close to construction activities when birds are present. Sensory disturbance during installation of port facilities may displace a small number of waterfowl during construction, however, the large concentrations of staging waterfowl are in coastal areas and estuaries, most of which are greater than 1.5 km from wind turbines and associated infrastructure so effects (if any) will be relatively small.

However, mitigation to reduce noise and disturbance to wildlife and implementation of timing windows and pre-construction surveys will result in negligible indirect effects to staging waterfowl. The residual effects of the construction phase on waterfowl habitat are expected to be adverse, low in magnitude, restricted to the LAA, occur during times of no to high sensitivity, be short (indirect loss) to long-term (direct habitat loss) in duration, continuous and loss of wetland habitat is expected to be irreversible (Section 13.5.3.1).

Raptors

Construction of the Project will result in the direct loss of 19.59 km² of forested habitat, a 5.12% loss within the LAA. Forested habitat may support Merlin (*Falco columbarius*), Great Horned Owl (*Bubo virginianus*) and the less common Sharp-shinned Hawk (*Accipiter striatus*) and Northern Saw-whet Owl (*Aegolius acadicus*). Bald Eagle may also be present in forested areas where large trees and adjacent waterbodies are present. There will be a direct loss of 0.76 km² loss of aquatic habitat (based on the terrestrial habitat assessment; Section 13.2.2.4), which may provide foraging habitat for Bald Eagle and Osprey (*Pandion haliaetus*) and a direct loss of 2.56 km² of wetland, which may provide habitat for Northern Harrier (*Circus hudsonius*). In addition, raptors may be affected by indirect change in habitat (sensory disturbance) resulting from Project construction, as their nest sites are sensitive to anthropogenic disturbance. Other effect pathways, including dust deposition, edge effects, and fragmentation may also reduce habitat availability in areas where the Project Area is immediately adjacent to raptor nests. Implementation of nest setbacks, timing windows and nest monitoring during construction will reduce the likelihood of indirect effects on raptors.

During migration, adverse effects relating to the direct and indirect loss or alteration of habitat on raptors will be negligible; relatively small numbers of raptors pass through the RAA and there are no known bottlenecks that concentrate the migrating raptors. Wintering raptors may be adversely affected but the magnitude will be low.

The residual effects of the construction phase on raptor habitat are expected to be adverse, low (wintering) to moderate (breeding) in magnitude, restricted to the LAA, occur during times of moderate to high sensitivity, be short (indirect loss) to long-term (direct habitat loss) in duration and continuous. (Table 13.16). Loss of terrestrial habitat is reversible whereas loss of wetland habitat is irreversible.



Landbirds

Construction of the Project will result in the direct loss of 40.72 km² (a 5.4% decrease) of habitat within the Project Area, which includes approximately 1 km² of anthropogenic and agricultural habitat. Habitat for landbirds includes all upland and wetland habitat classes. The largest proportional loss of upland habitat is for hardwood (a 7.91% decrease), followed by deciduous scrub (a 7.66% decrease) because these habitat types are uncommon within the RAA (Table 13.10). There will be a proportional loss of 6.12% of coniferous scrub and a loss of 5.14% of softwood forest. Following construction of the Project, habitat for landbirds within the LAA will remain abundant because anthropogenic disturbance is low within the RAA and large tracts of habitat will remain intact.

Direct and indirect habitat loss or alteration is most likely to affect breeding landbird species that are common within the LAA (eBird 2022, NL BBA 2022a), such as:

- American Goldfinch (*Spinus tristis*)
- American Redstart (*Setophaga ruticilla*)
- Black-capped Chickadee (*Poecile atricapillus*)
- Black-and-white Warbler (*Mniotilta varia*)
- Black-throated Green Warbler (*Setophaga virens*)
- Blackpoll Warbler (*Setophaga striata*)
- Blue Jay (*Cyanocitta cristata*)
- Boreal Chickadee (*Poecile husonicus*)
- Canada Jay
- Dark-eyed Junco (*Junco hyemalis*)
- Downy Woodpecker (*Dryobates pubescens*)
- Fox Sparrow (*Passerella iliaca*)
- Golden-crowned Kinglet (*Regulus satrapa*)
- Hairy Woodpecker (*Dryobates villosus*)
- Hermit Thrush (*Catharus guttatus*)
- Magnolia Warbler (*Setophaga magnolia*)
- Northern Flicker (*Colaptes auratus*)
- Northern Waterthrush (*Parkesia noveboracensis*)
- Red-breasted Nuthatch (*Sitta canadensis*)
- Ruby-crowned Kinglet (*Corthylio calendula*)
- Swainson's Thrush
- White-throated Sparrow
- White-winged Crossbill (*Loxia leucoptera*)
- Yellow Warbler (*Setophaga petechia*)
- Yellow-rumped Warbler (*Setophaga coronata*)
- Yellow-bellied Flycatcher (*Empidonax flaviventris*)
- Pine Siskin (*Spinus pinus*)

An indirect loss of landbird habitat is expected through sensory disturbance during construction. It is well known that anthropogenic noise negatively affects landbirds. Effects of noise include declines in breeding success, behavioural changes such as altered song characteristics (Francis et al. 2011), to population or physiological consequences such as altered species abundance and/or richness and increased stress (Bayne et al. 2008, Shannon et al., 2016, Rosa and Koper 2023). A study that experimentally replicated traffic noise to a roadless area documented more than a one-quarter decline in bird abundance and almost complete avoidance by some species, which suggests that that anthropogenic noise can have strong adverse effects on birds (McClure et al. 2013).



Other effect pathways, including dust deposition, edge effects, and fragmentation may also reduce habitat quality in areas adjacent to the Project Area. Edge and fragmentation effects will vary by species. For example, forest-interior species are disproportionately affected compared to edge-tolerant (Laurance et al. 2004). Although birds are highly mobile, studies show that natural and anthropogenic (e.g., roads or utility corridors) forest gaps, may impede landscape-level movements of some bird species (Bélisle and St. Clair 2002).

The residual effects of the construction phase on landbird habitat are expected to be adverse, moderate in magnitude, restricted to the LAA, occur during times of no sensitivity, be short-term in duration, continuous and reversible (Section 13.5.3.1).

Upland Gamebirds

There will be a direct loss of habitat during construction for two upland gamebird species that are present in forested habitats within the LAA - Ruffed Grouse (*Bonasa umbellus*) and Spruce Grouse (*Canachites canadensis*) and two species that are present in open habitats (barrens) – Willow Ptarmigan (*Lagopus lagopus*) and Rock Ptarmigan (*Lagopus muta*).

There will be a 31.3 km² and 27.68km² loss of potential habitat for Ruffed Grouse and Spruce Grouse respectfully. A direct loss of 7.59 km² of habitat for Willow and Rock Ptarmigan is also anticipated. An indirect loss of habitat for gamebirds is expected through sensory disturbance during construction in forested, bog and open habitats. Other effect pathways, including dust deposition, edge effects, and fragmentation, may also reduce habitat quality in areas adjacent to the Project Area.

The residual effects of the construction phase on upland gamebird habitat are expected to be adverse, moderate in magnitude, restricted to the LAA, occur during times of moderate to high sensitivity, be short (indirect loss) to long-term (direct habitat loss) in duration, continuous and reversible (Section 13.5.3.1).

Species at Risk

Landbird SAR that rely on forested habitats could experience a direct loss of habitat. A direct loss of 19.15 km² of potential Evening Grosbeak (*Coccothraustes vespertinus*) habitat, 27.68 km² of potential Gray-cheeked Thrush (*Catharus minimus minimus*) habitat, 21.71 km² of potential Olive-sided Flycatcher (*Contopus cooperi*) habitat, 16.79 km² of potential Red Crossbill (*Loxia curvirostra percna*) habitat and 19.35 km² of potential habitat for Rusty Blackbird (*Euphagus carolinus*), using the habitat affiliations as identified in Table 13.7. These SAR could also experience indirect habitat loss through sensory disturbance during construction, as discussed above for landbirds. Evening Grosbeak and Red Crossbill are year-round residents and are therefore vulnerable to sensory disturbance in all seasons whereas the other forest bird SAR are only present during the breeding season.

Bank Swallow (*Riparia riparia*) colonies are present throughout the LAA and RAA. They are found on Port au Port Peninsula, Stephenville, Stephenville Crossing, throughout the Flat Bay and Jeffrey's regions, and in coastal areas adjacent to the Project Area (eBird 2022). Based on the known distribution of colonies and potential roosting locations, no direct loss of Bank Swallow habitat is expected. Bank Swallows are also unlikely to experience indirect habitat loss through sensory disturbance because the



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colonies are not located close to Project infrastructure. Further, Bank Swallows are tolerant of disturbance as they often nest in human-made environments including aggregate pits and waste topsoil on construction sites.

Short-eared Owl (*Asio flammeus*), which is found in open habitats, could experience a direct loss of 2.56 km² of bog habitat, 5.03 km² of barren habitat and 0.94 km² of anthropogenic habitat and indirect habitat loss as discussed above for raptors. Short-eared Owls are most vulnerable to disturbance during the nesting period but with the implementation of mitigation including pre-construction monitoring for breeding territories and curtailment if breeding activity is observed, indirect habitat loss will be negligible.

Effects of loss or alteration of habitat from transportation corridors, roads and/or renewable energy are ranked as negligible, low, or unknown in status reports, recovery strategies or management plans for Evening Grosbeak (ECCC 2022b), Red Crossbill (EC 2006), Rusty Blackbird (EC 2015b), Olive-sided Flycatcher (COSEWIC 2018), and Short-eared Owl (ECCC 2018). No status reports or management plans are currently available for Gray-cheeked Thrush.

No direct loss of habitat will occur for Harlequin Duck, Hudsonian Godwit (*Limosa haemastica*), Lesser Yellowlegs (*Tringa flavipes*), Piping Plover (*Charadrius melodus*), Red Knot (*Calidris canutus rufa*) or Red-necked Phalarope (*Phalaropus lobatus*). Breeding and/or staging habitat for these species will not be directly affected during construction. No indirect effects on habitat are expected for Harlequin Duck because this species is only present in marine habitats outside of the LAA and does not breed within the LAA or RAA.

Piping Plover is an Endangered species that nests along sandy beaches and dunes within and close to the LAA. Critical habitat for Piping Plover is present within the LAA but will not be directly affected by the Project. There are five mapped areas of critical habitat for Piping Plover, the nearest of which is approximately 2km from the hydrogen / ammonia plant. There are also additional nesting sites that have been used at least once since 1991 located on the Port-au-Port Peninsula, Stephenville Crossing and in the Codroy area. Some of these historic nesting locations (e.g., West Bay, Picadilly Beach, Kippens) are approximately 1.0-1.5 km from the Project Area. Based on the current distribution of Piping Plovers in the LAA and RAA, this species is unlikely to experience indirect habitat loss from construction activities. Further, with the implementation of pre-construction monitoring (if construction overlaps with Piping Plover breeding season), timing windows and appropriate setbacks, indirect effects to habitat can be avoided.

Four shorebird SAR may be present in the RAA or LAA only during migration. Lesser Yellowlegs, Hudsonian Godwit and Red Knot may be present in coastal habitats (mudflats, beaches) during migration in small numbers and Red-necked Phalarope, a provincially Vulnerable species may also be present during migration in small groups on the ocean (eBird 2022). Red-necked Phalarope will not experience indirect effects during construction because they are only present in the open ocean. Based on the known distribution of shorebird staging areas, Lesser Yellowlegs, Hudsonian Godwit and Red Knot could experience indirect habitat loss associated with construction of the hydrogen / ammonia plant and the port facilities if construction takes place when these species are present (July-October); the other staging areas are located >1.5 km from Project Components. With the implementation of pre-construction



monitoring (if construction overlaps with migration period), timing windows, and appropriate setbacks, indirect effects to habitat can be lessened or avoided.

There is no Critical Habitat, as defined under SARA, within the Project Area; mapped Critical Habitat for Bobolink overlaps the LAA but no loss of habitat (direct or indirect) is anticipated.

The residual effects of the construction phase on SAR habitat are expected to be adverse, low to moderate in magnitude, restricted to the LAA, occur during times of no to high sensitivity, be short (indirect loss) to long-term (direct habitat loss) in duration and continuous. Loss of terrestrial habitat will be reversible whereas loss of wetland habitat is irreversible (Section 13.5.3.1).

Summary of Effects by Project Component During Construction

Based on the information above, a summary of residual effects on change in habitat during the construction phase is provided in Table 13.10.

Table 13.10 Summary of Effects on Change in Habitat by Project Component During Construction

Project Site	Summary of Effect during Construction
Temporary Workforce Accommodations	During construction, there will be a direct loss of habitat for avifauna. Effects will be greatest for breeding birds, resident landbirds and gamebirds in upland habitats. There will also be an indirect loss of habitat for breeding waterbirds, shorebirds, waterfowl, raptors and landbirds, mainly through sensory disturbance during construction. There will a greater loss of habitat for birds that are present in bog, soil barren and mixedwood forests in the Codroy wind farm as compared to Port au Port. Mixedwood forests are uncommon in the RAA and are mainly located within the Codroy area. For this reason, loss of mixedwood habitat for the Codroy wind farm will affect different bird species compared to Port au Port. Migrating birds and birds wintering in coastal habitats will not experience direct habitat loss and effects of indirect habitat can be addressed through construction mitigation including timing windows, construction monitoring and setbacks. Indirect effects are unlikely to affect birds that are breeding, staging or wintering in coastal areas at the Codroy wind farm because project components are further inland compared to the Port au Port wind farm. There will be direct habitat loss for SAR including Evening Grosbeak, Gray-cheeked Thrush, Olive-sided Flycatcher, Red Crossbill, Rusty Blackbird and Short-eared Owl and additional indirect habitat loss due to sensory disturbance during construction.
Port au Port Wind Farm and Associated Infrastructure	
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	Construction of port facilities may result in a direct loss of habitat for staging and breeding waterbirds, shorebirds and waterfowl. Additional indirect loss of habitat will occur from sensory disturbance during construction. Least Sandpiper and Red Knot, two SAR, may experience indirect habitat loss if construction activities overlap with time period when species are present.
Port Facilities	



13.5.1.2 Operation and Maintenance

Most of the direct habitat loss for avifauna will occur during the construction phase. The only potential pathway for direct habitat loss during operations is potential water level changes associated with water use by the hydrogen / ammonia plant. Other habitat loss during operations is indirect due to sensory disturbance (noise, light, visual intrusion, vibration human disturbance). There will be noise, light, shadowing, and vibration associated with the wind farms, increase vehicular traffic on access roads, and noise and light at the hydrogen / ammonia plant. There will also be increase shipping traffic in the port.

The presence of wind turbines can cause local displacement of breeding birds, but the effect varies by site and species groups. Some bird groups have shown large displacement distances, while some have shown no evidence of displacement, and still others showed attraction to wind turbines (Marques et al. 2021). For bird groups for which there is evidence of displacement, the scale of the effect varies greatly, from less than 100 m to several kilometers (Marques et al. 2021, Drewitt and Langston 2006).

Sensory disturbance during the operational phase of a wind farm can also cause an indirect loss of habitat for migrating birds. The presence of wind turbines can cause birds to alter their migration flyways or local flight paths to avoid a wind farm. This can result in increased energy expenditure and may disrupt critical linkages between feeding, roosting, moulting, breeding, staging, and wintering areas (Drewitt and Langston 2006).

Waterbirds

No additional direct loss of habitat will occur during operation as a result of wind farms, access roads, transmission lines or collector systems. However, a change in water levels due to water intake for the hydrogen / ammonia plant could result in a change in habitat for waterbirds in ponds and wetlands adjacent to the plant including a local loss/alteration of habitat for breeding or staging waterbird species.

Breeding waterbirds may experience an indirect loss of habitat due to sensory disturbance (noise, light, vibration) from operation of the wind farm and the hydrogen / ammonia plant. Research from other wind farms has shown that densities of some waterbird species are reduced near wind farms (Everaert and Stienen 2007) although Niemuth et al. (2013) found that wetland bird species did not avoid wetland basins close to (within 1 km) wind turbines. The large concentrations of breeding waterbirds in the RAA and LAA (gulls, terns, seabirds) are concentrated along the coast, in most cases > 2 km from wind turbines.

Indirect loss of habitat from sensory disturbance (noise, light) from the hydrogen / ammonia plant is most likely to affect nearby staging and breeding waterbirds. Ponds adjacent to the plant may support breeding waterbirds including Common Loons, Great Blue Herons and Double-crested Cormorants; gulls/terns use the area for roosting. However, the density of breeding waterbirds in this area during existing conditions is thought to be low so the magnitude of the effect will be small.

Migrating and wintering waterbirds in the RAA are unlikely to experience an indirect loss of habitat due to the presence of wind turbines because waterbirds are concentrated in coastal habitats, which are > 2km from wind turbine locations.



The residual effects of the operations and maintenance phase on waterbird habitat are expected to be adverse, low in magnitude, restricted to the LAA, occur during times of moderate to high sensitivity, be long-term in duration, continuous, and reversible (Section 13.5.3.1).

Shorebirds

No direct loss of habitat during the operational phase is expected for shorebirds during operation as a result of wind farms, access roads, transmission lines or collector systems. However, a change in water levels due to water intake for the hydrogen / ammonia plant could result in a change in habitat for shorebirds in ponds and wetlands adjacent to the plant including a local loss/alteration of habitat for breeding or staging shorebirds.

Shorebirds may also experience an indirect loss of habitat due to sensory disturbance (light, noise, vibration). An analysis of effects of wind farms on Common Snipe, Eurasian Curlew (*Numenius arquata*) and Golden plover (*Pluvialis apricaria*) found significant avoidance effects that extended 200-400 m from the turbines (Pearce-Higgins et al. 2009, 2012). However, other studies have found no evidence of avoidance of areas with wind turbines. Niemuth et al. (2013) and Marques et al. (2021) found that shorebirds are one of the bird groups for which statistically significant effects of displacement are often not observed. Applying the precautionary principle, an indirect effect on breeding shorebirds can occur during the operational phase for wind farms.

Indirect habitat loss via sensory disturbance during operation of the wind farms is likely to be negligible because most shorebird staging areas are located > 1.5 km from the Project Area and shorebirds are not expected to migrate over the wind farms. The Port Harmon Beach and retention pond, and other wetlands and waterbodies adjacent to the hydrogen / ammonia plant could experience a small loss of habitat (from disturbance) for breeding and staging shorebirds during operation of the plant and port facilities.

The residual effects of the operations and maintenance phase on shorebird habitat are expected to be adverse, low in magnitude, restricted to the LAA, occur during times of moderate to high sensitivity, be long-term in duration, continuous and reversible (Section 13.5.3.1).

Waterfowl

No additional direct loss of habitat for waterfowl will occur as a result of wind farms, access roads, transmission lines or collector systems. However, a change in water levels due to water intake for the hydrogen / ammonia plant could result in a change in habitat for waterfowl in ponds and wetlands adjacent to the plant including a local loss/alteration of habitat for breeding or staging waterfowl.

Breeding waterfowl may experience an indirect loss of habitat due to sensory disturbance (noise, light, vibration) from operation of the wind farm and the hydrogen / ammonia plant. Studies have shown that waterfowl are displaced from areas wind energy development, as measured by reduced abundance (Loesch et al. 2013, Stewart et al. 2007). Although many studies have shown displacement of breeding waterfowl; the mean displacement distance was 116 m in a systematic review of the literature available on bird displacement due to wind turbines (Marques et al. 2021). Based on this, a small indirect loss of habitat is expected for breeding waterfowl in areas where wind turbines are within 200 m.



Indirect loss of habitat from sensory disturbance can also affect staging and breeding waterfowl within and near the hydrogen / ammonia plant and port facilities. Ponds adjacent to the plant support breeding and migrating waterfowl such as mergansers, Canada Geese, American Black Duck, Common Goldeneye, and Green-winged Teal. Ducks and geese use the area within and near the hydrogen / ammonia plant and the port facilities for roosting and nesting and an indirect loss of habitat is expected.

Wind turbines also have the potential to disrupt flight-lines and migratory flight paths for waterfowl. Several studies have shown that some species alter their route to avoid flying through wind farms (Dirksen et al. 1998, Tulp et al. 1999), although most studies have focused on offshore wind farms. If waterfowl alter their flight path this could result in the wind farm acting as a barrier. Other studies, however, have shown that large numbers of waterfowl regularly fly through the wind farm without diverting around it (Everaert et al. 2002).

The residual effects of the operations and maintenance phase on waterfowl habitat are expected to be adverse, low in magnitude, restricted to the LAA, occur during times of moderate to high sensitivity, be long-term in duration, continuous and reversible (Section 13.5.3.1).

Raptors

No additional direct loss of habitat for raptors will occur as a result of the operation and maintenance of wind farms, access roads, transmission lines / collector systems or the hydrogen / ammonia plant.

Studies show some evidence that raptors can be displaced from wind farms. For example, Garvin et al. (2011) found a 47% reduction of raptors compared to pre-construction levels, Howe et al. (2002) found that raptors that use open habitats were displaced from wind farms and Pearce-Higgins et al. (2009) found that densities of breeding harriers were reduced within 500 m of wind farms. Based on this research, we can expect an indirect loss of habitat for breeding and wintering raptors due to sensory disturbance from the operation and maintenance of the wind farms and the hydrogen / ammonia plant.

There are no large numbers or concentrations of raptors within the RAA during spring or fall migration, and flight paths of raptors within the RAA are currently not known. Using the precautionary principle, we will assume an indirect loss of habitat for raptors migrating through the RAA; raptors may be displaced from migratory pathways due to the presence of wind turbines and the hydrogen / ammonia plant.

The residual effects of the operations and maintenance phase on raptor habitat are expected to be adverse, low in magnitude, restricted to the LAA, occur during times of moderate to high sensitivity, be long-term in duration, continuous and reversible (Section 13.5.3.1).

Landbirds

No additional direct loss of habitat for landbirds will occur as a result of the operation and maintenance of wind farms, access roads, transmission lines/ collector systems or the hydrogen / ammonia plant.

Forest and shrub nesting birds show behavioral responses to acoustic effects of wind turbines during operation and maintenance (Schöll and Nopp-Mayr 2021) and habitat quality for forest passerines is negatively affected by anthropogenic noise (Bayne et al. 2008). Passerines may be present in lower



densities in areas with high noise levels (Bayne et al. 2008) and behaviour of birds may also be negatively affected. Noise can obscure territorial defense signals, which may result in decreased breeding success (Zwart et al. 2016).

Site lighting may also result in sensory disturbance to avifauna species. Light pollution from wind turbines and the hydrogen / ammonia plant can cause adverse effects for local and migrating avifauna; the zone of influence varies with factors such as weather, intensity, and position (height) of the light source, and ambient light conditions (Poot et al. 2008, Jones and Francis 2003). Based on this evidence, an indirect loss of habitat for breeding, wintering, and migrating landbirds from the operation of wind farms and the hydrogen / ammonia plant on breeding landbirds is expected.

The residual effects of the operations and maintenance phase on landbird habitat are expected to be adverse, low in magnitude, restricted to the LAA, occur during times of moderate to high sensitivity, be long-term in duration, continuous, and reversible (Section 13.5.3.1).

Upland Gamebirds

No additional direct loss of habitat for upland gamebirds will occur as a result of the operation and maintenance of wind farms, access roads, transmission lines/ collector systems or the hydrogen / ammonia plant. However, upland gamebirds may experience indirect habitat loss year-round due to sensory disturbance during the operation/maintenance phase of the wind farms. Responses of grouse/ptarmigan to wind farms are varied; some studies have shown displacement distances between 500 and 600 m, but some studies show no evidence of displacement (Coppes et al. 2020). Indirect loss of habitat during operation of the hydrogen / ammonia plant and port facilities may also affect grouse species because these species may be present in proximity to the plant.

The residual effects of the operations and maintenance phase on upland gamebird habitat are expected to be adverse, low in magnitude, restricted to the LAA, occur during times of moderate to high sensitivity, be long-term in duration, continuous and reversible (Section 13.5.3.1).

Species at Risk

No additional direct loss of habitat is expected for SAR during operation and maintenance.

The following forest bird (landbird) SAR may experience an indirect loss of habitat during operation and maintenance of the wind farms: Evening Grosbeak, Gray-cheeked Thrush, Olive-sided Flycatcher, Red Crossbill and Rusty Blackbird as discussed above for landbirds. Evening Grosbeak and Red Crossbill are year-round residents so are vulnerable to sensory disturbance in all seasons whereas the other forest bird SAR are only present during the breeding season.

No indirect loss of habitat during operation is expected for Bank Swallow, Harlequin Duck, or Red-necked Phalarope.

Short-eared Owls may experience indirect loss of habitat due to sensory disturbance from the operation and maintenance of the wind farms and the hydrogen / ammonia plant as discussed above for raptors.



Based on the current distribution of Piping Plovers in the LAA and RAA, this species is unlikely to experience indirect habitat loss during operation of wind farms or hydrogen / ammonia plant.

Indirect loss via sensory disturbance during operation of the wind farms is likely to be negligible for Lesser Yellowlegs, Hudsonian Godwit and Red Knot because most shorebird staging areas are located > 1.5 km from the Project Area and they are unlikely to migrate over areas with wind farms. These three species could experience a small indirect loss of habitat associated with operation of the hydrogen / ammonia plant and the port facilities.

The residual effects of the operations and maintenance phase on SAR habitat are expected to be adverse, low in magnitude, restricted to the LAA, occur during times of moderate to high sensitivity, be long-term in duration, continuous and reversible (Section 13.5.3.1).

Summary of Effects by Project Component During Operation and Maintenance

Based on the information above, a summary of residual effects on change in habitat during the construction phase is provided in Table 13.11.

Table 13.11 Summary of Effects on Change in Habitat by Project Component During Operation and Maintenance

Project Site	Summary of Effect during Operation and Maintenance
Port au Port Wind Farm and Associated Infrastructure	No direct loss of habitat is expected for breeding, migrating, or wintering bird groups during operation and maintenance. An indirect loss of habitat due to sensory disturbance may affect breeding waterbirds, breeding shorebirds, breeding waterfowl, breeding, migrating and wintering raptors, breeding, migrating and wintering landbirds, and breeding and wintering upland game birds. Birds breeding, wintering and staging in coastal areas adjacent to the Codroy wind farm are less likely to experience indirect effects during operation compared to the Port au Port wind farm due to the larger distance between the coast and Project components. No direct loss of habitat is expected for SAR. Indirect loss of habitat may affect the following SAR: Evening Grosbeak, Gray-cheeked Thrush, Olive-sided Flycatcher, Red Crossbill, Rusty Blackbird and Short-eared Owl.
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	No direct or indirect effects on habitat loss during operation and maintenance of transmission lines and substations.
Hydrogen / Ammonia Production and Storage Facilities	Changing water levels during operation can result in direct habitat loss for waterbirds, waterfowl and shorebirds. Indirect loss of habitat may affect waterbirds, shorebirds, waterfowl, raptors, landbirds and upland gamebirds during migration, breeding or in winter. SAR - Lesser Yellowlegs, Hudsonian Godwit, Red Knot, and Short-eared Owl may experience indirect loss of habitat associated with operation of the hydrogen / ammonia plant.
Port Facilities	Operation/Maintenance of port facilities may result in indirect loss of habitat for waterbirds, waterfowl and shorebirds. Indirect loss of habitat may affect the following SAR - Lesser Yellowlegs, Hudsonian Godwit, Red Knot.



13.5.1.3 Decommissioning and Rehabilitation

During decommissioning, Project infrastructure will be removed, and the Project Area will be rehabilitated. Decommissioning and rehabilitation are expected to have indirect effects on avifauna habitat through disturbance (light and noise). During decommissioning, infrastructure will be demolished and/or removed, resulting in temporary noise and other sensory disturbance. The effects of light and noise on avifauna during decommissioning will be the same as the construction phase, as discussed in Section 13.5.1.1.

Over time, vegetation in the Project Area will re-establish which will result in an increase in habitat for some bird species. Open habitats will succeed to scrub and eventually forest, and the representative bird community will change as the habitats change. While the removal of infrastructure may take place relatively quickly, the re-growth of vegetation to pre-Project conditions will take much longer.

Presence of temporary workforce accommodations will result in a direct loss of avifauna habitat during the decommissioning phase and an indirect loss of habitat due to sensory disturbance as discussed in Section 13.5.1.1.

Waterbirds

There will be no additional direct loss of habitat for breeding waterbirds during decommissioning of the wind farms, transmission lines and substations, hydrogen / ammonia plant and the port facilities. No direct loss of waterbird habitat is expected due to the presence of temporary workforce accommodations.

An indirect loss of habitat from sensory disturbance may occur for breeding waterbirds during decommissioning of the wind farms, transmission lines and substations, and the presence of temporary workforce accommodations as discussed in Section 13.5.1.1. An indirect loss of habitat during decommissioning of the hydrogen / ammonia plant and port facilities may occur for breeding and migrating waterbirds. No indirect loss of habitat is expected for wintering waterbirds.

No increase in waterbird habitat is expected during the rehabilitation phase.

The residual effects of the decommissioning and rehabilitation phase on waterbird habitat are expected to be adverse, low in magnitude, restricted to the LAA, occur during times of no to high sensitivity, be short-term in duration, continuous, and reversible (Section 13.5.3.1).

Shorebirds

There will be no additional direct loss of habitat for breeding shorebirds during decommissioning of the wind farms, transmission lines and substations, hydrogen / ammonia plant and port facilities except for a small loss of anthropogenic habitat for Killdeer that nest on gravel roads and gravel turbine pads. Loss of habitat for shorebirds due to temporary workforce accommodations can be avoided with proper siting.

An indirect loss of habitat from sensory disturbance may occur for breeding shorebirds during decommissioning of the wind farms, transmission lines and substations and the presence of temporary workforce accommodations (Section 13.5.1.1). An indirect loss of habitat may occur for migrating and



breeding shorebirds during decommissioning of the hydrogen / ammonia plant and the port facilities. No indirect loss of habitat during decommissioning is expected for wintering shorebirds.

As open areas succeed to scrub during the rehabilitation phase, habitat for American Woodcock may be created. No other change in habitat is expected for other shorebird species during rehabilitation.

The residual effects of the decommissioning and rehabilitation phase on shorebird habitat are expected to be adverse or positive (depending on species), low in magnitude, restricted to the LAA, occur during times of no to high sensitivity, be short-term in duration, continuous, and reversible (Section 13.5.3.1).

Waterfowl

There will be no additional direct loss of habitat for breeding waterfowl during decommissioning of the wind farms, transmission lines and substations, hydrogen / ammonia plant and port facilities. Loss of habitat for waterfowl due to temporary workforce accommodations can be avoided with proper siting.

An indirect loss of habitat from sensory disturbance may occur for breeding waterfowl during decommissioning of the wind farms, transmission lines and substations and the presence of temporary workforce accommodations (Section 13.5.1.1). An indirect loss of habitat may occur for migrating and breeding waterfowl during decommissioning of the hydrogen / ammonia plant and the port facilities. No indirect loss of habitat is expected during decommissioning for wintering waterfowl.

No change in waterfowl habitat is expected during the rehabilitation phase.

The residual effects of the decommissioning and rehabilitation phase on waterfowl habitat are expected to be adverse, low in magnitude, restricted to the LAA, occur during times of no to high sensitivity, be short-term in duration, continuous, and reversible (Section 13.5.3.1).

Raptors

There will be no additional direct loss of habitat for breeding, migrating or wintering raptors during decommissioning of the wind farms, transmission lines and substations, hydrogen / ammonia plant and port facilities. Loss of habitat for raptors due to temporary workforce accommodations can be avoided with proper siting.

An indirect loss of habitat from sensory disturbance may occur for breeding and wintering raptors during decommissioning of the wind farms, transmission lines and substations and hydrogen / ammonia plant and due to the presence of temporary workforce accommodations (Section 13.5.1.1).

Habitat for species that nest/forage in open habitats will increase following rehabilitation (e.g., Northern Harrier), but habitat for forest raptors (e.g., Sharp-shinned Hawk, Northern Saw-whet Owl) will be slow to recover.

The residual effects of the decommissioning and rehabilitation phase on raptor habitat are expected to be adverse or positive (depending on species), low in magnitude, restricted to the LAA, occur during times of moderate to high sensitivity, be short-term in duration, continuous, and reversible (Section 13.5.3.1).



Landbirds

There will be no additional direct loss of habitat for breeding, migrating, or wintering landbirds during decommissioning of the wind farms, transmission lines and substations, hydrogen / ammonia plant and port facilities. The presence of temporary workforce accommodations may result in a direct loss of landbird habitat.

An indirect loss of habitat from sensory disturbance may occur for breeding, migrating and resident landbirds during decommissioning of the wind farms, transmission lines and substations, hydrogen / ammonia plant, and the presence of temporary workforce accommodations (discussed in Section 13.5.1.1). No indirect loss of habitat for landbirds is expected during decommissioning of the port facilities.

A change in landbird habitat is expected during the rehabilitation stage. Birds that nest in open areas will likely become more abundant, followed by shrub-nesting birds as revegetation occurs. Habitat for birds that require mature forests will be the slowest to recover.

The residual effects of the decommissioning and rehabilitation phase on landbird habitat are expected to be adverse or positive (depending on species), low in magnitude, restricted to the LAA, occur during times of moderate to high sensitivity, be short-term in duration, continuous and reversible (Section 13.5.3.1).

Upland Gamebirds

There will be no additional direct loss of habitat for upland gamebirds during decommissioning of the wind farms, transmission lines and substations, hydrogen / ammonia plant, and port facilities. Loss of habitat for upland gamebirds due to temporary workforce accommodations can be avoided with proper siting.

An indirect loss of habitat from sensory disturbance may occur for upland gamebirds during decommissioning of the wind farms, transmission lines and substations, hydrogen / ammonia plant, hydrogen / ammonia plant, and the presence of temporary workforce accommodations (discussed in Section 13.5.1.1). No indirect loss of habitat for upland gamebirds is expected during decommissioning of the port facilities.

A change in habitat for gamebirds is expected during the rehabilitation stage. Habitat for ptarmigan, which use barren and open habitats may become suitable during rehabilitation whereas habitat for grouse (forested areas) will be slower to recover.

The residual effects of the decommissioning and rehabilitation phase on upland gamebird habitat are expected to be adverse or positive (depending on species), low in magnitude, restricted to the LAA, occur during times of moderate to high sensitivity, be short-term in duration, continuous, and reversible (Section 13.5.3.1).



Species at Risk

No additional direct loss of habitat for SAR is expected during decommissioning of the wind farms, transmission lines and substations, hydrogen / ammonia plant, and port facilities. Direct loss of habitat for SAR due to the presence of temporary workforce accommodations can be avoided by proper siting.

An indirect loss of habitat from sensory disturbance during decommissioning of the wind farms, transmission lines and substations, hydrogen / ammonia plant, and the presence of temporary workforce accommodations (discussed in Section 13.5.1.1) may occur for the following breeding SAR:

- Evening Grosbeak
- Gray-cheeked Thrush
- Red Crossbill
- Olive-sided Flycatcher
- Rusty Blackbird

Evening Grosbeak and Red Crossbill are year-round residents so are vulnerable to sensory disturbance in all seasons whereas the other forest bird SAR are only present during the breeding season. Habitat for these forest SAR will be slow to recover following decommissioning and rehabilitation.

Indirect loss via sensory disturbance during decommissioning of wind farms, transmission lines and substations and temporary workforce accommodations is likely to be negligible for Lesser Yellowlegs, Hudsonian Godwit and Red Knot because most shorebird staging areas are located > 1.5 km from the Project Area. These three species could experience a small indirect loss of habitat associated with decommissioning of the hydrogen / ammonia plant and the port facilities if decommissioning takes place when these species are present (July-October). No change in habitat is expected for these species during rehabilitation.

Short-eared Owls are most vulnerable to disturbance during the nesting period but with the implementation of mitigation including monitoring for breeding territories and curtailment if breeding activity is observed, indirect habitat loss will be negligible. Following rehabilitation, an increase in Short-eared Owl habitat may occur as vegetation recovers in open areas.

No indirect loss of habitat is expected for Bank Swallow, Harlequin Duck, Piping Plover, and Red-necked Phalarope (Section 13.5.1). No change in habitat is expected for these species during rehabilitation.

The residual effects of the decommissioning and rehabilitation phase on SAR habitat are expected to be adverse or positive (depending on species), low in magnitude, restricted to the LAA, occur during times of low to high sensitivity, be short-term in duration, continuous and reversible (Section 13.5.3.1).



Summary of Effects by Project Component During Decommissioning and Rehabilitation

Based on the information above, a summary of residual effects on change in habitat during the decommissioning and rehabilitation phase is provided in Table 13.12.

Table 13.12 Summary of Effects on Change in Habitat by Project Component During Decommissioning and Rehabilitation

Project Site	Summary of Effect during Decommissioning and Rehabilitation
Temporary Workforce Accommodations	With proper siting of temporary workforce accommodations, direct habitat loss is likely only for landbirds. An indirect loss of habitat from sensory disturbance may occur for breeding waterbirds; breeding shorebirds; breeding waterfowl, breeding and wintering raptors, breeding, migrating, and wintering landbirds; and for breeding and wintering gamebirds. An indirect loss of habitat may affect Evening Grosbeak (year-round), Gray-cheeked Thrush (breeding), Red Crossbill (year-round), Olive-sided Flycatcher (breeding), Rusty Blackbird (breeding).
Port au Port Wind Farm and Associated Infrastructure Codroy Wind Farm and Associated Infrastructure	No additional direct loss of habitat is expected for bird groups during decommissioning of wind farms. An indirect loss of habitat from sensory disturbance may occur for breeding waterbirds; breeding shorebirds; breeding waterfowl, breeding and wintering raptors; breeding, migrating and wintering landbirds; and breeding and wintering gamebirds. Birds breeding, wintering and staging in coastal areas adjacent to the Codroy wind farm are less likely to experience indirect habitat loss compared to the Port au Port wind farm because Project Components are located further from the coast. An indirect loss of habitat may affect Evening Grosbeak (year-round), Gray-cheeked Thrush (breeding), Red Crossbill (year-round), Olive-sided Flycatcher (breeding), Rusty Blackbird (breeding).
230 kV Transmission Lines and Substations	No additional direct loss of habitat is expected for any bird groups during decommissioning of transmission lines and substations. An indirect loss of habitat from sensory disturbance may occur for breeding waterbirds.; breeding shorebirds; breeding and wintering raptors; breeding, migrating and wintering landbirds; and breeding and wintering gamebirds. An indirect loss of habitat may affect SAR including Evening Grosbeak (year-round), Gray-cheeked Thrush (breeding), Red Crossbill (year-round), Olive-sided Flycatcher (breeding), Rusty Blackbird (breeding).
Hydrogen / Ammonia Production and Storage Facilities	No additional direct loss of habitat is expected for any bird groups during decommissioning of hydrogen / ammonia production and storage facilities. An indirect loss of habitat from sensory disturbance may occur for migrating and breeding waterbirds; migrating and breeding shorebirds; migrating and breeding waterfowl; breeding and wintering raptors; breeding, migrating and wintering landbirds; and breeding and wintering gamebirds. An indirect loss of habitat may affect SAR including Evening Grosbeak (year-round), Gray-cheeked Thrush (breeding), Red Crossbill (year-round), Olive-sided Flycatcher (breeding), Rusty Blackbird (breeding), Lesser Yellowlegs (migration), Hudsonian Godwit (migration) and Red Knot (migration).



Table 13.12 Summary of Effects on Change in Habitat by Project Component During Decommissioning and Rehabilitation

Project Site	Summary of Effect during Decommissioning and Rehabilitation
Port Facilities	No additional direct loss of habitat is expected for any bird groups during decommissioning of port facilities. An indirect loss of habitat from sensory disturbance may occur for migrating and breeding waterbirds; migrating and breeding shorebirds; and migrating and breeding waterfowl. An indirect loss of habitat may affect SAR including Lesser Yellowlegs (migration), Hudsonian Godwit (migration) and Red Knot (migration).

13.5.2 Change in Mortality

13.5.2.1 Construction

The Project activities during the construction phase have the potential to contribute to a direct change in mortality. During the construction phase, site preparation and civil works, which includes site clearing, grubbing, blasting, and construction is the pathway that is most likely to increase mortality risk for avifauna. In the absence of mitigation, there may be destruction of nests, and the subsequent mortality of young birds or eggs, particularly if these activities are completed during the nesting period of avifauna species. To mitigate these risks, site clearing should take place outside of the nesting season, when possible. If this is not possible, nest searches will be completed prior to the clearing of vegetation, as discussed in Section 13.4. These searches would be conducted in accordance with CWS guidance and best practice. The nesting period for the avifauna within the RAA extends from mid-April to mid-August (ECCC 2023).

The risk of mortality to birds during construction will be similar at the Port au Port wind farm and the Codroy wind farm, although the species potentially affected will differ. The Codroy wind farm supports a different suite of bird species, including birds that prefer high elevation habitats and mixed forests. Further, the Port au Port wind farm is located closer to the coast so there is greater potential for interactions with birds that are present in coastal habitats.

Transportation of materials and equipment, increased vehicular traffic, and the installation of Project components could result in equipment or vehicles crushing or colliding with avifauna individuals and / or avifauna colliding with Project-related infrastructure or equipment. A study that estimated annual avian mortality due to vehicular collisions during the breeding and fledging season in Canadian ecozones found that roads through wetlands, followed by mixed and deciduous forests, had the highest rates of avian mortality (Bishop and Brogan 2013). Species at high risk of vehicle collisions include those that hunt adjacent to roads, scavenge roadkill, and roost or nest near roads (Kociolek et al. 2015).

Noise due to construction can result in physiologic stress responses in birds (Kight and Swaddle 2011, Blickey et al. 2012), which can result in a weakened immune function and reduced breeding success (Halfwerk et al. 2010, Blickey et al. 2012). Light during construction can also negatively affect birds (see Section 13.5.2.2).



Waterbirds

Site preparation and civil works is unlikely to result in a direct or indirect increase in waterbird mortality, particularly if site clearing takes place outside of the prime nesting season. Most waterbird nesting, staging, and wintering locations are also located outside of the Project Area. Collisions with vehicles, equipment and Project components is also unlikely for waterbirds because they were most likely to be encountered in coastal areas. Installation and commissioning of the hydrogen / ammonia plant and upgrades at the port facilities are the two pathways that are most likely to result in a change of mortality for migrating and breeding waterbirds but the magnitude of the effect is expected to be small because there are no large concentrations of waterbirds in these areas (eBird 2022).

A change in mortality for wintering waterbirds during construction is not expected.

The effects of construction on mortality of waterbirds are expected to be adverse, low in magnitude, restricted to the LAA, occur in times of moderate to high sensitivity, be short-term, irregular, and reversible (Section 13.5.3.1).

Shorebirds

Site preparation and civil works could result in an increase in mortality for breeding shorebirds, including Killdeer, Spotted Sandpiper, Wilson's Snipe, and American Woodcock, particularly if site clearing takes place during the nesting season. A change in mortality for these species may also occur from collisions with vehicles, equipment, and Project components, and indirectly through effects of noise on fitness. Killdeer are most likely to experience a change in mortality because they will quickly move into and nest in disturbed areas, including gravel roads and turbine pads.

A change in mortality for migrating and wintering shorebirds during construction is not expected.

The effects of construction on mortality of shorebirds are expected to be adverse, low in magnitude, restricted to the LAA, occur in times of no to high sensitivity, be short-term, irregular, and reversible (Section 13.5.3.1).

Waterfowl

Site preparation and civil works are unlikely to result in an increase in waterfowl mortality, particularly if site clearing takes place outside of the nesting season. Most waterfowl nesting, staging, and wintering locations are located outside of the Project Area. Collisions with vehicles, equipment and Project components is also unlikely for waterfowl because they were most likely to be encountered in coastal estuaries and in open aquatic habitats. Installation and Commissioning of the hydrogen / ammonia plant and Restoration of port facilities are the two pathways that are most likely to result in a change of mortality for migrating and breeding waterfowl but the magnitude of the effect is expected to be small because existing data do not show large concentrations of waterbirds in these areas (eBird 2022).

A change in mortality for wintering waterfowl during construction is not expected.



The effects of construction on mortality of waterfowl are expected to be neutral to adverse, low in magnitude, restricted to the LAA, occur in times of moderate to high sensitivity, be short-term, irregular, and reversible (Section 13.5.3.1).

Raptors

Site preparation and civil works could result in an increase in raptor mortality if site clearing takes place during the nesting season. However, pre-clearing surveys and implementation of buffer zones around known nests will reduce the likelihood of raptor mortality during this activity. Raptor mortality may also increase due to collisions with vehicles and Project components during construction. Raptors, especially owls, are particularly susceptible to road mortality due to their hunting in open areas (Bishop and Brogan 2013, Boves and Belthoff 2012). Increase in raptor mortality may take place year-round because many raptors are year-round residents.

The effects of construction on mortality of raptors are expected to be adverse, low in magnitude, restricted to the LAA, occur in times of moderate to high sensitivity, be short-term, irregular and reversible (Section 13.5.3.1).

Landbirds

An increase in mortality from site preparation and civil works is more likely to affect breeding, migrating, and wintering landbirds than other bird groups, because they are most numerous within the Project Area and nest in all habitat types present within the LAA. Site preparation and civil works is likely to result in an increase in landbird mortality if site clearing takes place during the prime nesting season. Pre-construction nesting surveys have a low likelihood of detecting nests within scrub and forested habitats and are therefore not considered effective mitigation and not recommended by CWS (Government of Canada 2019).

An increase in landbird mortality may also occur from collisions with vehicles and Project components during construction. Passerines (perching birds) are the bird group that is most likely to be reported as roadkill in North America (Bishop and Brogan 2013). Implementing mitigation, including reducing speed limits during construction will reduce the magnitude of this effect. An indirect increase in mortality may result from loss of fitness due to noise during construction.

The effects of construction on mortality of landbirds are expected to be adverse, low in magnitude, restricted to the LAA, occur in times of moderate to high sensitivity, be short-term, irregular and reversible (Section 13.5.3.1).



Upland Gamebirds

Site preparation and civil works could result in an increase in gamebird mortality if site clearing takes place during the nesting season. Collisions with vehicles, equipment and Project components may also result in an increase in upland gamebird mortality. Upland gamebirds may be particularly vulnerable to vehicle collisions because they spend most of their time on the ground and are slow moving. Indirect effects of noise on fitness may also affect gamebirds and the presence of workers could result in increased mortality due to harvesting.

The effects of construction on mortality of upland gamebirds are expected to be adverse, low in magnitude, restricted to the LAA, occur in times of moderate to high sensitivity, be short-term, irregular, and reversible (Section 13.5.3.1).

Species at Risk

Site preparation and civil works may result in an increase in mortality for the following SAR if vegetation is cleared during the nesting season within the species' habitat:

- Gray-cheeked Thrush
- Bobolink
- Rusty Blackbird
- Red Crossbill
- Olive-sided Flycatcher
- Evening Grosbeak
- Short-eared Owl

Site preparation and civil works is unlikely to result in an increase in mortality for the following SAR because their preferred habitat is located outside of the Project Area:

- Bank Swallow
- Barn Swallow
- Barrow's Goldeneye
- Harlequin Duck
- Horned Grebe
- Hudsonian Godwit
- Ivory Gull
- Leach's Storm Petrel
- Lesser Yellowlegs
- Peregrine Falcon
- Piping Plover
- Red-necked Phalarope
- Red Knot

Collisions with vehicles, equipment and Project components may also result in an increase in mortality for SAR that are likely to be encountered in the Project Area and/or are vulnerable to collisions with vehicles due to their behaviour and/or habitat preferences, including:

- Gray-cheeked Thrush
- Bobolink
- Rusty Blackbird
- Red Crossbill
- Olive-sided Flycatcher
- Evening Grosbeak
- Short-eared Owl
- Bank Swallow



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Hudsonian Godwit, Lesser Yellowlegs, and Red Knot have potential to interact with construction vehicles and equipment during construction of the hydrogen / ammonia plant if construction takes place when these species are present (July-October).

With the implementation of mitigation including timing windows, reduced speed limits and construction monitoring, the likelihood of mortality to SAR will be lessened.

The effects of construction on mortality of SAR are expected to be adverse, low in magnitude, restricted to the LAA, occur in times of moderate to high sensitivity, be short-term, irregular, and reversible (Section 13.5.3.1).

Summary of Effects by Project Component During Construction

Based on the information above, a summary of residual effects on change in mortality during the construction phase is provided in Table 13.13.

Table 13.13 Summary of Effects on Change in Mortality by Project Component During Construction

Project Site	Summary of Effect during Construction
Temporary Workforce Accommodations	Construction has potential to cause an increase in mortality for breeding shorebirds; breeding, migrating and wintering raptors; breeding, migrating and wintering landbirds; and breeding and wintering gamebirds. Construction has potential to cause an increase in mortality for the following SAR: • Gray-cheeked Thrush • Bobolink • Rusty Blackbird • Red Crossbill • Olive-sided Flycatcher • Evening Grosbeak • Short-eared Owl • Hudsonian Godwit • Lesser Yellowlegs • Red Knot Although the risk of mortality will be similar throughout the LAA for during construction, the species potentially affected will differ because the composition of the bird communities varies across the LAA depending on the habitat type. The Codroy wind farm contains some habitat types such as mixedwood and deciduous forests and high elevation habitats, which will support different bird species than the Port au Port wind farm. The Port au Port wind farm is also located closer to the coast and therefore there is more potential for interactions with birds in coastal habitat.
Port au Port Wind Farm and Associated Infrastructure	
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	Construction of port facilities has potential to cause and increase in mortality for waterbirds and waterfowl during the breeding season, migration or in winter.



13.5.2.2 Operation and Maintenance

The primary pathway for bird mortality during operation is direct strikes with turbines, or with other wind farm infrastructure, including powerlines. Risk of collision with turbines varies by species, bird abundance, behaviour, weather conditions, and topography (Drewitt and Langston 2006). The characteristics of the wind farm, including but not limited to turbine height, rotor speed, configuration, and lighting (Marques et al. 2014), may also influence the risk of bird mortality. Risk of collisions with wind turbines will be greater in areas where birds congregate for feeding or roosting or along migratory pathways (Marques et al. 2014). Studies have shown that some large birds (e.g., swans and geese) are more likely to collide with structures because they have poor maneuverability (Brown et al. 1992). Migratory birds may also be more vulnerable to collision with wind farms compared to resident species (Thaxter et al. 2017). Birds collide with wind turbines more frequently during inclement weather, including low cloud conditions or fog (Erickson et al. 2001). During these conditions, nocturnal migrants typically fly at lower altitudes, and are thus more susceptible to collisions. They may also be more attracted to artificial lights on nights with inclement weather, and research indicates that birds may be more attracted to pulsating red lights than they are to white strobe lights during these conditions (Erickson et al. 2001)

A study that reviewed 43 wind farms across Canada found that on average, 8.2 ± 1.4 birds were killed per turbine per year. At the individual wind farms included in the study, these numbers ranged from 0 to 26.9 birds per turbine per year (Zimmerling et al. 2013). The 2018 Report from the Wind Energy Bird and Bat Monitoring Database found that non-raptor bird mortality estimates from May 1 to October 31 were: 1.0 ± 0.5 birds/turbine in Atlantic Canada, and 4.9 ± 0.06 birds/turbine in Ontario (BSC et al. 2018). Bird mortality rates were slightly higher between July and October than between May and June, which suggests that bird mortality may increase during the fall from an influx of inexperienced hatch-year birds undergoing migration (BSC et al. 2018). Bird fatalities at wind farms were dominated by passerines with relatively low numbers of raptors and waterbirds; the most common bird species found across Canada during mortality monitoring surveys were: Golden-crowned Kinglet, Horned Lark, and Red-eyed Vireo (BSC et al. 2018).

Another potential pathway for bird mortality during operation is collisions with transmission lines. Transmission lines in Canada are estimated to kill 2.5 million to 25.6 million birds per year (Rioux et al. 2013). Large-bodied birds with poor maneuverability, such as cranes and waterfowl (Bevanger 1998, Loss et al. 2014), and species that form flocks (Scott et al. 1972, Liguori 2009, Loss et al. 2014) are more likely to be killed by collisions with transmission lines. As many as 245 bird species are known to collide with power lines, and collisions are more common among shorebirds, waterfowl, cranes, herons, grouse, and passerines (Rioux et al. 2013, Bevanger 1998).

Anthropogenic light from wind turbines and the hydrogen / ammonia plant may result in increased bird mortality. The main species groups affected by artificial lighting are waterbirds and landbirds. Attraction to artificial light and resulting disorientation can result in large numbers of birds congregating, colliding with lit structures or becoming stranded on land (waterbirds) (Rodríguez et al. 2017, Brown et al. 2022). This can result in mass mortality events. Migrating birds are also at risk of becoming disoriented and colliding with lit structures (Rodríguez et al. 2017), particularly at night (Cabrera-Cruz et al. 2018). Lighting can also disrupt the mechanisms that birds use to migrate (Poot et al. 2008). Risks associated with artificial light



may specifically affect migrating shorebirds, waterfowl, and landbirds such as warblers (Cabrera-Cruz et al. 2018).

At the hydrogen/ammonia plant, flaring is not a planned activity, but to be conservative is assumed to occur approximately once a year (Chapter 2), which could result in bird mortalities depending on the timing. Mass fatalities of birds have been recorded during flaring events at gas plants (Ronconi et al. 2015), including the death of an estimated 7,500 migrating songbirds at an LNG gas plant in Saint John, NB during fall migration at night, during fog and low cloud cover conditions (CBC 2013).

Exposure to ammonia, hydrogen, fuels, or other hazardous substances used in the Project can be harmful or fatal to wildlife, including birds. However, releases to the environment are not expected during normal Project activities, and mitigation will be implemented to reduce the risk of spills or releases. Accidents, including accidental spills and/or releases, are discussed in Chapter 24 (Accidents and Malfunctions).

As described in Section 13.5.2.1, collisions with vehicles or heavy equipment may also result in bird fatalities.

Waterbirds

Fatalities of waterbirds are uncommon at land-based wind farms (Allison et al. 2019) and are not expected for this Project because the highest concentrations of waterbirds are within coastal areas outside of the LAA. Further, studies have shown that waterbird species, including kittiwakes, gannets, and gulls exhibit avoidance behaviour when flying near turbines (Cox and Larsen 2023). Based on this, there is little risk of mortality of waterbirds from collisions with wind turbines.

An increase in waterbird mortality may occur from collisions with transmission lines but the magnitude of this effect is expected to be low because most waterbird nesting areas are located outside of the LAA.

Seabirds that breed on coastal colonies around the province are susceptible to mass stranding events caused by attraction to anthropogenic light (Brown et al. 2022). When seabirds such as Dovekies, murres, puffins, storm-petrels, shearwaters, and fulmars are found near shore, their proximity to bright lighting is thought to disorient them and/or draw them to land, which can be fatal. Seabirds may be unable to take flight from land and can become stranded on the ground unable to return to the ocean, which renders them susceptible to predation (Rodríguez et al. 2017). Seabirds could be drawn to lighting at the hydrogen / ammonia plant or on wind turbines; however, mitigation to reduce the intensity and duration of lights on turbines will reduce the likelihood of waterbirds being drawn to wind turbine lights. As noted in Section 13.4, lighting on the hydrogen / ammonia plant will be limited to the amount necessary for safety and will be angled down to reduce emission.

The effects of operation and maintenance on mortality of waterbirds are expected to be adverse, low in magnitude, restricted to the LAA, occur in times of no to high sensitivity, be long-term, continuous, and reversible (Section 13.5.3.1).



Shorebirds

Fatalities of shorebirds are uncommon at land-based wind energy facilities (Allison et al. 2019). Shorebird species that are most likely to experience an increase in mortality from collisions with wind turbines include American Woodcock, Wilson's Snipe, Killdeer, and Spotted Sandpiper because these species may nest close to wind turbines. However, fatalities for these species are very rare in Canada (BSC et al. 2018), so the magnitude of the effect is expected to be small. Migrating and wintering shorebirds (Purple Sandpiper) are not expected to experience an increase in mortality from wind turbines because staging and wintering areas are located outside of the LAA and these species are unlikely to fly across the area where wind turbines will be sited.

An increase in shorebird mortality from collisions with transmission lines is not expected because shorebirds are unlikely to be flying in areas where transmission lines will be sited.

No direct mortality is expected during operation of the hydrogen / ammonia plant and disturbance is unlikely to result in an increase in mortality.

The effects of operation and maintenance on mortality of shorebirds are expected to be adverse, low in magnitude, restricted to the LAA, occur in times of no to high sensitivity, be long-term, continuous, and reversible (Section 13.5.3.1).

Waterfowl

Fatalities of waterfowl are observed infrequently at land-based wind energy facilities (Allison et al. 2019). Waterfowl nesting within the LAA are widely dispersed and there are no known concentrations within the Project Area. Large numbers of waterfowl may be present during spring and fall in coastal estuaries (e.g., Codroy) and open ocean, but these waterfowl are not expected to interact with wind turbines because they are located outside of the LAA and are unlikely to fly across areas where wind turbines will be sited.

Transmission lines could result in an increase in waterfowl mortality; however, the transmission lines are not located close to any known large concentrations of waterfowl, so the magnitude of the effect (if any) is expected to be small.

No direct mortality is expected during operation of the hydrogen / ammonia plant and sensory disturbance from noise and light is unlikely to result in an increase in mortality.

The effects of operation and maintenance on mortality of shorebirds are expected to be adverse, low in magnitude, restricted to the LAA, occur in times of no to high sensitivity, be long-term, continuous, and reversible (Section 13.5.3.1).



Raptors

Raptors may be particularly susceptible to collisions with turbines strikes due to their morphology and foraging behavior (Smallwood et al. 2009, Thaxter et al 2017). Raptors are also more likely to forage, perch and fly close to wind turbines, and may even perch on turbines, putting them more at risk of collisions (Garvin et al. 2011). Given this, migrating, breeding, and wintering raptors may experience an increase in mortality during operation of wind turbines.

Raptor species are thought to have a lower risk of collisions with transmission lines compared to other bird families because of their sharp eyesight and flight agility (Bernardino et al. 2018). However, collision risk can increase when they are focused downward searching for prey (Martin 2012).

No direct mortality is expected during operation of the hydrogen / ammonia plant (due to flaring during upset conditions) and disturbance is unlikely to result in an increase in mortality.

The effects of operation and maintenance on mortality of raptors are expected to be adverse, low in magnitude, restricted to the LAA, occur in times of no to high sensitivity, be long-term, continuous, and reversible (Section 13.5.3.1).

Landbirds

Landbirds may experience an increase in mortality due to collisions with wind turbines. Studies have found that passerines typically make up 80% of fatalities at wind farms, most of which are nocturnal migrants (Mabee et al. 2006). Landbirds are the most common bird group within the Project Area and are found in all habitats; therefore, they are more likely to interact with wind turbines.

Landbirds are less likely than larger bodied birds to experience an increase in mortality due to collisions with transmission lines.

An increase in mortality could occur during flaring events at the hydrogen / ammonia plant; however, these are unplanned events due to upset conditions, so the timing cannot be predicted. Migrating birds are also at risk of becoming disoriented and colliding with lit structures, such as those present at the hydrogen / ammonia plant (Rodríguez et al 2017), particularly at night (Cabrera-Cruz et al. 2018). There have been large mortality events at a variety of lit structures in the USA as a result of nocturnal-migrant songbirds being disorientated by lights when forced to fly at low altitude by rain and mist (Langston and Pullan 2003; Kingsley and Whittam 2005).

The effects of operation and maintenance on mortality of landbirds are expected to be adverse, low in magnitude, restricted to the LAA, occur in times of no to high sensitivity, be long-term, continuous, and reversible (Section 13.5.3.1).



Upland Gamebirds

Upland gamebirds may experience an increase in mortality during operation of wind farms. Upland gamebirds have poor vision, poor flight maneuverability and they are often active at dawn and dusk, which makes them vulnerable to collisions (Stokke et al. 2020). Although these birds are unlikely to fly near the turbine blades, ptarmigan species frequently collide with turbine poles in Norway (Stokke et al. 2020).

Upland gamebirds may also experience an increase in mortality from collisions with transmission lines. Collisions of grouse and ptarmigan with power lines has been observed in Norway (Bevanger 1995).

No direct mortality is expected during operation of the hydrogen / ammonia plant (due to flaring during upset conditions) and disturbance is unlikely to result in an increase in mortality.

The effects of operation and maintenance on mortality of upland gamebirds are expected to be adverse, low in magnitude, restricted to the LAA, occur in times of no to high sensitivity, be long-term, continuous, and reversible (Section 13.5.3.1).

Species at Risk

The following SAR may experience an increase in mortality from collisions with wind turbines during the operation phase of the project because their preferred habitat is present within the Project Area and LAA; collisions with wind turbines were either not identified as a threat or ranked as negligible to low in recovery documents:

- Gray-cheeked Thrush
- Rusty Blackbird
- Red Crossbill
- Olive-sided Flycatcher
- Evening Grosbeak
- Short-eared Owl

The operation of wind turbines is unlikely to result in an increase in mortality for the following SAR because their habitat is located outside of the Project Area:

- Bank Swallow
- Barn Swallow
- Bobolink
- Barrow's Goldeneye
- Harlequin Duck
- Horned Grebe
- Hudsonian Godwit
- Ivory Gull
- Leach's Storm Petrel
- Lesser Yellowlegs
- Peregrine Falcon
- Piping Plover
- Red-necked Phalarope
- Red Knot

Short-eared Owl is the only SAR that may be vulnerable to collisions with power lines (ECCC 2018). The other species are unlikely to collide, or their habitat is located outside of the LAA.



An increase in mortality could occur during flaring events at the hydrogen / ammonia plant if migrating SAR are present.

Leach's Storm-petrels is vulnerable to becoming stranded on land when attracted to artificial lights (d'Entremont et al. 2021). Artificial lights in communities or industrial sites near colonies can cause newly fledged Leach's Storm-Petrels to collide with structures or become stranded on the ground, where they are vulnerable to predation (COSEWIC 2020a). This has been identified as a threat to the species recovery (COSEWIC 2020a). Leach's Storm-Petrels are relatively common in the waters surrounding the Port au Port Peninsula (eBird 2022), including Stephenville Crossing, which is within 3 km of the hydrogen / ammonia plant and port facilities. Given this, strandings of Leach's Storm-Petrels have potential to occur from lighting at the plant and port.

The effects of operation and maintenance on mortality on shorebirds are expected to be adverse, low to moderate in magnitude, restricted to the LAA, occur in times of no to high sensitivity, be long-term, continuous, and reversible (Section 13.5.3.1).

Summary of Effects by Project Component During Operation and Maintenance

Based on the information above, a summary of residual effects on change in mortality during the operation and maintenance phase is provided in Table 13.14.

Table 13.14 Summary of Effects on Change in Mortality by Project Component During Operation and Maintenance

Project Component	Summary of Effect during Operation and Maintenance
Port au Port Wind Farm and Associated Infrastructure	Operation of wind farms has potential to cause an increase in mortality for breeding shorebirds; breeding, migrating, and wintering raptors; breeding, migrating, and wintering landbirds; and breeding and wintering gamebirds.
Codroy Wind Farm and Associated Infrastructure	The following SAR may experience an increase in mortality due to the operation of wind turbines: • Gray-cheeked Thrush • Rusty Blackbird • Red Crossbill • Olive-sided Flycatcher • Evening Grosbeak • Short-eared Owl Although the risk of mortality will be similar for the two wind farm sites, the species potentially affected will differ because the composition of the bird communities varies across the LAA depending on the habitat type. The Codroy wind farm contains some habitat types such as mixedwood and deciduous forests and high elevation habitats, which will support different bird species than the Port au Port wind farm. The Port au Port wind farm is also located closer to the coast and therefore there is more potential for interactions with birds in coastal habitat. The Codroy Estuary IBA, which supports large numbers of staging waterfowl is located approximately 9 km south of the Codroy wind farm, so interactions with wind turbines are not expected.



Table 13.14 Summary of Effects on Change in Mortality by Project Component During Operation and Maintenance

Project Component	Summary of Effect during Operation and Maintenance
230 kV Transmission Lines and Substations	Breeding and migrating waterbirds; breeding and migrating waterfowl; and breeding, migrating, and wintering raptors may experience an increase in mortality due to presence of transmission lines. One SAR - Short-eared Owl may experience an increase in mortality due to presence of transmission lines.
Hydrogen / Ammonia Production and Storage Facilities	Landbirds, including SAR may experience an increase in mortality during the operation of the hydrogen / ammonia plant due to flaring events.
Port Facilities	No increase in mortality is expected for avifauna during operation of port facilities.

13.5.2.3 Decommissioning and Rehabilitation

Site traffic and equipment activity in the Project Area during decommissioning and rehabilitation are expected to be similar to, or less than, during construction; a change in mortality risk could occur from collisions with equipment and vehicles as discussed in Section 13.5.2.1. Similar to other phases, the presence of Project workers could also result in an increase in harvesting of waterfowl and gamebirds; however Project workers will be prohibited from hunting as mitigation.

Removal, dismantling and transportation of Project components could result in mortality to bird nests but the implementation of timing windows and/or nest searches will reduce the likelihood of nest mortality.

Waterbirds

Collisions with vehicles, equipment and Project components is also unlikely for waterbirds because they were most likely to be encountered in coastal areas. Decommissioning of the hydrogen / ammonia plant and port facilities are the two pathways that are most likely to result in a change of mortality for migrating and breeding waterbirds, but the magnitude of the effect is expected to be small because existing data does not show large concentrations of waterbirds in these areas (eBird 2022).

A change in mortality for wintering waterbirds during decommissioning is not expected.

The effects of decommissioning on mortality of waterbirds are expected to be adverse, low in magnitude, restricted to the LAA, occur in times of moderate to high sensitivity, be short-term, irregular, and reversible (Section 13.5.3.1).

Shorebirds

A change in mortality for breeding shorebirds may also occur from collisions with vehicles, equipment, and Project components, and indirectly through effects of noise on fitness. Killdeer are most likely to experience a change in mortality because they nest in disturbed areas, including gravel roads and turbine pads (A. Taylor, pers. comm.).

A change in mortality for migrating and wintering shorebirds during decommissioning is not expected.



The effects of decommissioning on mortality of shorebirds are expected to be adverse, low in magnitude, restricted to the LAA, occur in times of no to high sensitivity, be short-term, irregular, and reversible (Section 13.5.3.1).

Waterfowl

Waterfowl are unlikely to collide with vehicles, equipment, and Project components because they are most likely to be encountered in coastal estuaries and in open aquatic habitats. Decommissioning of the hydrogen / ammonia plant and port facilities are the two pathways that are most likely to result in a change of mortality for migrating and breeding waterfowl, but the magnitude of the effect is expected to be small because existing data do not show large concentrations of waterbirds in these areas (eBird 2022).

A change in mortality for wintering waterfowl during decommissioning is not expected.

The effects of decommissioning on mortality of waterfowl are expected to be neutral, low in magnitude, restricted to the LAA, occur in times of moderate to high sensitivity, be short-term, irregular and reversible (Section 13.5.3.1).

Raptors

Raptor mortality risk during decommissioning is expected to be similar to, or less than, during construction and could result from collisions with vehicles and Project components as discussed in Section 13.5.2.1. Increase in raptor mortality may take place year-round because many raptors are year-round residents.

The effects of decommissioning on mortality of raptors are expected to be adverse, low in magnitude, restricted to the LAA, occur in times of moderate to high sensitivity, be short-term, irregular, and reversible (Section 13.5.3.1).

Landbirds

An increase in landbird mortality may occur during decommissioning from collisions with vehicles and Project components, similar to during construction as discussed in Section 13.5.1. Increase in landbird mortality may take place year-round because many landbirds are year-round residents.

The effects of decommissioning on mortality of landbirds are expected to be adverse, low in magnitude, restricted to the LAA, occur in times of moderate to high sensitivity, be short-term, irregular, and reversible (Section 13.5.3.1).



Upland Gamebirds

Collisions with vehicles, equipment, and Project components during decommissioning may result in an increase in upland gamebird mortality, similar to during construction as discussed in Section 13.5.1. Increase in gamebird mortality may take place year-round because gamebird species are year-round residents.

The effects of construction on mortality of upland gamebirds are expected to be adverse, low in magnitude, restricted to the LAA, occur in times of moderate to high sensitivity, be short-term, irregular and reversible (Section 13.5.3.1).

Species at Risk

Collisions with vehicles, equipment and Project components during decommissioning may also result in an increase in mortality for SAR that are likely to be encountered in the Project Area and/or are vulnerable to collisions with vehicles due to their behaviour and/or habitat preferences, including:

- Gray-cheeked Thrush
- Bobolink
- Rusty Blackbird
- Red Crossbill
- Olive-sided Flycatcher
- Evening Grosbeak
- Short-eared Owl
- Bank Swallow

Hudsonian Godwit, Lesser Yellowlegs, and Red Knot have potential to interact with construction vehicles and equipment during decommissioning of the hydrogen / ammonia plantoperat if construction takes place when these species are present (July-October).

With the implementation of mitigation including timing windows, reduced speed limits and construction monitoring, the likelihood of mortality to SAR will be lessened.

The effects of construction on mortality of SAR are expected to be adverse, low in magnitude, restricted to the LAA, occur in times of moderate to high sensitivity, be short-term, irregular, and reversible (Section 13.5.3.1).

Summary of Effects by Project Component During Decommissioning and Rehabilitation

Based on the information above, a summary of residual effects on change in mortality during the decommissioning and rehabilitation phase is provided in Table 13.15.



Table 13.15 Summary of Effects on Change in Mortality by Project Component During Decommissioning and Rehabilitation

Project Component	Summary of Effect during Decommissioning and Rehabilitation
Temporary Workforce Accommodations	Decommissioning and rehabilitation have potential to cause an increase in mortality for breeding shorebirds; breeding, migrating, and wintering raptors; breeding, migrating and wintering landbirds; and breeding and wintering gamebirds. Decommissioning and rehabilitation have potential to cause an increase in mortality for the following SAR: • Gray-cheeked Thrush • Bobolink • Rusty Blackbird • Red Crossbill • Olive-sided Flycatcher • Evening Grosbeak • Short-eared Owl • Bank Swallow • Hudsonian Godwit • Lesser Yellowlegs • Red Knot Although the risk of mortality will be similar throughout the LAA for during decommissioning, the species potentially affected will differ because the composition of the bird communities varies across the LAA depending on the habitat type. The Codroy wind farm contains some habitat types such as mixedwood and deciduous forests and high elevation habitats, which will support different bird species than the Port au Port wind farm. The Port au Port wind farm is also located closer to the coast and therefore there is more potential for interactions with birds in coastal habitat.
Port au Port Wind Farm and Associated Infrastructure	
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	Decommissioning of port facilities has potential to cause an increase in mortality for waterbirds and waterfowl.



13.5.3 Residual Environmental Effects Summary

13.5.3.1 Residual Environmental Effects Characterization

Table 13.16 summarizes the predicted environmental effects (residual effects) of the undertaking on avifauna.

Table 13.16 Summary of Predicted Environmental Effects of the Undertaking on Avifauna

Residual Effect	Residual Effects Characterization							
	Nature	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological and Socio-economic Context
Construction								
Change in Habitat	A	L-M	LAA	NS-HS	ST-LT	C	R/I	D/U
Change in Mortality	A	L	LAA	NS-HS	ST	IR	R	D/U
Operation and Maintenance								
Change in Habitat	A	L	LAA	MS-HS	LT	C	R	D/U
Change in Mortality	A	L	LAA	NS-HS	LT	C	R	D/U
Decommissioning and Rehabilitation								
Change in Habitat	A/P	L	LAA	NS-HS	ST	C	R	D/U
Change in Mortality	A	L	LAA	NS-HS	ST	IR	R	D/U
KEY: Nature: P: Positive A: Adverse N: Neutral Magnitude: N: Negligible L: Low M: Moderate H: High Geographic Extent: PA: Project Area LAA: Local Assessment Area RAA: Regional Assessment Area Duration: ST: Short-term MT: Medium-term LT: Long-term Timing: NS: No Sensitivity MS: Moderate Sensitivity HS: High Sensitivity Frequency: S: Single Event IR: Irregular Event R: Regular Event C: Continuous Reversibility: R: Reversible I: Irreversible Ecological / Socio-Economic Context: D: Disturbed U: Undisturbed								



13.5.3.2 Summary of Predicted Environmental Effects

The Project is anticipated to result in adverse effects on change in habitat during all phases. Land clearing will result in a direct long-term loss of upland and wetland avifauna habitat. Direct loss of habitat from land clearing during construction will primarily affect breeding birds that inhabit coniferous scrub and coniferous forest (softwood) habitats such as landbirds, shorebirds, raptors, and some upland gamebird species. An indirect loss of avifauna habitat may also occur through sensory disturbance (i.e., noise and light), dust deposition, edge effects, and habitat fragmentation. Migrating, staging, and wintering waterbirds, shorebirds, and waterfowl are unlikely to be affected by direct or indirect habitat loss because their staging and wintering areas are outside of the LAA. Landbird SAR that rely on forested habitats, including Evening Grosbeak, Gray-cheeked Thrush, Olive-sided Flycatcher, Red Crossbill, Rusty Blackbird, may experience direct and indirect loss of habitat. A loss of potential Short-eared Owl habitat is also anticipated.

The magnitude of change in habitat during construction will be low to moderate, depending on the species group and time of year (breeding birds vs. migrating/wintering birds) and low during operation and maintenance, and decommissioning and rehabilitation. The indirect effects on habitat (e.g., light and noise disturbance) will extend into the LAA for all Project phases and may occur during periods of high sensitivity, as each Project phases occurs year-round. Direct construction phase effects on habitat (loss/alteration) will occur during periods of moderate to high sensitivity (breeding season) depending on timing of construction. During the decommissioning and rehabilitation phase, results will be short term, and changes to habitat may also be both adverse and positive, as Project infrastructure is removed, and habitat is restored.

Effects during the operations and maintenance phase will be long-term, as the Project will be operating for 30 years. The frequency of effects on habitat is continuous. The direct loss of habitat during the construction phase is reversible, but since mature forests are very slow to regrow in Newfoundland, it will be long term to be returned to pre-construction mature forest vegetation types in the years following the Project through remediation, and wetland (bogs, fens) losses may be permanent (see also Section 12.5.4).

The effects on habitat in the operation and maintenance phase and decommissioning and rehabilitation phase are reversible. Prior to the Project, the socio-economic context of most of the Port au Port Peninsula and the Stephenville area is disturbed. The Project Area for the Codroy wind farm, and portions of the Port au Port wind farm, are relatively undisturbed.

The Project is anticipated to result in adverse changes to avifauna mortality risk. Bird mortality may occur during the construction phase through collisions with vehicles or machinery. Nests/eggs/young could also be destroyed but mitigation including timing windows and nest searches will reduce the likelihood of occurrence. An increased risk to avifauna mortality is expected during the operations phase primarily through collisions with turbines and transmission lines. Operation of the hydrogen / ammonia plant also has potential to result in mortality events through flaring. Project lighting could increase mortality for waterbirds and migratory landbirds if they are attracted to the artificial light and become stranded (waterbirds) or disoriented and collide with structures (migratory landbirds). Leach's Storm-Petrel, a SAR is particularly vulnerable to stranding events, especially in the fall.



The risk of mortality is restricted to the LAA, and may occur during high sensitivity periods (e.g., breeding season), since Project activities will occur year-round. During the construction phase and the decommissioning and rehabilitation phase results will be short term, lasting only as long as those phases occur. However, the effects during the operations and maintenance phase will be long-term, as the Project will be operating for 30 years. Effects on mortality risk will be continuous during the operations phase, as the turbines are active. During the construction and decommissioning and rehabilitation phases, the mortality events are expected to be uncommon and irregular. Effects on mortality are reversible, as they will cease after the Project is completed and not expected to result in long-term population declines.

Prior to the Project, the socio-economic context of most of the Port au Port Peninsula and the Stephenville area is disturbed. The Project Area for the Codroy wind farm, and portions of the Port au Port wind farm, are relatively undisturbed.

13.6 Determination of Significance

In consideration of the VEC-specific significance criteria defined above, the residual effect(s) of routine Project activities on avifauna (i.e., change in habitat and change in mortality) are predicted to be not significant. The residual environmental effects from the Project on avifauna do not threaten the long-term persistence, viability, or recovery of an avifauna species (including SAR and SOCC) in the RAA. The Project is not predicted to result in residual effects to avifauna that are contrary to or inconsistent with the goals, objectives or activities of recovery strategies, action plans or management plans.

Project-related activities may result in short to long-term effects on avifauna in the Project Area and LAA, primarily as a result of clearing and cutting of vegetation, avifauna collisions with wind turbines, transmission lines, vehicles, equipment or infrastructure, and sensory disturbance.

The Project is not predicted to result in a substantial decline in avifauna density or diversity. Loss of habitat is predicted to be low to moderate depending on the species group. This is a conservative prediction because it assumes all habitat within the coarse scale habitat categories is suitable and that the species or species group is present. Increase in avifauna mortality is predicted to be low in magnitude because there are no concentrations of birds (e.g., colonies, migration bottlenecks) close to proposed wind turbines.

Critical habitat for Piping Plover is present in the RAA and Bobolink habitat is present in the LAA, but there is no critical habitat within the Project Area. No effects to critical habitat are expected from the Project and the Project is not predicted to jeopardize the overall abundance, distribution, or health of SAR.

The level of confidence in this prediction is discussed in Section 13.7.



13.7 Prediction Confidence

The prediction confidence in the determination of significance for avifauna is considered moderate. The predictions are based on background data compiled for the baseline report, an understanding of existing conditions, GIS habitat analyses, understanding of Project activities, winter baseline surveys for waterbirds, professional judgement and experience with similar projects, and the effectiveness of mitigation measures based on similar projects.

The level of confidence for the prediction is moderate (and not high) because the distribution and relative abundance of birds (including SAR) in the Project Area and the suitability of the habitat to support specific bird groups and SAR are not fully understood. A conservative approach was used to identify suitable habitat and predict habitat loss, which compensates for some uncertainty. Habitat occurrence and loss was mapped using available GIS data, but habitat data was coarse and was not suitable for detailed quantitative analyses. Mitigation measures identified in Section 13.4 are based on industry standards and have been implemented and demonstrated to be effective.

Prediction confidence is expected to increase following the completion of pre-construction surveys and proposed monitoring programs discussed below.

13.8 Follow-Up and Monitoring

Collection of baseline data for birds began in winter 2023 and continue through spring, summer and fall 2023 in the Port-au-Port area. Field surveys include:

- Winter waterbird land based and aerial surveys (winter)
- Harlequin Duck and Purple Sandpiper surveys (winter)
- Nocturnal owl surveys (breeding)
- Migration counts (spring and fall migration)
- Bird flight path surveys (spring and fall migration)
- Shorebird surveys (spring and fall migration, breeding)
- Breeding bird surveys using autonomous recording units (ARUs) and point count surveys (breeding)
- Waterbird colony counts (breeding)
- Marshbird surveys (breeding)
- Bank Swallow surveys (breeding and fall migration)
- Short-eared Owl surveys (breeding)
- Common Nighthawk surveys 3

ARUs were distributed across the LAA within the proposed locations of the Port au Port wind farm, transmission lines, and the hydrogen / ammonia plant in representative habitat types. ARUs will record vocalizations of bird species that are detected, including SAR.



Field effort in 2024 will focus on the Codroy wind farm and will fill in gaps in coverage in the Port-au-Port area. A bird monitoring program will be developed and implemented to evaluate changes in the bird community, including SAR.

A post-construction wildlife mortality monitoring program will be developed in consultation with NLDDFA-WD and ECCC CWS. This program will involve carcass searches between April and October. The search radius will be determined based on final turbine heights, as this affects fall distance of fatalities (Choi et al. 2020). In addition, searcher efficiency trials and scavenger trials will be conducted. These results will be used to estimate mortality rates for the Project.

13.9 Capacity of Renewable Resources and Effects on Biological Diversity

The potential environmental effects of the Project on avifauna were thoroughly assessed. The assessment concluded that routine Project activities are not likely to result in significant residual adverse effects on avifauna. Therefore, adverse Project-related effects on the capacity of renewable resources to meet the needs of the present and those of the future are not anticipated with respect to avifauna. Similarly, adverse Project-related effects on biological diversity that exceed the limits of natural variability or affect the long-term viability of biological diversity in the RAA are not anticipated with respect to avifauna.

13.10 Predicted Future Environmental Conditions if the Project Does Not Proceed

If the project is not allowed to proceed, the existing conditions as described in the baseline section will continue to prevail, including current land use and natural conditions. It is possible that future development may occur in the area, including wind energy (given those Project areas are designated for wind farm development), but neither the likelihood nor extent of such development can be reasonably predicted at this time based on currently known information. Future projects are anticipated to have similar effects on avifauna. Should the Project Area remain undeveloped, the predicted future condition of avifauna would be relatively unchanged from that discussed in the existing environment portion of this assessment (Section 13.2 and BSA 3).



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14.0 Bats

14.1 Scope of Assessment

The Bat Valued Environmental Component (VEC) includes resident and migratory bat species that occur on the island of Newfoundland. Bats are mammals that make up the order *Chiroptera*, which includes over 1,400 species, accounting for approximately 20% of all classified mammal species (Bat Conservation Trust 2023). Bats are the only mammal capable of true flight. On the island of Newfoundland, all bats are in the suborder *Microchiroptera* and in the family *Vespertilionidae* (or vesper bats), which are typically small, insectivorous species. Five species of bats have been recorded on the island of Newfoundland, of which two are species at risk (SAR) under the Newfoundland and Labrador *Endangered Species Act* (NL ESA) and under Schedule 1 of the federal *Species at Risk Act* (SARA).

Bats were chosen as a VEC because they are an ecologically important group of species, and are known to be adversely affected by wind farms. Wind turbines are known to cause bat fatalities through collisions and barotrauma. Barotrauma occurs when bats experience a sudden drop in air pressure when they get close to the rotating turbine blades. This causes internal hemorrhaging as the air in the lungs and other internal tissues expands rapidly, resulting in death (Baerwald et al. 2008; Brownlee and Whidden 2011).

Two species of resident bats in Newfoundland (little brown myotis (*Myotis lucifugus*) and northern myotis (*M. septentrionalis*) are federally listed as endangered due to recent populations declines caused by white-nose syndrome, a fungal disease that infects hibernating bats. In addition, in 2023 the three migratory species that occur on the island of Newfoundland (hoary bat (*Lasiurus cinereus*), eastern red bat (*Lasiurus borealis*), and silver-haired bat (*Lasionycteris noctivagans*)) have been ranked as endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). These COSEWIC assessments reflect the population declines in the migratory bats as a result of food and habitat loss, and from wind turbine related mortality (COSEWIC 2023).

While bats are very important ecologically, they are also economically important to the agricultural industry as pest control; it has been suggested that losing bats in North America could lead to agricultural losses of greater than \$3.7 billion per year (Boyles et al. 2011).

14.1.1 Regulatory and Policy Setting

Species at Risk Act (SARA)

SARA provides a framework across Canada to prevent the extinction of wildlife species and to support actions for their recovery. General SARA prohibitions include Section 32(1), which states that “no person shall kill, harm, harass, capture, or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species”, and Section 33, which states that “no person shall damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered species or a threatened species, or that is listed as an extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada.” In addition, critical



habitat, defined as the habitat that is necessary for the survival or recovery of a listed wildlife species, may be defined and protected under Section 58. Only those species currently listed in Schedule 1 of SARA (i.e., those listed as extirpated, endangered, or threatened) are protected by the prohibitions of Sections 32 to 36 and 58 of SARA, and then only on federal lands, except for aquatic species and migratory birds which are protected throughout Canada by other acts and regulations.

Newfoundland and Labrador Endangered Species Act (NL ESA)

In Newfoundland and Labrador, species at risk are protected under the NL ESA. Designation under the Act follows the recommendations of the Species Status Advisory Committee on the appropriate assessment of a species and referring concerns about the status of species to COSEWIC, where the species is of national importance.

The purpose of NL ESA is to:

- Prevent listed species from being extirpated from Newfoundland and Labrador
- Provide for the recovery of species listed as extirpated, endangered, or threatened as a result of human activity
- Conserve species listed as special concern to prevent them from becoming endangered or threatened

Prohibitions of NL ESA include Section 16, which states “a person shall not disturb, harass, injure, or kill an individual of a species designated as threatened, endangered or extirpated”. In addition, residences of threatened, endangered and extirpated species are also protected, through prohibition to ‘disturb or destroy’ the residence of these species. Species are listed under the Endangered Species List Regulations.

14.1.2 Species at Risk and Species of Conservation Concern

For this Project, SAR are defined as species that are:

- Listed on Schedule 1 of SARA as Extirpated, Endangered, Threatened or Special Concern
- Listed as Extirpated, Endangered, Threatened, or Vulnerable under the NL ESA

Species of Conservation Concern (SOCC) are defined as those species that are:

- Assessed as Extirpated, Endangered, Threatened, or Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) but have not yet been added to Schedule 1 of SARA
- Recommended for listing by the Species Status Advisory Committee (SSAC) as Endangered, Threatened or Vulnerable but are not yet listed under the NL ESA
- Ranked as provincially rare by the Atlantic Canada Conservation Data Centre (AC CDC) including species with provincial status (S-ranks) of S1 (Critically Imperiled), S2 (Imperiled) or combinations thereof (e.g., S1S2) upon review by the AC CDC (AC CDC 2023)



14.1.3 Boundaries

14.1.3.1 Spatial Boundaries

The following spatial boundaries were used to assess Project effects, including residual environmental effects, on bats in areas surrounding the Project components (Figures 14.1 and 14.2):

- **Project Area:** The Project Area encompasses the immediate area in which the Project activities and components occur and is comprised of following distinct areas: the Port au Port wind farm, the Codroy wind farm, the Hydrogen/Ammonia Production and Storage Facility (hydrogen / ammonia plant), Port Facilities, and the 230 kilovolt (kV) Transmission Lines, as well as associated infrastructure including roads, substations, and water supply infrastructure. The Project Area is the anticipated area of direct physical disturbance associated with the construction, operation and decommissioning, rehabilitation and closure of the Project. In addition to encompassing the immediate area in which Project components and activities will occur, the Project Area also includes a buffer of up to 300 m for access roads and turbines and a 350 m corridor to accommodate the 70 to 75 m wide right of way (RoW) for the transmission line. These buffers allow flexibility for the micro-siting of Project components during detailed design, based on technical considerations as well as the avoidance of environmentally sensitive areas, where practicable.
- **Local Assessment Area (LAA):** The LAA includes a 1 km buffer around the wind farms and hydrogen / ammonia plant, and 500 m around access roads and transmissions lines (Figure 14.1).
- **Regional Assessment Area (RAA):** The RAA for this VEC was delineated using ecoregions (subregions) and watersheds. It includes the Port au Port Subregion, the St. George's Bay Subregion and the Codroy Subregion. In addition, it includes the watersheds from within the Corner Brook Subregion that overlap with the Port au Port wind farm on Table Mountain (Figure 14.2).

Though not an official Project Boundary, the assessment references the "Project footprint", which is the anticipated area of direct physical disturbance associated with construction, operation and decommissioning, within the Project Area. The Project footprint is likely to change in some parts of the Project Area as a result of micro-siting, following biophysical surveys. The Project footprint represents 5.29% of the LAA and 1.12% of the RAA. The Project Area, which is not expected to be completely directly disturbed but represents the extent where clearing is possible, represents 36.56% of the LAA and 7.71% of the RAA.





Proposed Project Features

- ★ Hydrogen / Ammonia Plant Location
- Transmission Line 230 kV
- Project Area
- Local Assessment Area

Other Features

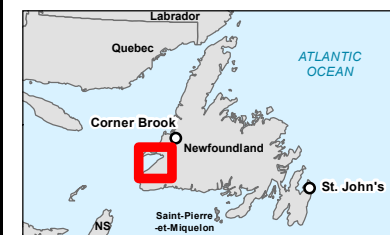
- Transmission Line, Existing
- Trans-Canada Highway
- Road
- Watercourse
- Contour (100 m)
- Wetland
- Waterbody
- Forested Area



0 10 Kilometres
(At original document size of 8.5x11)
1:520,227

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCAN CanVec, OpenStreetMap
3. Background: NRCAN CanVec



Project Location
Stephenville
NL

Prepared by MB on 2023-06-30
QR by AW on 2023-07-06

Client/Project
World Energy GH2
Project Nujio'qonik

121417233_067b

Figure No.

14.1

Local Assessment Area for Bats



Proposed Project Features

- ★ Hydrogen / Ammonia Plant Location
- Transmission Line 230 kV
- Project Area
- Regional Assessment Area

Other Features

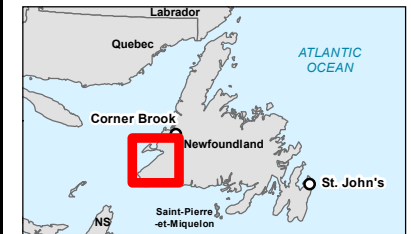
- Transmission Line, Existing
- Trans-Canada Highway
- Road
- Watercourse
- Contour (100 m)
- Waterbody
- Forested Area



0 10 Kilometres
(At original document size of 8.5x11)
1:730,000

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCan CanVec, OpenStreetMap
3. Background: NRCan CanVec



Project Location
Stephenville
NL

Prepared by MB on 2023-06-30
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Client/Project
World Energy GH2
Project Nujio'qonik

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Figure No.

14.2

Regional Assessment Area for Bats

14.1.3.2 Temporal Boundaries

The temporal boundaries for the assessment of potential effects on Bats include:

- **Construction:** Overall the construction phase of the Project will be from Q4 2023 through Q2 2027, pending EA approval and receipt of other required permits and approvals. Early civil works are planned to start Q4 2023 through Q3 2024. Construction of the Port au Port wind farm and associated infrastructure is expected to start in Q3 2024 with completion of the construction in Q4 2026. Construction of the Codroy wind farm and associated infrastructure is expected to start Q4 2025 with completion in Q1 2027. The hydrogen / ammonia plant will be constructed in phases from Q2 2024 to Q1 2026. Grid power sources are planned for hydrogen production in 2025 until March 2026, when the electrolyzer is commissioned.
- **Operation and maintenance:** Wind farm commissioning is anticipated to start Q1 2026 at the Port au Port wind farm and Q2 2027 at the Codroy wind farm. The 600 MW electrolyzer expected to be commissioned in Q1 2026. The operational life of the Project is 30 years at each site.
- **Decommissioning and rehabilitation:** After a 30-year operational life, the decommissioning phase is anticipated to occur during 2057 and 2058. Decommissioning is anticipated to begin Q1 2057 at the Port au Port wind farm, with completion in Q3 2058 at the Codroy wind farm.

14.2 Existing Environmental Conditions

14.2.1 Methods

Existing conditions were established through a literature review, a desktop habitat assessment and through field surveys.

The information on existing conditions was compiled from several sources including peer-reviewed published literature, field studies within the Project Area, and communications with the NL Department of Fisheries, Forestry and Agriculture – Wildlife Division (NLDFFA-WD). The following key public resources were used during background review:

- Recovery Strategy for the Little Brown Myotis (*Myotis lucifugus*), the Northern Myotis (*Myotis septentrionalis*), and the Tri-colored Bat (*Perimyotis subflavus*) in Canada (ECCC 2018)
- Guide for Bat Monitoring in Atlantic Canada (McBurney and Segers 2021)

The existing environment conditions information was informed by field surveys in the vicinity of the Project Area. Stantec completed an acoustic bat survey during the fall of 2022, during which eight Wildlife Acoustics Song Meter Mini Bat detectors were deployed. Four bat detectors were deployed at Port au Port Peninsula, and four were deployed at Codroy Valley. Habitats were targeted that are suitable for bats, including older forest, wetlands, ponds, and watercourses. In addition, Qalipu First Nation completed bat acoustic surveys on Port au Port Peninsula during the summer of 2019, 2020, 2021 and 2022. Four bat detectors were deployed each year, with the number of recording nights varying from four to 18. A more detailed description of field methods is included in the Terrestrial Environment Baseline Study (BSA-3).



A desktop habitat assessment was conducted using GIS. The Newfoundland Forest Inventory data set (NL Department of Forestry, Fisheries and Agriculture) was used to assess the presence of suitable bat habitat within the Project Area, LAA, and RAA. For the purpose of this assessment, suitable bat habitat was defined as habitat that provides roosting and/or foraging opportunities for resident bat species during the active season. These habitat categories were determined in the literature review. Using the Forestry Inventory data, suitable habitat was identified in the Project Area, LAA, and RAA, and the percentage of suitable habitat was calculated. In addition, that area to be cleared for the Project was also analyzed, to determine the abundance and types of habitats being altered as a result of the Project.

14.2.2 Existing Conditions

Five species of bats have been recorded in western Island of Newfoundland. This includes two resident species (little brown myotis and northern myotis, and three migratory species (hoary bat, silver-haired bat, and eastern red bat). One other species, big brown bat (*Eptesicus fuscus*) could potentially occur in western NL, based on its nearby range. These six species, including their habitat preferences, and records in Newfoundland and Labrador, are briefly described below. For more information, see the Terrestrial Environment Baseline Report (BSA-3).

14.2.2.1 Little Brown Myotis

In the province of Newfoundland and Labrador, little brown myotis is the most common bat species (NLDDFA n.d.). Little brown myotis is a resident species that is found in forested habitat in the spring, summer and fall, and hibernates during the winter. During the breeding season, females form maternity roosts, which can include up to hundreds of individuals, where they give birth to and raise their pups. Maternity colonies are often located in human structures, such as barns, attics, buildings, or bat boxes. They are also found in large diameter trees with cavities and/or peeling bark. Foraging sites for this species include open habitats, such as ponds, roads, or forest clearings. Little brown myotis spend their winters in hibernation at underground sites, such as caves and abandoned mines. The locations of hibernation sites (called hibernacula) are not well known in Newfoundland and Labrador. No known hibernacula sites occur within the Project Area (J. Humber, personal communication, February 24, 2023). However, there is the potential for hibernacula in the Anguille Mountains, particularly in areas with rocky limestone/karst landscapes.

Little brown myotis are listed as Endangered under the NL ESA and under Schedule 1 of SARA. This species has seen drastic population declines in North America caused by a fungal pathogen called white-nose syndrome, which was first detected in New York state in 2006. This pathogen affects hibernating bats, where it colonizes the bats skin, causing damage to the skin and elevated metabolic rates. Affected bats awake from torpor more frequently, which results in the depletion of energy reserves, and eventually mortality (ECCC 2018; Frank et al. 2014; Verant et al. 2014). White-nose syndrome was confirmed on the Island of Newfoundland in the winter of 2016/2017 (US Fish and Wildlife Service 2022). In areas affected by white-nose syndrome, mortality rates are typically high. Populations of little brown and northern myotis at some hibernacula in eastern Canada have declined by 94% since the arrival of white-nose syndrome (COSEWIC 2013). In in western Island of Newfoundland, the populations of hibernating bats have experienced declines between 94 and 99% (J. Humber, pers comm, December 8, 2022). As a result, the



population of little brown bats in western Island of Newfoundland is currently very low, in comparison with pre-white-nose levels.

A recovery strategy for little brown myotis (in combination with the northern myotis and tri-colored bat (*Perimyotis subflavus*) was released in 2018 (ECCC 2018). The short-term population objective for little brown and northern myotis in WNS affected areas is to stop the declining trend, and for the long term, to have a self-sustaining, resilient, redundant, and representative population (ECCC 2018a). Recovery planning strategies include species monitoring and research across Canada, public education, partnerships and stewardship, habitat and species conservation and management, and the development and implementation of management plans, laws, and policies (ECCC 2018).

Little brown myotis are confirmed as occurring in the LAA and in both the Codroy wind farm and Port au Port wind farm during the fall 2022 acoustic bat surveys.

14.2.2.2 Northern Myotis

Similar to little brown myotis, northern myotis is a resident species in Newfoundland and Labrador, associated with interior forest habitat during the active season. This species is more forest-associated than little brown myotis, and does not typically form maternity roosts in anthropogenic structures. Maternity roosts are formed in large diameter trees in forests with an open canopy and a high density of snags (Broder and Forbes 2004; Barclay and Kurta 2007; Garroway and Broders 2008). Bats roost in cavities or under loose bark, and maternity colonies frequently switch roost trees, but roosts are clustered in roosting areas (Foster and Kurta 1999; Broders et al 2006; ECCC 2018). Northern myotis hibernate at the same locations as little brown myotis, and both species are often found hibernating together.

Northern myotis are listed as Endangered under NL ESA and under Schedule 1 of SARA. Similar to little brown myotis, northern myotis has been heavily affected by white-nose syndrome, with estimated population declines of 94% (COSEWIC 2013). As a result, the current population level in western Island of Newfoundland is estimated to be very low. The recovery strategy is discussed in Section 14.2.2.1.

Northern myotis was confirmed as occurring in the LAA, within the Port au Port wind farm, during the fall 2022 acoustic bat surveys. It is very likely to occur during the Codroy wind farm and other portions of the Project Area as well.

14.2.2.3 Hoary Bat

Hoary bats are long-distance migrants, that move from northern breeding sites to overwintering sites, typically in the southern US or Mexico (Findley and Jones 1964, Cryan 2003). Hoary bats are typically solitary and roost in the foliage of mature deciduous or coniferous trees (Bat Conservation International 2023). In Newfoundland and Labrador, this species is thought to be an infrequent vagrant, and not a summer resident (Washingier et al. 2020). Based on records from Labrador (Aivek Stantec Limited Partnership 2021) and Nova Scotia (Lucas and Hebda 2011), hoary bats are most likely to occur in the fall migratory period (August and September). A hoary bat call was identified in the Codroy wind farm area during the fall 2022 acoustic surveys. This species was not recorded in the Qalipu acoustic data collected in the summers of 2019 to 2022.



Hoary bats are particularly vulnerable to turbine strikes, and account for approximately half of bat fatalities at wind turbine facilities in North America (Arnett et al. 2008). The majority of fatalities occur during the migratory period (Arnett et al. 2008). Hoary bats are designated as Endangered by COSEWIC.

14.2.2.4 Silver-haired Bat

Silver-haired bats are a tree-roosting, migratory species. This species is not expected to breed in Newfoundland. Most records of silver-haired bats in Atlantic Canada occur during migration (Lucas and Hebda 2011). In the fall, silver-haired bats migrate southwards to locations with milder temperatures, where they overwinter in roosts found in tree hollows, under loose bark, in wood piles or on cliff faces (Bat Conservation International 2023).

Within Atlantic Canada, silver-haired bats have been confirmed in Nova Scotia and New Brunswick. Acoustic detectors of this species have occurred in Newfoundland and Labrador and in Prince Edward Island, but presence has not been positively confirmed by capture and in-hand identification (McBurney and Segers 2021). During the 2022 acoustic surveys, silver-haired bat was recorded twice in the vicinity of the Codroy wind farm. This species was not recorded in the Qalipu acoustic data collected in the summers of 2019 to 2022. This species is only expected to occur during the migratory period. Records along the Atlantic Coast suggest that this species may migrate along coastlines and suggests that they are more associated with coastlines in the fall than during the spring migration (Cryan 2003). While silver-haired bats are typically solitary, they do form flocks during migration (Lucas and Hebda 2011). As a migratory, tree-roosting bat, silver-haired bats are vulnerable to turbine strikes, particularly during migration. Silver-haired bats are designated as Endangered by COSEWIC.

14.2.2.5 Eastern Red Bat

Like silver-haired and hoary bats, eastern red bats are a tree-roosting, migratory species. They roost in the foliage of deciduous or conifers, and typically occur in mixedwood forests. They are typically a solitary species, and females roost alone when rearing their young.

During the fall, eastern red bats migrate long distances to more southern areas with milder climates, where they overwinter (McBurney and Segers 2021). Little is known about the wintering habitat and behaviour of eastern red bat (Bat Conservation International 2023).

In Atlantic Canada, eastern red bat is confirmed as occurring in Nova Scotia and New Brunswick, and unconfirmed in Prince Edward Island. While there are no published records of this species in Newfoundland, NLDFFA-WD has detected this species in the past (J. Humber, personal communication, December 16, 2022). During the fall 2022 acoustic bat surveys, two calls from an eastern red bat were recorded on the Port au Port peninsula. This species is only expected to occur during the migratory period, and is not known to breed in Newfoundland and Labrador. This species was not recorded in the Qalipu acoustic data collected in the summers of 2019 to 2022. Eastern red bats are designated as Endangered by COSEWIC.



14.2.2.6 Big Brown Bat

Big brown bats are a habitat generalist, but are abundant in deciduous forests and suburban areas (Bat Conservation International 2023). During the breeding season, female bats typically form maternity colonies in human structures, including barns, buildings, bat houses and bridges, or in cavities or under the bark of trees (McBurney and Segers 2021; Bat Conservation International 2023). Big brown bats hibernate during the winter in heated buildings, deep rock crevices, or underground sites including caves and abandoned mines (McBurney and Segers 2021). As a foraging generalist, this species feeds on a wide variety of insects. Big brown bat was not recorded during the fall 2022 acoustic monitoring, or during the Qalipu acoustic surveys between 2019 and 2022.

14.2.2.7 Habitat Assessment

Based on the literature review, the following habitat types were identified as preferred habitat for roosting and foraging during the active bat season: mature forests with larger trees, wetlands, and waterbodies. It is important to note that bats may occur in any habitats throughout the Island of Newfoundland. Little brown myotis, in particular, is a habitat generalist and could occur in barren or stunted forest habitat while foraging. However, the aforementioned habitats were chosen as preferred habitats that may provide a specialized function, and bats may be more sensitive to changes in these habitat types. Myotis species often forage in wetland and over waterbodies, and typically roost in forests with large trees and snags. In Newfoundland, forest age may not be a good measure of forest suitability for bats, since mature forests are stunted, especially in coastal areas (Protected Areas Association of Newfoundland and Labrador 2008). Bats require large trees and snags, which may not be present in stunted coastal forests. To account for this, average forest height was used as the determinant of forest suitability, rather than forest maturity. Forests (including mixedwood, hardwood and softwood), with an average forest height of class 4 ($\geq 9.6\text{m}$) were classified as potentially suitable for bats. Within the forestry inventory data, not all forests are classified to forest type and height. Where they could not be classified, forests are identified as 'unknown forest'. To be conservative, unknown forest is classified as suitable bat habitat, since the forest attributes are unknown.

Suitable bat habitat within the Project Area is presented by Project component in Table 14.1. Overall, suitable bat habitat accounts for 24.8% of the Project Area, or 6,989 ha. Softwood forest and wetlands account for the largest suitable habitat categories, covering approximately 9.1% and 8.1% of the Project Area, respectively. These are also some of the most prevalent habitat types in the Project Area (Chapter 12). Very little suitable hardwood forest occurs within the Project Area, accounting for only 0.4% of land cover. Most suitable habitat occurs at the Codroy wind farm (9.6% of the Project Area), followed by the Port au Port wind farm (8.4% of the Project Area). Within the Project Area at the hydrogen/ammonia plant, potentially suitable forest habitat is classified as unknown forest. As such, the quality of that habitat for bats is not known.



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Table 14.1 Suitable Bat Habitat in the Project Area by Project Component

Habitat Type	Port au Port Wind Farm		Codroy Wind Farm		Hydrogen/Ammonia Plant		Transmission Lines		Total Area (ha)	Total % of Project Area
	Area (ha)	% of Project Area	Area (ha)	% of Project Area	Area (ha)	% of Project Area	Area (ha)	% of Project Area		
Mixedwood (height ≥ 9.6 m)	77.49	0.28	241.48	0.86	-	-	287.68	1.02	606.65	2.16
Softwood (height ≥ 9.6 m)	1,098.20	3.90	896.47	3.18	-	-	570.01	2.02	2,564.68	9.11
Hardwood (height ≥ 9.6 m)	-	0.00	63.17	0.22	-	-	40.14	0.14	103.32	0.37
Unknown Forest	678.33	2.41	93.92	0.33	7.78	0.00	167.66	0.60	947.69	3.37
Water	44.35	0.16	73.71	0.26	43.45	0.00	328.50	1.17	490.01	1.74
Wetland	467.10	1.66	1,324.67	4.71	10.13	0.00	475.00	1.69	2,276.90	8.09
Total	2,365.46	8.40	2,693.43	9.57	61.36	0.00	1,868.99	6.64	6,989.24	24.83



14.3 Assessment Criteria and Methods

This section describes the criteria and methods used to assess environmental effects on Bats. Residual environmental effects (Section 14.5) are assessed and characterized using criteria defined in Section 14.3.1, including direction, magnitude, geographic extent, timing, duration, frequency, reversibility, and ecological or socio-economic context. The assessment also evaluates the significance of residual effects using threshold criteria or standards beyond which a residual environmental effect is considered significant. The definition of a significant effect for Bats is provided in Section 14.3.2. Section 14.3.3 identifies the environmental effects to be assessed for Bats, including effect pathways and measurable parameters. This is followed by the identification of potential Project interactions with this VEC (Section 14.3.4). Analytical assessment techniques employed for the assessment of potential Project-related environmental effects on Bats are provided in Section 14.3.5. The assumptions that were made to support a conservative approach to the assessment of residual effects on Bats are described in Section 14.3.5.1.

14.3.1 Residual Effects Characterization

Table 14.2 presents definitions for the predicted environmental effects characterization of the undertaking on Bats. The criteria are used to describe the potential residual effects that remain after mitigation measures have been implemented. Quantitative measures have been developed, where possible, to characterize residual effects. Qualitative considerations are used where quantitative measurement is not possible.

Table 14.2 Characterization of Predicted Environmental Effects of the Undertaking on Bats

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Nature	The long-term trend of the residual effect	• Neutral – No net change in the measurable parameter(s) for Bats relative to baseline • Positive – A residual effect that moves the measurable parameter(s) in a direction beneficial to Bats relative to baseline • Adverse – A residual effect that moves the measurable parameter(s) in a direction detrimental to Bats relative to baseline



Table 14.2 Characterization of Predicted Environmental Effects of the Undertaking on Bats

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Magnitude	The amount of change in measurable parameter(s) or the VEC relative to existing conditions	• Negligible – No measurable change • Low – <u>Change in habitat</u>: localized change in habitat, change in bat relative abundance is within natural variation <u>Change in mortality</u>: estimated bat mortality rates are lower than average mortality rates at other wind farms in Atlantic Canada (as compared using the Wind Energy Bird and Bat Monitoring Database) • Moderate – <u>Change in habitat</u>: change restricted to a portion of a population or habitat, rapid and unpredictable change, temporarily outside range of natural variability <u>Change in mortality</u>: estimated bat mortality rates are comparable to average mortality rates at other wind farms in Atlantic Canada (as compared using the Wind Energy Bird and Bat Monitoring Database) • High – <u>Change in habitat</u>: change affecting a population, outside the range of natural variation. <u>Change in mortality</u>: estimated bat mortality rates are higher than average mortality rates at other wind farms in Atlantic Canada (as compared using the Wind Energy Bird and Bat Monitoring Database)
Geographic Extent	The geographic area in which a residual effect of a defined magnitude occurs	• Project Area – Residual effect is restricted to the Project Area • LAA – Residual effect extends into the LAA • RAA – Residual effect extends into the RAA
Timing	Considers when the residual environmental effect is expected to occur, where applicable or relevant to the VEC.	• No Sensitivity – Residual effect does not occur during critical life stage (e.g., breeding season) or timing does not affect Bats. • Moderate Sensitivity – Residual effect may occur during a lower sensitive period of a critical life stage (e.g., early in the breeding season when females are pregnant, but before pups are born) or end (e.g., when pups have the ability to fly) of the critical period. • High Sensitivity – Residual effect occurs during a critical life stage (e.g., breeding season, when pups are born but not yet able to fly).



Table 14.2 Characterization of Predicted Environmental Effects of the Undertaking on Bats

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Duration	The period of time required until the measurable parameter(s) or the VEC returns to its existing (baseline) condition, or the residual effect can no longer be measured or otherwise perceived	• Short-term – Residual effect is restricted to the duration of the construction phase (4 years). • Medium-term – Residual effect extends beyond the construction phase OR includes both the construction and decommissioning and rehabilitation phase. • Long-term – Residual effect extends through the operation and maintenance phase of the Project (30 years), or extend beyond the life of the Project.
Frequency	Identifies how often the residual effect occurs during the Project, during a specific phase of the Project, or during another specified time period	• Single event • Multiple irregular event – Occurs at no set schedule • Multiple regular event – Occurs at regular intervals • Continuous – Occurs continuously
Reversibility	Describes whether a measurable parameter(s) or the VEC can return to its existing condition after the Project activity ceases, including through active management techniques	• Reversible – Residual effect is likely to be reversed after activity completion and rehabilitation • Irreversible – Residual effect is unlikely to be reversed
Ecological / Socio-economic Context	Existing conditions and trends in the area where the residual effect occurs	• Undisturbed – Area is relatively undisturbed or not adversely affected by human activity. • Disturbed – Area has been substantially previously disturbed by human development or human development is still present.

14.3.2 Significance Definition

A significant adverse residual effect on bats and their habitat is defined as one that threatens the long-term persistence, viability, or recovery of a bat population in the RAA, including effects that are contrary or inconsistent with the goals, objectives or activities of the federal recovery strategy for bats (ECCC 2018).

14.3.3 Potential Environmental Effects, Project Pathways, and Measurable Parameters

Table 14.3 lists the potential Project effects on Bats and provides a summary of the Project effect pathways and measurable parameters and units of measurement to assess potential effects. Potential environmental effects and measurable parameters were selected based on review of recent environmental assessments for large development projects in NL, renewable energy projects in other parts of Canada, comments provided during engagement, and professional judgment.



Table 14.3 Environmental Effects, Effect Pathways, and Measurable Parameters for Bats

Environmental Effect(s)	Effect Pathway(s)	Measurable Parameter(s) and Units of Measurement
Change in habitat (Quantity and Quality)	• Direct habitat alteration through forest clearing, or infilling of wetland/waterbodies, as well as potential loss of hibernacula • Indirect habitat alteration resulting from light or noise pollution, or avoidance of turbines.	• Area (ha) of high suitability habitat in Project Area resident bats.
Change in Mortality	• Direct effect, e.g. collisions with wind turbines, other infrastructure and barotrauma • Indirect effect, e.g. reduced breeding success, reduced foraging habitat availability	• Post-construction mortality counts and modelling.

The Project may affect habitat quantity and quality. The quantity (area) of suitable bat habitat will decrease as a result of land clearing and conversion for Project components. This could lead to the loss of potential roosting sites used during the spring and summer season. In addition, the quality of habitat could be affected by noise or light pollution results from the Project (e.g., Schaub et al. 2008; Stone et al. 2015). Bats may avoid Project activity, resulting in habitat loss through disturbance.

The Project may also affect mortality in bats. Wind turbines can kill bats through direct collision and through barotrauma (e.g., Baerwald et al. 2008; Schuster et al 2015; Choi et al. 2020). Mortality is typically highest for migratory bats (Arnett et al. 2008), however, all of the bat species known to occur in western Island of Newfoundland may be affected. In addition, there may be indirect effects of the project on mortality. For example, disturbance related to project activities may result in decreased breeding success or foraging opportunities.

14.3.4 Project Interactions with Bats

Table 14.4 uses checkmarks to indicate the routine Project activities that could interact with the VEC and result in the identified environmental effect(s) to be assessed. Immediately following Table 14.4, environmental effects pathways are briefly described for potential routine Project-related environmental effects and justification is provided in cases where no Project interaction with the VEC (and therefore no potential environmental effect on the VEC) is predicted.



Table 14.4 Project Interactions with Bats, Environmental Effects, and Environmental Effect Pathways

Project Activities	Environmental Effect(s) to be Assessed	
	Effect #1 – Change in Habitat	Effect #2 – Change in Mortality
CONSTRUCTION		
Site Preparation and Civil Works (including turbine foundations, road construction, quarries, clearing, grubbing, blasting, cement production, and watercourse crossings)	✓	✓
Transportation of Resources and Equipment (includes trucking, shipping and barging of materials)	-	-
Construction / Installation, Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure	✓	-
Installation and Commissioning of Wind Turbines	✓	-
Installation and Commissioning of Collector Systems	✓	-
Installation and Commissioning of Transmission Lines and Substations (including marine cable crossing)	✓	-
Installation and Commissioning of Hydrogen / Ammonia Production, and Storage Facilities and Associated Infrastructure (including Industrial water supply infrastructure)	✓	-
Restoration of Existing Port Facilities (including pile driving and dredging)	✓	-
Emissions, Discharges, and Wastes ¹	✓	✓
Employment and Expenditures ²	-	-
OPERATION AND MAINTENANCE		
Presence, Operation, and Maintenance of Wind Farms (including wind turbines, access roads, and collector systems)	-	✓
Presence, Operation, and Maintenance of Transmission Lines and Substations	-	-
Presence, Operation, and Maintenance of Hydrogen / Ammonia Production, and Storage, Facilities and Associated Infrastructure (includes marine discharge from treatment plant)	-	-
Presence, Operation, and Maintenance of Port Facilities (includes loading of ammonia and vessel maneuvering within Port)	-	-
Emissions, Discharges, and Wastes ¹	✓	✓
Employment and Expenditures ²	-	-
DECOMMISSIONING AND REHABILITATION		
Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure	✓	-



Table 14.4 Project Interactions with Bats, Environmental Effects, and Environmental Effect Pathways

Project Activities	Environmental Effect(s) to be Assessed	
	Effect #1 – Change in Habitat	Effect #2 – Change in Mortality
Decommissioning and Rehabilitation of Wind Farms (including wind turbines, access roads, and collector systems)	✓	-
Decommissioning and Rehabilitation of Transmission Lines and Substations	✓	✓
Decommissioning and Rehabilitation of Hydrogen / Ammonia Production, and Storage, Facilities and Associated Infrastructure	✓	✓
Decommissioning and Rehabilitation of Port Facilities	✓	✓
Emissions, Discharges, and Wastes ¹	✓	✓
Employment and Expenditures ²	-	-
Notes: ✓ = Potential interaction – = No interaction ¹ Emissions (e.g., light, noise, vibration, air contaminants and GHGs), discharges (e.g., wastewater and other liquid effluents), and hazardous and non-hazardous wastes are generated by many Project activities. Rather than acknowledging this by placing a checkmark against each of these activities, “Emissions, Discharges, and Wastes” is listed as a separate item under each phase of the Project. ² Project employment and expenditures are generated by most Project activities and are the main drivers of many potential socio-economic effects. Rather than acknowledging this by placing a checkmark against each of these activities, “Employment and Expenditures” is listed as a separate item under each phase of the Project.		

In the absence of mitigation, the Project may interact with bats in the following ways:

Construction:

- All activities during construction, except employment and expenditures and transportation of resources and equipment, may result in a change in habitat for bats. Habitat will be altered where suitable habitat is cleared during site preparations, which includes clearing and grubbing. This could result in loss of roost sites (mature forest) and foraging habitat (wetland/waterbodies).
- Site preparation may also result in bat mortality, if a tree or structure containing a roost is destroyed. Young bats in maternity roosts without the ability to fly are particularly susceptible to mortality if this occurs.
- The presence, operation and maintenance of temporary workforce accommodations and associated infrastructure have the potential to provide new roosting structures for bats.



- Emissions, discharges and wastes during the construction phase includes noise and light pollution. Noise can have an indirect effect on bats through disturbance. Light pollution at night has the potential to attract bats, as lights attract insect prey. Habitat may be altered through avoidance or attractance (e.g., Schaub et al. 2008; Stone et al. 2015).
- Discharges or wastes that are toxic (e.g., ammonia, hydrocarbons) have the potential to cause mortality in bats, if they are above certain thresholds. Discharges into wetland / waterbody foraging habitat may affect productivity of prey sources, indirectly affecting bats.

Operation and Maintenance:

- The presence and operation of wind farms will affect mortality, and bat fatalities may occur as a result of strikes with turbines or barotrauma. Migratory bats typically account for the majority of bat fatalities in Canada (Arnett et al. 2008).
- Emissions, discharges and Wastes during the operations and maintenance phase includes noise and light pollution. Noise and light can have an indirect effect on bats through disturbance, and may results in habitat loss through avoidance (e.g., Schaub et al. 2008; Stone et al. 2015).
- Discharges or wastes that are toxic (e.g., ammonia, hydrocarbons) have the potential to cause mortality in bats, if they are above certain thresholds. Discharges into wetland / waterbody foraging habitat may affect productivity of prey sources, indirectly affecting bats.

Decommissioning and Rehabilitation

- The presence, operation and maintenance of temporary workforce accommodations and associated infrastructure have the potential to provide new roosting structures for bats.
- The decommissioning of substations, hydrogen/ammonia plant, port facilities and associated infrastructure has the potential to remove potential bat roost locations. If bats are roosting in these structures when they are torn down, decommissioning has the potential to result in mortality.
- Emissions, discharges and wastes during the operations and maintenance phase includes noise and light pollution. Noise and light can have an indirect effect on bats through disturbance, and may results in habitat loss through avoidance (e.g., Schaub et al. 2008; Stone et al. 2015).
- Discharges or wastes that are toxic (e.g., ammonia, hydrocarbons) have the potential to cause mortality in bats, if they are above certain thresholds. Discharges into wetland / waterbody foraging habitat may affect productivity of prey sources, indirectly affecting bats.

The following Project activities are not expected to result in a change in habitat and/or mortality:

Construction:

- The transportation of resource and equipment is not expected to interact with bat habitat, with the exception of noise and light, which is captured under emissions, discharges and wastes.
- Employment and expenditures are will not interact with bat habitat or mortality.
- The following are not expected to effect a change in mortality for bats:
 - Transportation of resources and equipment



- Construction/installation, presence, operation and maintenance of temporary workforce accommodation
- Installation and commissioning of wind turbines
- Installation and commissioning of collector systems
- Installation and commissioning of transmission lines and substations
- Installation and commissioning of hydrogen/ammonia production and storage facilities, and associated infrastructure
- Restoration of existing port facilities
- Some of these Project activities may have the potential to result in discharges or wastes, however, those effects are captured under the emissions, discharges and wastes activity. It is expected that bats can move out of the way of the potential dangers of construction.

Operation and Maintenance:

- Since noise pollution, air pollution, emissions, wastes and discharges are covered under the emissions, discharges and wastes effect, no further effects on habitat or mortality are expected from the presence, operation and maintenance of the hydrogen/ammonia facility or port facilities. Similarly, the presence, operation and maintenance of wind farms is not expected to result in further effects of habitat.
- Employment and expenditures will not interact with bats habitat or mortality.

Decommissioning and Rehabilitation

- Mortality is not expected from the following project activities:
 - Presence, operation and maintenance of temporary workforce accommodations and associated infrastructure
 - Decommissioning and rehabilitation of wind farms
- The presence of temporary accommodations and infrastructure are not expected to result in bat mortality. It is not anticipated that bats will be roosting in wind turbines or collector systems, where they could be harmed by decommissioning.
- Employment and expenditures will not interact with bats habitat or mortality.

14.3.5 Analytical Assessment Techniques and Level of Knowledge

Environmental effects of this Project on bats have been determined through a literature review. The effects of wind turbines on bats have been well studied in North America. Post-construction mortality surveys are standard at wind farms in Canada and the United States, and as such, seasonal patterns and species composition of bat mortalities are well understood.



Most studies related to the effects of wind turbines on bats have focused on the risk of bat fatalities, rather than indirect effects on habitat (Schuster et al. 2015). Indirect effects are less understood. However, literature on the effects of noise and light on bats in other contexts was used to predict potential effects of the Project.

14.3.5.1 Assumptions and Conservative Approach

A conservative approach was used to address uncertainty in the environmental effects assessment, allowing for increased confidence in the final determination of significance. Specifically, the following assumptions were made:

- The amount of suitable habitat for bats was estimated using a conservative approach. Relatively broad habitat classes were used for rankings, which may result in an overestimation of suitable habitat. In practice, species may only use a portion of habitats identified.
- In determining the size of the LAA, the distance from which indirect changes in habitat extend from the source were assumed to occur at the maximum identified distances of the LAA at all times, whereas the indirect effects will actually vary greatly depending on site activity.
- Mortality was also assessed using a conservative approach. Wildlife typically has the ability to move out of the way of danger and will typically avoid areas where work is being conducted, because of the presence of human activity and noise.

14.4 Mitigation Measures

A series of environmental management plans will be developed by WEGH2 to mitigate the effects of Project development on the environment. A full list of mitigation measures to be applied throughout Project construction, operation and maintenance, and decommissioning and rehabilitation is provided in Chapter 26, Section 26.2. Key measures to mitigate the potential effects of the Project on bats are listed in Table 14.6, by category and Project phase.

Table 14.5 Mitigation Measures: Bats

ID #*	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
4	Mitigation	Sensitive areas (e.g., wetlands, rare plant occurrences, hibernacula, mineral licks, roosts) identified prior to Project activities will be flagged and appropriate buffers maintained around these areas, where feasible.	X	-	-
5	Mitigation	Clearing for temporary road construction will be limited to the width required for road embankment, drainage requirements, and safe line of sight requirements. Trees will be cut close to ground level, and only large tree stumps will be removed, where practicable. Low ground shrubs will be left in place for soil stability and erosion protection purposes, where possible.	X	-	-
8	Mitigation	Project staff and contractors will adhere to the waste management procedures to be included in the EPP and the Waste Management Plan.	X	X	X



Table 14.5 Mitigation Measures: Bats

ID #*	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
11	Mitigation	Volatile wastes and materials, such as fuel, mineral spirits, oil, or paint thinner will be stored appropriately and will not be permitted to enter into waterways or storm drains. They will be disposed of at an approved site.	X	X	X
14	Mitigation	Bulk fuel and lubricants will be stored in secure areas (i.e., with bund walls and impervious flooring) that have the capacity to trap more than the volume of petroleum hydrocarbons being stored; this will serve as a secondary containment should the primary containment fail. Other petroleum hydrocarbon products will not be stored in large quantities on-site, and secondary containment (e.g., drip trays) will be used in areas of storage and transfer.	X	X	X
15	Mitigation	Hazardous products will be stored according to industrial requirements and standards, and safely secured so that access is limited to authorized personnel.	X	X	X
16	Mitigation	Fueling and servicing will be conducted using appropriate containment equipment, including spill kits.	X	X	X
20	Mitigation	Project footprint and disturbed areas will be limited to the extent practicable.	X	X	X
22	Mitigation	Project vehicles, heavy equipment, machinery, and associated exhaust systems and mufflers (and/or other appropriate sound attenuation devices) will be regularly inspected and maintained so that they remain operating in accordance with manufacturer's recommendations.	X	-	-
23	Mitigation	Project vehicles, heavy equipment, and machinery will be shut down when stationary for long periods of time. The idling of vehicles and equipment will be avoided whenever practical.	X	-	-
29	Mitigation	Project vehicles will drive within the speed limit to reduce engine noises as vehicles travel on roadways within adjacent communities, and horns will be used only as necessary for safety purposes.	X	-	-
39	Mitigation	Environmental personnel responsible for site monitoring during construction will receive training to recognize SAR / SOCC that may be present in Project Area.	X	-	-
40	Mitigation	WEGH2 will work with Wildlife Division to manage interactions with identified sensitive areas.	X	-	-
41	Mitigation	Artificial lighting will be limited to the amount required for safety and security purposes, and will be directional, or otherwise designed, to reduce spill-over light, wherever feasible, without compromising site safety or security. Lights will be side-shielded and directed downward to reduce the attraction of birds, where possible.	X	-	-
59	Mitigation	Hazardous products will be stored according to industrial requirements and standards, and safely secured so that access is limited to authorized personnel.	X	X	X



Table 14.5 Mitigation Measures: Bats

ID #*	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
72	Mitigation	Turbine lighting levels will be at, or above, the minimum allowed by Transport Canada for aeronautical safety, and white or red strobe lights may be used with the minimum intensity and flashes per minute allowable.	-	X	-
73	Mitigation	A post-construction wildlife mortality monitoring program will be established, and carcass searches will be conducted at the turbines between April and October. Surveys will be designed to account for searcher efficiency and scavenger rates. The mortality monitoring program will be developed in consultation with the Government of NL Wildlife Division and the CWS.	-	X	-
74	Mitigation	An adaptive management framework will be used to introduce new mitigation measures if high fatality rates are observed. Mitigation measures such as an increase in cut-in speeds, or other effective mitigation measures from operational wind power projects, will be considered.	-	X	-
77	Mitigation	Best practices for the proper handling, storage, and disposal of spilled hazardous chemicals and fuels will be included in the EPP and implemented by the Project personnel and contractors.	X	-	-
148	Mitigation	Wildlife surveillance will be conducted prior to, and post, noise elevated activities. Activities may be delayed until wildlife have been allowed to leave the area as directed by the OSEM.	X	-	-
149	Mitigation	Blasting patterns and procedures will be used to reduce shock or instantaneous peak noise levels, in accordance with a Blast Management Plan that will be developed for the Project.	X	-	-
150	Mitigation	Explosives will be used in a manner that will reduce damage or defacement of landscape features, trees, ecologically sensitive areas such as wetlands, and other surrounding objects, by controlling through standard best practice (including precisely calculated explosive loads and adequate stemming), the scatter of blasted material beyond the limits of activity. Outside of cleared areas, inadvertently damaged trees will be cut, removed, and salvaged, if merchantable (refer to Section, "Clearing of Vegetation"). Fly rock, which inadvertently enters a waterbody, watercourse, or ecologically sensitive area and that can be recovered without further damage to the environment, will be removed. Instances where larger fly rocks (boulders) enter these areas or deep waterbodies, recovery of this will be discussed with the OSEM.	X	-	-
159	Design	Proposed ecological reserves on the Port au Port Peninsula and Codroy area will be avoided to the extent possible.	X	-	-
240	Mitigation	Tree clearing will be completed in accordance with permit conditions, including any timing windows/restrictions.	X	-	-
241	Mitigation	A Species at Risk Impact Mitigation and Monitoring Plan will be developed for the Project, which will include mitigation and monitoring for SAR bats.	X	-	-



Table 14.5 Mitigation Measures: Bats

ID #*	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
251	Mitigation	Observations of bat colonies, potential hibernacula sites, and sick or dead bats will be reported to the provincial Wildlife Division at 709-637-2025 or email endangeredspecies@gov.nl.ca. Bat sightings can also be reported to the toll-free bat hotline the Province has partnered with: 1-833-434-2287 (BATS).	X	X	X
252	Mitigation	The SAR IMMP will include information about hoary bat (<i>Lasiurus cinereus</i>), silver-haired bat (<i>Lasionycteris noctivagans</i>), and Eastern red bat (<i>Lasiurus borealis</i>), particularly given their known susceptibility to mortality at wind turbines. Mitigation in the IMMP may include locking or feathering the turbine blades below the standard cut-in speed during the bat active season from May 1 to October 31.	X	X	X
253	Mitigation	If there is observed mortality of NL ESA-listed bat species (currently little brown myotis [<i>Myotis lucifugus</i>] and northern myotis [<i>M. septentrionalis</i>]) during operation and maintenance activities, any relevant procedures prescribed by permit conditions will be followed.	X	X	X
* Note: "ID #" denotes the master identification number for mitigation, Appendix 26-A "C" denotes the construction phase of the Project. "O" denotes the operation and maintenance phase of the Project. "D" denotes the decommissioning and rehabilitation phase of the Project. "X" denotes the relevant Project phase to mitigation measure					

14.4.1 Application of the Precautionary Principle to Project Mitigation Measures

The mitigation measures in Section 14.4 have been selected in consideration of the environmental effects pathways and include standard proven mitigation measures for bats. The precautionary principle was used in determining mitigation measures for the Project. For example, although it is not known if bats occur in all portions of the Project Area, mitigation measures assume that bats are present ubiquitously across the landscape. Because there is some uncertainty around the magnitude of effects on bats, an adaptive management framework will be used, which allows for mitigation to be changed or strengthened if unexpected, or higher magnitude than expected, effects are observed.

As a result of using the precautionary principle, it is expected that the mitigation measures presented are more than adequate for reducing the risk of effects to acceptable levels.



14.5 Residual Environmental Effects

14.5.1 Change in Habitat

14.5.1.1 Construction

Most direct habitat loss for bats will occur during the construction phase as a result of land clearing and land conversion. This will occur during the site preparation and civil works project activities. Vegetated habitat will be cleared for roads, transmission lines, turbine pads, the hydrogen/ammonia plant, and other Project infrastructure. This can result in the loss of suitable habitat for roosting or foraging.

Based on the assessment of suitable bat habitat, approximately 13.9% of the suitable bat habitat within the Project Area will be altered as a result of clearing for Project infrastructure (Table 14.6). This habitat includes hardwood, softwood and mixedwood forests with average tree heights ≥ 9.6 m, as well as wetlands and waterbodies and/or watercourses.

Within the Project Area, 29% of suitable hardwood forest will be lost. Overall, suitable hardwood forest is a small component of the Project Area, and even a small loss of this habitat (86 ha) accounts for a relatively large proportion. Similarly, 18% of the suitable mixedwood forest within the Project Area is lost. Within the LAA, hardwood forest again has the largest percent lost, at 5.9%. For other suitable habitat types, the percentage lost was less than 5%. In the RAA, the percentage of suitable habitat lost aligns more closely with the abundance of habitat across the landscape, with softwood forest having the largest percentage lost.

Although some of that habitat will be remediated after the Project is over, forests on the Island of Newfoundland are slow-growing and would not return to a mature natural state for many years.



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Table 14.6 Area and Percentage of Suitable Habitat to be Cleared in the Project Area, LAA and RAA

Habitat Type	Project Area			LAA		RAA	
	Area of Suitable Habitat to be Cleared (ha)	Area of Suitable Habitat in Project Area (ha)	% of Suitable Habitat Lost	Area of Suitable habitat in LAA (ha)	% of Suitable Habitat Lost	Area of Suitable habitat in RAA (ha)	% of Suitable Habitat Lost
Hardwood (height ≥ 9.6 m)	25.43	86.36	29.45	432.50	5.88	5,372.59	0.47
Softwood (height ≥ 9.6 m)	352.35	2,398.32	14.69	8,074.91	4.36	34,659.23	1.02
Mixedwood (height ≥ 9.6 m)	95.60	513.31	18.62	2,916.87	3.28	21,228.14	0.45
Unknown Forest	116.50	923.59	12.61	2,916.79	3.99	12,614.31	0.92
Wetland	256.00	2,242.39	11.42	5,479.39	4.67	34,512.89	0.74
Water	76.28	479.94	15.89	1,408.02	5.42	123,088.28	0.06
Total	922.16	6,643.91	13.88	21,228.47	4.34	231,475.44	0.40



Habitat loss or conversion can result in habitat fragmentation and loss of connectivity. Bats require connectivity between roosting and foraging areas (Verboom and Huitema, 1997; Stone et al. 2015). As a result, fragmentation can affect bat populations and distribution. For example, a study on northern myotis and habitat fragmentation on Prince Edward Island found a positive relationship between forest cover and bat presence (Henderson et al. 2008). Fragmentation can also result in a reduction in animal movement, potentially resulting in a reduction of gene flow (Frankham 2006).

Project construction may also result in an indirect loss of habitat through sensory disturbance (e.g., noise, light, vibrations). The magnitude of sensory disturbance is directly related to the level of nearby Project activity. Examples of Project construction activities resulting in loud noises including, blasting, drilling and the operation of heavy equipment. Noise may result in bat avoidance, and thus a loss of suitable habitat for bats (Schaub et al. 2008). A variety of mitigation will be implemented to reduce Project related noise (Table 14.6). For example, blasting patterns and procedures will be used to limit shock or instantaneous peak noise levels. Project vehicles, heavy equipment, and machinery will be shut down when stationary for long periods of time, and vehicles, equipment and machinery and associated exhaust systems and mufflers (mufflers (and/or other appropriate sound attenuation devices) will be regularly inspected.

As a nocturnal species, bats can be affected by artificial light. The natural light dark cycle is important for the biological circadian rhythms of animals, and influences behaviour and activity (Stone et al. 2015; Haeussler and Erkert 1978). In some cases, artificial light near bat roosts can cause delayed emergence in some species (Stone et al. 2015; Boldogh et al. 2007). This delay may result in decreased foraging. The peak of insect activity typically occurs at dusk, and if bats are delayed in emerging, they may miss this peak, thus resulting in reduced foraging success (Rydell et al. 1996). Bats may avoid areas that are artificially lit up, resulting in reduced habitat availability and foraging opportunities (Stone et al. 2012).

The effects of artificial lighting on bats differs by species, and by type of light. For example, some studies have shown that certain species avoid streetlights (e.g., Rydell 1992), while other studies show attraction to streetlights (Rydell & Racey 1995). The highest levels of bat activity seem to be associated with white lights, likely because insects are also attracted to white lights (Rydell and Racey 1995; Rydell, 1992).

As per the mitigation outlined in Table 14.6, turbine lighting will be the minimum allowed by Transport Canada for aeronautical safety. In addition, artificial lighting on Project buildings and other infrastructure will be limited to the amount required for safety and security purposes, and will be directional or otherwise designed to reduce spill-over light wherever feasible.

The Environment and Climate Change Canada (ECCC) recovery strategy (2018) identifies preliminary areas of critical habitat. At this stage, the only habitat feature considered as critical habitat are hibernacula, since suitable hibernacula may be limiting for little brown myotis (ECCC 2018). There are no known hibernacula in the LAA. However, it is likely that hibernacula do occur, particularly in the limestone barrens at Port au Port Peninsula and the Anguille Mountains. Project construction may affect hibernacula, should they occur in the vicinity of Project activities. Construction activities, including drilling or blasting, could disturb hibernating bats through noise and vibrations. Should bat hibernacula occur within the LAA, blasting and other loud noise may result in disturbance to hibernating bats. Blasting can also result in underground vibrations, which may disturb hibernating bats if they are close enough to the blasting to experience vibrations. Noise or vibrations could wake bats from hibernation, thereby causing



them to expend undue energy and burn limited fat reserves (West Virginia Department of Environmental Protection 2006). Underground vibrations could also result in damage to underground hibernacula sites, including collapses, which could affect the ability of bats to access sites. Changes to underground structures, such as caves, could also result in a change to airflow, and subsequently the site microclimate.

Effects of Project construction on bat habitat are expected to be moderate in magnitude, occur in the LAA, occur during times of high sensitivity, be short term, continuous, and reversible. Based on the information above, a summary of residual effects on a change in habitat during the construction phase is provided in Table 14.7.

Table 14.7 Summary of Effects by Project Component During Construction

Project Site	Summary of Effect during Construction
Temporary Workforce Accommodations	Residual direct habitat alternation will occur if suitable bat habitat is cleared for Project infrastructure, which may occur at any of the Project sites. This could also result in habitat fragmentation. Residual indirect effects on habitat may occur through disturbance caused by light and noise during construction. This may result in avoidance of areas where construction is occurring. Blasting could result in vibrations, which may disturb hibernating bats.
Port au Port Wind Farm and Associated Infrastructure	
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

14.5.1.2 Operation and Maintenance

Operation and maintenance may have indirect effects on bats through noise and light. Noise will be produced by the operation of the plant and wind turbines, as well as maintenance activities at both wind farms. Some turbines will be equipped with lights. The hydrogen/ammonia plant will also produce noise and light as a part of regular operation. In addition, the roads associated with the Project will have traffic throughout the operation phase, resulting in both noise and light effects. Traffic noise is relatively low, and both noise and light are temporary as cars pass. These effects, and associated mitigation are discussed in Section 14.5.1.1.

It is possible that some project infrastructure could provide roosting opportunities for bats. This would include structures such as the temporary workforce accommodation, port facilities, hydrogen/ammonia plant. It is expected that most infrastructure would not be attractive for bats due to high levels of activity and noise.

Effects of Project operation and maintenance on bat habitat are expected to be adverse, of low magnitude, occur within the LAA, occur during times of high sensitivity (e.g., the breeding season), be long term in duration, continuous, and reversible. Based on the information above, a summary of residual effects on Bats during the operation and maintenance phase is provided in Table 14.8.



Table 14.8 Summary of Effects by Project Component During Operation and Maintenance

Project Site	Summary of Effect during Operation and Maintenance
Port au Port Wind Farm and Associated Infrastructure	There will be a residual indirect effect on habitat through disturbance caused by light and noise during regular operations and maintenance. Light and noise disturbance may occur at any of the Project Sites, and could result in habitat loss through avoidance. Project infrastructure (e.g., temporary work accommodations, storage facilities) could provide suitable bat roosts. However, it is expected that many of these roosts would not be attractive to bats due to noise and light in the area.
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

14.5.1.3 Decommissioning and Rehabilitation

Decommissioning and rehabilitation are expected to have indirect effects on bat habitat through disturbance (light and noise). During decommissioning, infrastructure will be disassembled and removed, resulting in temporary noise. The effects of light and noise, and associated mitigation, are discussed in Section 14.5.1.1.

Bats may use buildings or structures within the Project Area as roosts during the spring, summer or fall. If bats roost in Project infrastructure, that habitat has the potential to be lost during decommissioning. However, the suitability of most structures as roost is limited, due to the Project activity and associated noise and light.

Rehabilitation may increase suitable habitat, if suitable bat habitat is restored. However, it will take an extended time period for mature roosting habitats to develop post-rehabilitation.

The effects of Project decommissioning and rehabilitation on bat habitat are expected to be both adverse and positive, low in magnitude, occur in the LAA, occur during times of high sensitivity (e.g., the breeding season), be continuous, and reversible. Based on the information above, a summary of residual effects on Bats during the decommissioning and rehabilitation phase is provided in Table 14.9.



Table 14.9 Summary of Effects by Project Component During Decommissioning and Rehabilitation

Project Site	Summary of Effect during Decommissioning and Rehabilitation
Temporary Workforce Accommodations	There will be a residual indirect effect on habitat through disturbance caused by light and noise during regular operations and maintenance. Light and noise disturbance may occur at any of the Project Sites, and could result in habitat loss through avoidance.
Port au Port Wind Farm and Associated Infrastructure	
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	Potential loss of roosting habitat may occur, if the temporary workforce accommodations, or other Project infrastructure, provided a suitable roost site. When Project infrastructure is demolished and/or removed from site, that potential roosting habitat is lost.
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

14.5.2 Change in Mortality

14.5.2.1 Construction

Mortality could occur during the construction phase through the destruction of roosts. If a tree or snag containing a roost is destroyed during vegetation clearing, it could be fatal to roosting bats. Pups are particularly susceptible, as they are unable to fly and escape danger.

Road traffic may result in bat mortality through vehicle collisions. It is generally thought that bat-vehicle collisions are rare (Ramalho and Aguiar 2020; Ashely and Robinson 1996), however, it is possible that numbers are larger than reported since bats would be difficult to detect in a roadkill study due to their small size (Ramalho and Aguiar 2020). Bat vehicle collisions are higher where flyways cross the road, and when suitable bat habitat (e.g., forests) occurs on both sides of the road (Lesiński 2007; Altringham and Kerth 2016). Young bats are particularly more susceptible than adults to collision with cars (Fensome and Mathews 2016).

The Project could also affect risk of mortality through decreased reproductive success or fitness. For example, the exposure to artificial lighting has been shown to reduce reproductive success, and reduce juvenile growth rates (Boldogh et al. 2007; Stone et al. 2015). If hibernacula are located in or near the Project Area, disturbance could result in increased arousal during the hibernation period. Repeated arousals could result in increased fat consumption and premature energy depletion, starvation, and mortality (ECCC 2018). In addition, female reproductive success depends on spring fat reserves (Jonasson and Willis 2011), therefore a decrease in body condition during torpor could affect reproductive success. This could have a compounding effect on bat populations that are recovering from white-nose syndrome, as their fitness has already been reduced due to the fungal pathogen. However, these compounding effects would only occur during hibernation or directly after emergence, since the fungus causing white-nose syndrome cannot survive on active bats, since their body temperature is too high (Lanwing et al. 2015).



The effects of Project construction of bat mortality are expected to be adverse, of low magnitude, restricted to the Project Area, occur in high sensitivity timing, be short term, irregular, and reversible. Based on the information above, a summary of residual effects on change in mortality during the construction phase is provided in Table 14.10.

Table 14.10 Summary of Effects by Project Component During Construction

Project Site	Summary of Effect during Construction
Temporary Workforce Accommodations	Residual risk of mortality may occur if roost trees are removed during site clearing. Young bats are particularly vulnerable to mortality if their roost is destroyed before they have developed the ability to fly. In addition, risk of mortality may occur through bat collisions with vehicles or heavy equipment. This risk is expected to be low, and collisions are expected to be very infrequent. Residual indirect effects on mortality may occur if construction results in light or noise disturbance, which could lead to reduced reproductive success and fitness.
Port au Port Wind Farm and Associated Infrastructure	
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

14.5.2.2 Operation and Maintenance

Wind turbines can cause bat mortalities through turbine strikes or barotrauma. Barotrauma occurs when bats experience a rapid pressure drop as they enter the low-pressure area near turbine blades. This causes tissue damage to air-containing structures in their bodies and can include pulmonary hemorrhaging (Baerwald et al. 2008). Barotrauma has been found to cause a high proportion of bat fatalities associated with turbines. A study at a wind farm in Alberta examined 188 dead bats found evidence of barotrauma in 90% of bat fatalities, while external injuries consistent with blade strikes were found in 50% (Baerwald et al. 2008). Migratory bats that roost in trees (including hoary, silver-haired and eastern red bats) are most susceptible to wind turbine related mortalities. In North America, migratory tree bats account for 75% of wind farm fatalities, and hoary bats accounted for half of the fatalities (Arnett et al. 2008). A high proportion of these fatalities occur during the fall migration season (Cryan and Barclay 2009).

Although little brown myotis and northern myotis fatalities occur less frequently than the migratory species, fatalities of these species do occur as a result of barotrauma and blade strikes (COSEWIC 2013). In a study of bat mortality at wind farms across Canada, it was determined that little brown myotis accounted for 13% of bat mortalities from wind turbines (Zimmerling and Francis 2016).

Bats are long-lived and have low fecundity rates. As such, they are slow to recover from population declines. Research has indicated that increasing cut-in speeds can reduce bat fatality rates, since bat activity is highest at low wind speeds (Arnett et al. 2008). Cut in-speeds are the minimum wind speed required for the blades to start moving. A study in Pennsylvania compared fatality rates at turbines that were fully operational with those that had cut in rates of 5 m/s and 6.5 m/s. Results indicated an average



nightly bat fatality was reduced by 56 to 92% at the sites with reduced cut-in rates, with minimal annual power loss (Arnett et al. 2010).

Typically, locking or feathering turbine blades below standard cut-in speeds results in only a small reduction in annual energy production. A review of five studies showed an average of 1% reduction of annual energy production as result of curtailment (Whitby et al. 2021). Locking or feathering the blades prevents the blades from spinning or “pin wheeling” during low wind conditions, thus reduce the risk of bat collisions. An adaptive management framework will be developed to introduce new mitigation measures if bat fatalities exceed acceptable levels. New mitigation may include a reduction of cut-in speeds to reduce bat fatalities.

The number of resident bat species in the Project Area is low, because of the population declines from white-nose syndrome. As such, it is expected that mortality of resident species at the wind farms will be low. In addition, adaptive management measures during the active bat season is expected to reduce bat fatalities. It is not anticipated that wind farm related mortalities will hinder the recovery of resident bats from white-nose syndrome in Newfoundland.

At the hydrogen/ammonia plant, flaring will occur approximately once a year (Chapter 2). Flaring could result in bat mortalities, if bats are in the vicinity when flaring occurs. However, these fatalities would expect to be low. Although mass fatalities of birds have been recorded during flaring events (Ronconi et al. 2015), this has not been observed with bats.

Exposure to ammonia, hydrogen, fuels, or other hazardous substances used in the project can be harmful or fatal to wildlife, including bats. However, releases to the environment are not expected during normal Project activities, and mitigation will be implemented to reduce the risk of spills or releases. Accidents, including accidental spills and/or releases, are discussed in Chapter 24 (Accidents and Malfunctions).

As described in Section 14.5.2.1, bat collisions with vehicles or heavy equipment may result in bat fatalities.

The effects of Project operation and maintenance on bat mortality are expected to be adverse, moderate in magnitude, be restricted to the Project Area, occur during times of high sensitivity, be long-term, continuous, and reversible. Based on the information above, a summary of residual effects on Bats during the operation and maintenance phase is provided in Table 14.11.



Table 14.11 Summary of Effects by Project Component During Operation and Maintenance

Project Component	Summary of Effect during Operation and Maintenance
Port au Port Wind Farm and Associated Infrastructure	Residual risk of mortality exists through turbine collisions or barotrauma. Although migratory species are most vulnerable during migration, all species of bats in Newfoundland may experience wind turbine related mortality any time during the active bat season. However, with mitigation (including curtailment), mortalities of resident bat species are anticipated to be low. The wind farms are not anticipated to result in levels of mortality that would hinder the recovery of resident species from white-nose syndrome. Residual risk of mortality may occur through bat collisions with vehicles or heavy machinery. This risk is expected to be low, and collisions are expected to be very infrequent.
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	Residual risk of mortality may occur through bat collisions with vehicles or heavy machinery. This risk is expected to be low, and collisions are expected to be very infrequent.
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

14.5.2.3 Decommissioning and Rehabilitation

Bat mortality could occur during decommissioning activities, although it is predicted to be unlikely and uncommon. If bats roost in Project infrastructure, they could be killed during the removal of this infrastructure, particularly in young bats are present that cannot fly. Mortality from collisions with equipment, machinery or vehicles is also possible.

The effects of the Project during decommissioning and rehabilitation on bat mortality is expected to be adverse, low in magnitude, restricted to the Project Area, occur in times of high sensitivity, be short term, irregular, and reversible. Based on the information above, a summary of residual effects on Bats during the decommissioning and rehabilitation phase is provided in Table 14.12.

Table 14.12 Summary of Effects by Project Component During Decommissioning and Rehabilitation

Project Component	Summary of Effect during Decommissioning and Rehabilitation
Temporary Workforce Accommodations	Residual risk of mortality may occur if roost trees are removed during site clearing. Young bats are particularly vulnerable to mortality if their roost is destroyed before they have developed the ability to fly.
Port au Port Wind Farm and Associated Infrastructure	
Codroy Wind Farm and Associated Infrastructure	Residual risk of mortality occurs through the collision of bats with vehicles or heavy equipment. This risk is expected to be low, and collisions are expected to be very infrequent.
230 kV Transmission Lines and Substations	Residual indirect effects on mortality may occur if construction results in light or noise disturbance, which could lead to reduced reproductive success and fitness.
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	



14.5.3 Residual Environmental Effects Summary

14.5.3.1 Residual Environmental Effects Characterization

Table 14.13 summarizes the predicted environmental effects (residual effects) of the undertaking on bats.

Table 14.13 Summary of Predicted Environmental Effects of the Undertaking on Bats

Residual Effect	Residual Effects Characterization							
	Nature	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological and Socio-economic Context
Construction								
Change in Habitat	A	M	LAA	HS	ST	C	R	U/D
Change in Mortality	A	L	PA	HS	ST	IR	R	U/D
Operation and Maintenance								
Change in Habitat	A	L	LAA	HS	LT	C	R	U/D
Change in Mortality	A	M	PA	HS	LT	C	R	U/D
Decommissioning and Rehabilitation								
Change in Habitat	P/A	L	LAA	HS	ST	C	R	U/D
Change in Mortality	A	L	PA	HS	ST	IR	R	U/D
KEY: Nature: P: Positive A: Adverse N: Neutral Magnitude: N: Negligible L: Low M: Moderate H: High Geographic Extent: PA: Project Area LAA: Local Assessment Area RAA: Regional Assessment Area Duration: ST: Short-term MT: Medium-term LT: Long-term Timing: NS: No Sensitivity MS: Moderate Sensitivity HS: High Sensitivity Frequency: S: Single Event IR: Irregular Event R: Regular Event C: Continuous Reversibility: R: Reversible I: Irreversible Ecological / Socio-Economic Context: D: Disturbed U: Undisturbed								



14.5.3.2 Summary of Predicted Environmental Effects

With mitigation, the Project is anticipated to result in adverse effects on bat habitat during all phases. Land clearing may result in the removal of roost sites, and can decrease the amount of suitable habitat available to bats. However, the changes to habitat may also be positive during the decommissioning and rehabilitation phase, as Project infrastructure is removed and habitat is restored. The magnitude of this change will be moderate during construction, and low during operation and maintenance, and decommissioning and rehabilitation. The indirect effects on habitat (e.g., light and noise disturbance) will extend into the LAA for all Project phases. Both indirect and direct effects on habitat may occur during times of high sensitivity (e.g., breeding season), as each Project phases occurs year-round. . During the construction phase and the decommissioning and rehabilitation phase, results will be short term, lasting only as long as those phases occur. However, the effects during the operations and maintenance phase will be long-term, as the project will be operating for 30 years. The frequency of effects on habitat is continuous. The direct loss of habitat during the construction phase is reversible, but since mature forests are very slow to regrow in Newfoundland, it will be long term to be returned to pre-construction mature forest vegetation types in the years following the project through remediation. The effects on habitat in the operation and maintenance phase and decommissioning and rehabilitation phase are reversible. Prior to the Project, the socio-economic context of most of the Port au Port Peninsula and the Stephenville area is disturbed. The Project Area for the Codroy wind farm, and portions of the Port au Port wind farm, are relatively undisturbed.

With mitigation, the Project is anticipated to result in adverse changes to mortality. Bat mortality may occur during the operations phase by turbine strikes or barotrauma, and in all Project phases through collisions with vehicles or machinery. The magnitude of these effects is expected to be moderate during the operations phase, and low during the construction and decommissioning and rehabilitation phases. The risk of mortality is generally restricted to the Project Area, and may occur during high sensitivity periods (e.g., breeding season), since Project activities will occur year-round. During the construction phase and the decommissioning and rehabilitation phase, results will be short term, lasting only as long as those phases occur. However, the effects during the operations and maintenance phase will be long-term, as the project will be operating for 30 years. Effects on mortality will be continuous during the operations phase, as the turbines are active. During the construction and decommissioning and rehabilitation phases, the mortality events are expected to be uncommon and irregular. Effects on mortality are reversible, as they will cease after the Project is completed and not expected to result in long-term population declines. Prior to the Project, the socio-economic context of most of the Port au Port Peninsula and the Stephenville area is disturbed. The Project Area for the Codroy wind farm, and portions of the Port au Port wind farm, are relatively undisturbed.

14.6 Determination of Significance

In consideration of the VEC-specific significance criteria defined above, the residual effect(s) of routine Project activities on the bats (i.e., change in habitat, and change in mortality) are predicted to be not significant. Suitable habitat for bats in the Project Area is relatively low compared to the LAA and RAA. Migratory bats, which typically account for most fatalities and wind farms in North America, are uncommon in western Island of Newfoundland. The Project is not expected to threaten the long-term



persistence, viability, or recovery of a bat population in the RAA. In addition, the Project is not expected to have effects that are contrary or inconsistent with the goals, objectives or activities of the federal recovery strategy for bats. The level of confidence in this prediction is discussed in Section 14.7.

14.7 Prediction Confidence

The level of confidence in the predictions for Project-related residual effects on bats is moderate. The predictions are based on information collected as part of desktop data compilation, an understanding of existing conditions, GIS data analyses, understanding of Project activities, baseline surveys in the area, the known effectiveness of mitigation measures, and experience of the assessment team. The level of confidence for the prediction is moderate (and not high) because habitat requirements and use in the Project Area are not fully understood for bats, and because bat populations and species composition are not well known on the Island of Newfoundland. However, a conservative approach was employed to identify suitable bat habitat and predict habitat loss, and this compensates for some uncertainty. Habitat occurrence and loss was mapped using available GIS data, which allowed for a detailed quantitative analysis. Mitigation measures identified in Section 14.4 are standard practice and have been implemented and demonstrated to be effective.

14.8 Follow-Up and Monitoring

Baseline bat data collection will continue through the summer and fall of 2023, and during the spring, summer, and fall of 2024. Bat detectors (Wildlife Acoustics SM4s) will be deployed and the same locations during all survey periods, and will be distributed throughout the Project Area and LAA to determine the presence and species composition of bats. Control points outside of the LAA will also be used to account for environmental variation that is unrelated to the Project. This monitoring will provide two years of pre-construction data, and will be repeated post-construction to monitor for changes in the bat population. A post-construction wildlife mortality monitoring program will be developed in consultation with NLDFFA-WD and ECCC CWS. This program will involve bat carcass searches between April and October. The search radius will be determined based on final turbine heights, as this affects fall distance of fatalities (Choi et al. 2020). In addition, searcher efficiency trials and scavenger trials will be conducted. These results will be used in mortality models to estimate mortality rates for the Project.

14.9 Capacity of Renewable Resources and Effects on Biological Diversity

The potential environmental effects of the Project on bats were thoroughly assessed. The assessment concluded that routine Project activities are not likely to result in significant residual adverse effects on bats. Therefore, adverse Project-related effects on the capacity of renewable resources to meet the needs of the present and those of the future are not anticipated with respect to bats. Similarly, adverse Project-related effects on biological diversity that exceed the limits of natural variability or affect the long-term viability of biological diversity in the RAA are not anticipated with respect to bats.



14.10 Predicted Future Environmental Conditions if the Project Does Not Proceed

If the Project is not allowed to proceed, the existing conditions as described in the baseline section will continue to prevail, including current land use and natural conditions. It is possible that future development may occur in the area, including wind energy (given those Project areas are designated for wind farm development), but neither the likelihood nor extent of such development can be reasonably predicted at this time based on currently known information. If the Project does not proceed, hoary, silver-haired, and eastern red bats are expected to continue to occur during the migratory period. The frequency and abundance in which they occur would not be expected to change.

The abundance of resident bats (little brown and northern myotis) on the Island of Newfoundland is currently low, in comparison to the abundance prior to the arrival of white-nose syndrome. White-nose syndrome was first detected in western Island of Newfoundland in the winter of 2016/2017 (White-nose syndrome response team 2023), resulting in mass fatalities of hibernating bats. It is anticipated that bat populations in western Island of Newfoundland are currently at very low levels, after having seen declines between 94 and 99% (J. Humber, pers comm, December 8, 2022). It is expected that bat populations will begin to slowly recover on the Island of Newfoundland, as they have in other areas (Hooton et al. 2023). If the Project does not proceed, it is expected that little brown myotis and northern myotis populations would be expected to grow as recovery occurs.

14.11 References

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15.0 Other Wildlife

15.1 Scope of Assessment

Other wildlife was selected as a valued environmental component (VEC) because they provide ecological, cultural, recreational, and economic value to stakeholders including the public, Indigenous groups, local businesses, and government agencies. The Other Wildlife VEC considers large mammals and furbearers, including species at risk (SAR) and species of conservation concern (SOCC), and their habitats. One insect SAR is also included. Note that bats are discussed separately in Chapter 14, birds are discussed separately in Chapter 13, and freshwater fish and fish habitat are assessed in Chapter 10.

Other wildlife and their habitat have the potential to be affected by Project-related changes to areas of conservation concern (Chapter 16), vegetation and wetlands (Chapter 12), air and water quality (Chapters 6 through 9) and changes in the economy, employment and businesses (Chapter 17) through Project-related effects such as land clearing, sensory disturbance (e.g., noise, dust), and potential changes in hunting pressure. Therefore, residual effects predicted for these VECs were used to inform potential Project effects on other wildlife and their habitat. The VEC is also linked to:

- Human Health and Quality of Life (Chapter 19) – potential Project-related effects such as vibrations, noise levels, and noise, light and dust emissions can affect both human health and quality of life, and other wildlife and their habitat.
- Land and Resource Use (Chapter 20) – changes in other wildlife and their habitat have the potential to affect hunting, trapping and outfitting activities by resource users and Indigenous groups.

The following subsections (i.e., Section 15.1.1 and 15.1.2) define and describe the scope of the assessment of potential effects on other wildlife. The Environmental Impact Statement (EIS) Guidelines identified the information required to support the environmental assessment (EA), including information on caribou (*Rangifer tarandus*, a SAR), moose (*Alces alces*), and muskrat (*Ondatra zibethicus obscurus*). Following a review of proposed Project-related infrastructure, the Newfoundland and Labrador Department of Fisheries, Forestry and Agriculture - Wildlife Division (NLDDFA – WD) requested the inclusion of arctic hare (*Lepus arcticus bangsii*), based on their potential to occur in the vicinity of Project-related infrastructure. Other wildlife SAR with potential to occur are also considered. Assessed species and a rationale for their inclusion is presented in Table 15.1. Their known or likely occurrence in the Project Area is also presented in Table 15.1, by Project component.



Table 15.1 Species Assemblages and Assessed Species for the Evaluation of Other Wildlife

Species Assemblage	Assessed Species	Justification	Occurrence in the Project Area ²			
			Port au Port Wind Farm	Codroy Wind Farm	Hydrogen / Ammonia Plant	Transmission Lines
Large Mammals	Moose (<i>Alces alces</i>)	- Specified in EIS¹ Guidelines - Socio-economic importance / Important to resource users and Indigenous groups	✓	✓	✓	✓
Furbearers	Muskrat (<i>Ondatra zibethicus</i>)	- Specified in EIS Guidelines - Socio-economic importance / Important to resource users and Indigenous groups - Declines in NL are suspected - Native semi-aquatic mammal species	✓	✓	✓	✓
SAR / SOCC ¹	Caribou (<i>Rangifer tarandus</i>)	- SAR - Specified in EIS Guidelines - Socio-economic importance / Important to resource users and Indigenous groups - Native mammal species	-	-	-	✓
	Arctic Hare (<i>Lepus arcticus bangsii</i>)	- SOCC - Uncertainty surrounding their distribution in relation to the Project; historical range overlaps the Project Area - Native mammal species	-	✓ ³	-	-



Table 15.1 Species Assemblages and Assessed Species for the Evaluation of Other Wildlife

Species Assemblage	Assessed Species	Justification	Occurrence in the Project Area ²			
			Port au Port Wind Farm	Codroy Wind Farm	Hydrogen / Ammonia Plant	Transmission Lines
SAR / SOCC ¹ (cont'd)	Newfoundland Marten (<i>Martes americana atrata</i>)	• SAR • Included in EIS Guidelines as a key SAR issue • Project features overlap critical habitat for Newfoundland marten • Native mammal species	-	-	-	✓ ⁴
	Yellow-banded Bumble Bee (<i>Bombus terricola</i>)	• SAR • Included in EIS Guidelines as a key SAR issue	unknown	unknown	unknown	✓

Notes:

1. EIS = Environmental Impact Statement; SAR = Species at Risk; SOCC = Species of Conservation Concern
2. The Project Area is described in Section 15.1.2.1
3. Based on the area of presumed presence provided by NLDDFA – WD
4. Based on the area of proposed marten critical habitat

15.1.1 Regulatory and Policy Setting

This section identifies the primary regulatory requirements and policies of the federal and provincial authorities that influence the scope of the assessment on avifauna.

In addition to the NL Environmental Protection Act and associated Environmental Assessment Regulations, the Project is guided by the following federal and provincial legislation and guidance.

Species at Risk Act

The federal *Species at Risk Act* (SARA) provides a framework across Canada to prevent the extinction of wildlife species and to support actions for their recovery. General SARA prohibitions include Section 32(1), which states that “no person shall kill, harm, harass, capture, or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species”, and Section 33, which states that “no person shall damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered species or a threatened species, or that is listed as an extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada.” In addition, critical habitat, defined as the habitat that is necessary for the survival or recovery of a listed wildlife species, may be defined and protected under Section 58. Only those species currently listed in Schedule 1 of SARA (i.e., those listed as extirpated, endangered, or



threatened) are protected by the prohibitions of Sections 32 to 36 and 58 of SARA, and then only on federal lands, except for aquatic species and migratory birds which are protected throughout Canada by other acts and regulations.

The assessment of potential Project-related environmental effects on the Other Wildlife VEC also considers the following documents:

- Recovery Strategy for the American Marten (*Martes americana atrata*), Newfoundland Population, in Canada (Environment Canada 2013)
- The Amended Recovery Strategy for the Woodland Caribou (*Rangifer tarandus caribou*), Boreal population, in Canada¹ (ECCC 2020)
- Yellow-banded Bumble Bee (*Bombus terricola*): Management Plan Proposed 2022 (ECCC 2022)

Newfoundland and Labrador Endangered Species Act

In NL, SAR are protected under the Newfoundland and Labrador *Endangered Species Act* (NL ESA). Designation under the Act follows the recommendations of the Species Status Advisory Committee (SSAC) on the appropriate assessment of a species and referring concerns about the status of species to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), where the species is of national importance.

The purpose of NL ESA is to:

- Prevent listed species from being extirpated from NL
- Provide for the recovery of species listed as extirpated, endangered, or threatened as a result of human activity
- Conserve species listed as special concern to prevent them from becoming endangered or threatened

Prohibitions of NL ESA include Section 16, which states “a person shall not disturb, harass, injure, or kill an individual of a species designated as threatened, endangered or extirpated”. In addition, residences of threatened, endangered and extirpated species are also protected, through prohibition to ‘disturb or destroy’ the residence of these species. Species are listed under the *Endangered Species List Regulations*.

Wildlife species in NL are also protected under the NL *Wild Life Act*. The NL *Wild Life Act*, *Wild Life Regulations* and associated orders prohibit the hunting, taking, or killing of wildlife or classes of wildlife, whether in particular places or at particular times or by particular methods, except under licences or permit. It allows for the management and the regulation of activities relating to the taking and trading of wildlife, primarily game animals and furbearer species.

¹ Caribou on the Island of NL are not considered part of the Boreal population; however, guidance provided in this document provides some guidance that can be useful for interpreting the importance of potential Project and cumulative effects on the NL population of caribou.



The assessment of potential Project-related environmental effects on other wildlife also considers the following documents:

- Recovery plan for the threatened Newfoundland population of American marten (*Martes americana atrata*) (The Newfoundland Marten Recovery Team 2010)
- The Status of Arctic Hare (*Lepus arcticus bangsii*) in Insular Newfoundland (SSAC 2012)
- 2022-2026 Newfoundland and Labrador Moose Management Plan (GovNL 2022a)
- Provincial Sustainable Forest Management Strategy 2014-2024 (GovNL 2014)

The following provincial management areas and protected areas overlap or are in the vicinity of the Project:

- Moose Management Areas (MMAs) 6, 9, 10 and 43
- Caribou Management Area (CMA) 61
- Forestry Management Division 15
- Provincial Parks: Barachois Pond Provincial Park, Grand Codroy Provincial Park, Codroy Valley Provincial Park, J. T. Cheeseman Provincial Park, Blow Me Down Provincial Park and the T'Railway Provincial Park

Species At Risk and Species of Conservation Concern

For this Project, SAR are defined as species that are:

- listed on Schedule 1 of SARA as Extirpated, Endangered, Threatened or Special Concern
- listed as Extirpated, Endangered, Threatened, or Vulnerable under the NL ESA

SOCC are defined for this assessment as those species that are not specified under federal or provincial legislation, but are considered rare in the province, or ones for which the long-term sustainability of their populations has been evaluated as tenuous. Following direction previously provided by NLDFFA-WD, SOCC are defined as those species that are:

- assessed as Extirpated, Endangered, Threatened, or Special Concern by COSEWIC but have not yet been added to Schedule 1 of SARA
- recommended for listing by the SSAC as Endangered, Threatened or Vulnerable but are not yet listed under the NL ESA
- ranked as provincially rare by the Atlantic Canada Conservation Data Centre (AC CDC) including species with provincial status (S-ranks) of S1 (Critically Imperiled), S2 (Imperiled) or combinations thereof (e.g., S1S2) upon review by the AC CDC (AC CDC 2023)



15.1.2 Boundaries

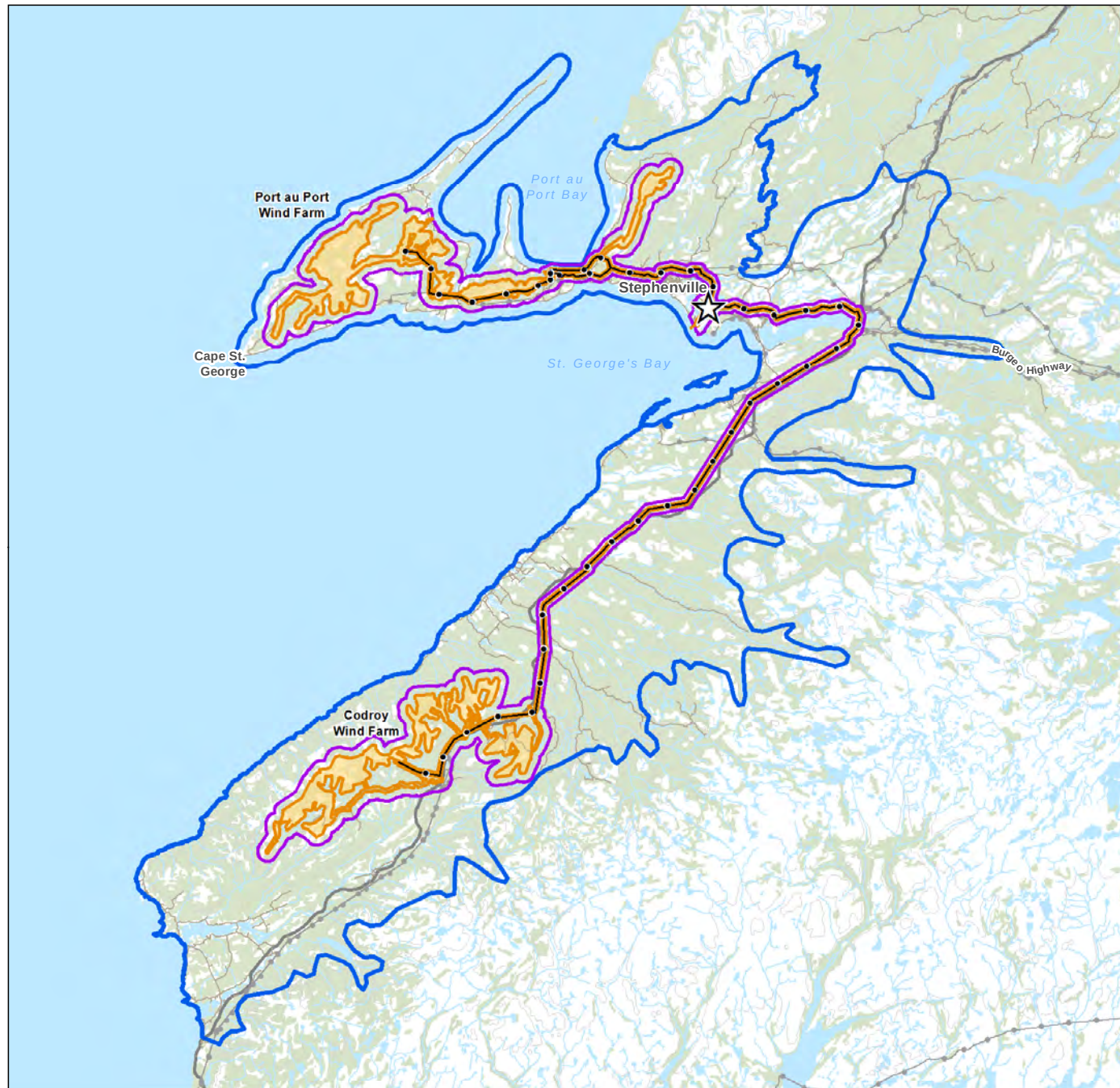
The scope of the assessment is defined by spatial boundaries (i.e., geographic extent of potential effects) and temporal boundaries (i.e., timing of potential effects). Spatial boundaries for other wildlife were selected in consideration of the geographic extent over which Project activities, and their effects, are likely to occur on the VEC. Temporal boundaries are based on the timing and duration of Project activities and the nature of the interactions with the VEC. The spatial and temporal boundaries associated with the effects assessment for other wildlife are described in the following sections.

15.1.2.1 Spatial Boundaries

The following spatial boundaries were used to assess Project effects, including residual environmental effects, on other wildlife in areas surrounding the Project components (Figure 15.1):

- **Project Area:** The Project Area encompasses the immediate area in which Project activities and components occur and is comprised of following distinct areas: the Port au Port wind farm, the Codroy wind farm, the hydrogen / ammonia production and storage facility (hydrogen / ammonia plant), port facilities, and the 230 kilovolt (kV) transmission lines, as well as associated infrastructure including roads, substations, and water supply intake infrastructure. The Project Area is the anticipated area of direct physical disturbance associated with the construction, operation and decommissioning, rehabilitation, and closure of the Project. In addition to encompassing the immediate area in which Project components and activities will occur, the Project Area also includes a buffer of up to 300 metre (m) for access roads and turbines and a 350 m corridor to accommodate the 70 to 75 m wide RoW for the transmission line. These buffers allow flexibility for the micro-siting of Project components during detailed design, based on technical considerations as well as the avoidance of environmentally sensitive areas, where practicable.
- **Local Assessment Area (LAA):** The LAA for this VEC encompasses the Project Area and includes a 1 km buffer around the wind farms and hydrogen facility, and 500 m around access roads and transmissions lines (Figure 15.1). The LAA is the area in which Project-related environmental effects (direct or indirect) on other wildlife are assessed.
- **Regional Assessment Area (RAA):** The RAA for this VEC encompasses the Project Area and the LAA and was delineated using ecoregions (subregions) and watersheds. It includes the Port-au-Port Subregion, the St. George's Bay Subregion and the Codroy Subregion. In addition, it includes the watersheds from within the Corner Brook Subregion that overlap with the Port-au-Port wind farm (Figure 15.2). The RAA is the area that establishes the context for determining the significance of Project-specific residual environmental effects. It is also the area within which potential cumulative effects—the residual effects from the Project in combination with those of past, present, and reasonably foreseeable projects are assessed.





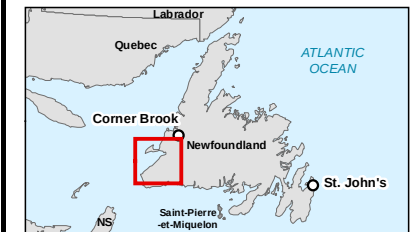
Local Assessment Area	Other Features
Regional Assessment Area	Transmission Line, Existing
Proposed Project Features	Trans-Canada Highway
Hydrogen / Ammonia Plant Location	Road
Transmission Line 230 kV	Watercourse
Project Area	Contour (100 m)
	Waterbody
	Forested Area



0 10 Kilometres
(At original document size of 8.5x11)
1:730,000

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCAN CanVec, OpenStreetMap
3. Background: NRCAN CanVec



Project Location: Stephenville, NL
Prepared by MB on 2023-06-30
QR by AW on 2023-07-06

Client/Project: 121417233_067c
World Energy GH2
Project Nujlo'qonik

Figure No.

15.1

Local and Regional Assessment Areas for Other Wildlife

Though not an official Project Boundary, the assessment references the “Project footprint”, which is the anticipated area of direct physical disturbance associated with construction, operation and decommissioning, within the Project Area. The Project footprint is likely to change in some parts of the Project Area as a result of micro-siting, following biophysical surveys. The Project footprint represents 5.29% of the LAA and 1.12% of the RAA. The Project Area, which is not expected to be completely directly disturbed but represents the extent where clearing is possible, represents 36.56% of the LAA and 7.71% of the RAA.

15.1.2.2 Temporal Boundaries

The temporal boundaries for the assessment of potential effects on the Other Wildlife VEC include:

- **Construction:** Overall the construction phase of the Project will be from Q4 2023 through Q2 2027, pending EA approval and receipt of other required permits and approvals. Early civil works are planned to start Q4 2023 through Q3 2024. Construction of the Port au Port Wind Farm and associated infrastructure is expected to start in Q3 2024 with completion of the construction in Q4 2026. Construction of the Codroy Wind Farm and associated infrastructure is expected to start Q4 2025 with completion in Q1 2027. The hydrogen / ammonia plant will be constructed in phases from Q2 2024 to Q1 2026. Grid power sources are planned for hydrogen production in 2025 until March 2026, when the electrolyzer is commissioned.
- **Operation and maintenance:** Wind farm commissioning is anticipated to start Q1 2026 at the Port au Port wind farm and Q3 2027 at the Codroy wind farm. The 600-megawatt electrolyzer expected to be commissioned in Q1 2026. The operational life of the Project is 30 years at each site.
- **Decommissioning and rehabilitation:** The decommissioning phase is anticipated to take two years, occurring between 2056 and 2058. Decommissioning is anticipated to begin Q1 2056 at the Port au Port wind farm, with completion in Q3 2058 at the Codroy wind farm.

15.2 Existing Environmental Conditions

15.2.1 Methods

Existing conditions for other wildlife within the spatial boundaries described in Section 15.1.2 are described in the following sections based on a combination of literature review, Project-specific field surveys and a desktop wildlife habitat assessment.

15.2.1.1 Literature Review

Existing data sources from federal and provincial government agencies, peer-reviewed published literature, other publications and data sources, and communications with the NLDDFA – WD were reviewed to compile information on the conservation status, abundance, distribution, and habitat associations for the assessed wildlife species in and adjacent to the Project Area. The following key public resources were consulted:

- Provincial Moose Management Plan (GovNL 2022a)



- Provincial Hunting and Trapping Guide (GovNL 2022b)
- Provincial Status and Recovery Plans for SAR / SOCC (NL Marten Recovery Team 2010, SSAC 2012)
- COSEWIC Assessment and Status Update Reports (COSEWIC 2014, 2022)
- SARA Recovery and Management Plans (Environment Canada 2013, ECCC 2022)
- AC CDC – observation data on SAR / SOCC in the RAA (AC CDC 2023)

15.2.1.2 Field Studies

The EIS Guidelines (Section 4.3.3) and subsequent consultation with NLDFFA – WD identified that moose, caribou, muskrat, and arctic hare surveys were required prior to Project construction to inform the description of existing (baseline) conditions. Stantec completed initial surveys for moose and caribou in 2023, with further studies planned in fall 2023 for muskrat and 2024 for moose, caribou, and arctic hare. A summary of completed and planned studies for the Project is provided in Table 15.2. Further detail on the study methods is available in the Terrestrial Environment Baseline Study (Appendix BSA 3).

Table 15.2 Wildlife Field Studies for the Project

Study	Date	Protocols	Summary
Aerial Moose Survey	March 8, 2023 (MMAs 43 and 6 surveyed in 2023) Future surveys planned for winter 2024.	Based on methods described in GovNL (2022a)	Modified stratified random block surveys to estimate moose abundance.
Aerial Caribou Survey	March 8, 2023 (MMAs 43 and 6 surveyed in 2023) Future surveys planned for winter 2024.	Concurrent with Moose Survey	Modified stratified random block surveys to determine caribou presence/absence.
Muskrat Survey	To be completed in fall between September 1 and November 1, 2023	Provincial Muskrat Survey Protocol for the Island of Newfoundland (NLDFFA 2019)	Potential muskrat habitat in the Project Area will be identified and delineated and areal searches for muskrat and muskrat sign completed to obtain data on presence/non-detection and relative abundance of muskrat.
Arctic Hare Pellet Survey	To be completed in 2024 (Codroy wind farm)	Following recommendations from NLDFFA – WD (S. Garland pers. comm. 2023)	Ground-based survey for arctic hare to determine presence/absence in a subsample of provincial 2 km x 2 km grids that overlap the Project Area near the Codroy wind farm.

15.2.1.3 Habitat Assessment

A desktop habitat assessment was conducted using a Geographic Information System (GIS). The Newfoundland Forest Inventory data set (NLDFFA) was used to assess habitat types within the Project Area, LAA and RAA.



Using the Forestry Inventory data, habitat quality was assessed for the assessed other wildlife species (Table 15.1). The habitat requirements for these species were determined, and each habitat type evaluated based on literature reviews, available information, and discussions with experts (where relevant). The evaluation of habitat considered features such as the presence of structural and compositional elements, and prey or forage availability, as well as seasonal habitat requirements for the assessed wildlife species (e.g., breeding, denning, hunting, or foraging).

For this assessment, three habitat value ranks were assigned to the identified habitat types:

1. High quality habitat – provides forage, protection, and denning and resting habitat
2. Moderate quality habitat – provides an abundance of one or more (or marginal amounts of all) of the critical elements (e.g., foraging, protection and resting)
3. Low quality habitat – provides marginal foraging, protection, or resting opportunities, or may be used only during transit

The evaluation of habitat suitability for the assessed species provides an overview of the potential for portions of the Project Area, LAA, and RAA to support these species. In addition, the amount of habitat lost or altered due to the Project (i.e., the Project footprint) was also determined, to assess potential impacts to other wildlife.

15.2.2 Existing Conditions

15.2.2.1 Overview

The Project Area occurs within the Western Newfoundland Forest Ecoregion (Damman 1983; Meades 1990), which is environmentally distinct in its geological diversity, humid climate, range in altitude, and relatively long growing season on average (Meades 1990). Habitat within the ecoregion is primarily forested, interspersed with ecologically important wetland and barren ecosystems (Meades 1990). Within the broader context of the Western Newfoundland Forest Ecoregion, the Project Area occurs within three provincial subregions, including the Port au Port subregion, the St. Georges' Bay subregion and the Codroy subregion (Meades 1990). Detailed descriptions of these subregions and dominant habitat types are provided in Chapter 12 (Wetlands and Vegetation).

For this assessment, thirteen habitat types have been identified in the Project Area, LAA, and RAA, based on the GIS desktop habitat assessment (Table 15.3). Upland areas are dominated by softwood forests (i.e., balsam fir [*Abies balsamea*] and black spruce [*Picea mariana*]), coniferous scrub and soil and rock barrens. Lowland sites consist of various wetland types including bogs, fens, marshes, and swamps.

Habitat rankings for the six assessed species are provided in Table 15.4. Justification for these rankings is provided under the habitat occurrence subsection for each species.



Table 15.3 Habitat Types within the Project Area, LAA and RAA

Habitat Type	Description	Project Footprint		Project Area		LAA		RAA	
		km ²	% of area	km ²	% of area	km ²	% of area	km ²	% of area
Barrens		5.03	12.37	38.79	13.78	82.02	10.65	253.22	6.94
Rock Barren	Open rock barrens with little vegetation	0.42	1.04	3.42	1.21	12.28	1.59	42.82	1.17
Soil Barren	Barrens with a thin soil layer that supports vegetation communities such as dwarf shrub heath	4.61	11.33	35.38	12.57	69.74	9.06	210.40	5.76
Wooded		31.32	76.93	209.31	74.36	588.31	76.41	2,554.54	69.96
Coniferous Scrub	Windswept and stunted coniferous trees, primarily balsam fir with black spruce; typically, less than 6.5 m in height	10.89	26.74	78.64	27.94	180.79	23.48	628.73	17.22
Deciduous Scrub	Thick, stunted deciduous trees and shrubs	0.84	2.06	3.91	1.39	11.52	1.50	59.21	1.62
Softwood	Forest dominated by softwood or coniferous trees, primarily balsam fir with black spruce and some scattered tamarack	15.62	38.38	104.99	37.30	311.92	40.52	1363.37	37.34
Hardwood	Forest dominated by hardwood or deciduous tree species, typically white birch	0.44	1.09	1.57	0.56	5.98	0.78	58.96	1.61
Mixedwood	Forest dominated by hardwood or deciduous and softwood or coniferous tree species, primarily balsam fir and white birch	2.36	5.80	10.96	3.89	48.93	6.36	318.12	8.71
Unknown Forest	Treed land that has not been classified into one of the above-described forested classes	1.16	2.86	9.24	3.28	29.17	3.79	126.14	3.45



Table 15.3 Habitat Types within the Project Area, LAA and RAA

Habitat Type	Description	Project Footprint		Project Area		LAA		RAA	
		km ²	% of area	km ²	% of area	km ²	% of area	km ²	% of area
Water		0.76	1.87	4.79	1.70	22.17	2.88	370.65	10.15
Freshwater	Lakes or ponds	0.25	0.61	2.05	0.73	11.79	1.53	83.75	2.29
Ocean	Open ocean	0.44	1.07	2.28	0.81	8.09	1.05	247.56	6.78
River	Watercourses	0.08	0.19	0.45	0.16	2.29	0.30	39.34	1.08
Wetland		2.56	6.29	22.44	7.97	54.86	7.13	345.62	9.47
Bog	Peatlands: bogs and fens	2.16	5.31	18.83	6.69	46.21	6.00	307.10	8.41
Small Island	Islands within the open water in bogs and fens (i.e., flarks or bogholes); part of the larger bog or fen complex	0.0004	0.0009	0.02	0.01	0.07	0.009	0.49	0.01
Treed bog	Peatlands (bogs and fens) supporting trees	0.15	0.37	1.31	0.47	3.25	0.42	15.52	0.42
Wet bog	Peatlands (bogs and fens) with visible surface water	0.25	0.61	2.29	0.81	5.33	0.69	22.51	0.62
Other		1.03	2.54	6.16	2.19	22.52	2.93	127.17	3.48
Agriculture	Land used for crops, forage, or pasture	0.10	0.24	0.52	0.18	5.01	0.65	42.25	1.16
Anthropogenic	Roads, transmission line RoWs, buildings, lawns, and other landscaped vegetated areas	0.94	2.31	5.60	0.02	17.30	0.02	80.90	0.02
Sand	Sandy or rocky areas, typically coastal beaches but occasionally on the banks of large watercourses	0.002	0.005	0.02	0.01	0.17	0.02	4.04	0.11
Total		40.72	100	281.5	100.00	769.9	100.00	3,651.20	100.00
Note: km ² = square kilometre; LAA = Local Assessment Area; RAA = Regional Assessment Area									



Table 15.4 Habitat Value Ranking for the Assessed Species

Habitat Type¹	Habitat Value Rankings					
	Moose	Caribou	Muskrat	Marten	Arctic Hare	Yellow-banded Bumble Bee
Barrens (soil, rock)	Low	Moderate	Low	Low	High	Low
Coniferous Scrub	Moderate	Low	Low	Low	Low	Low
Deciduous Scrub	Moderate	Low	Low	Low	Low	Low
Softwood	High	High	Low	High	Moderate	High
Hardwood	High	Moderate	Low	Moderate	Moderate	High
Mixedwood	High	Moderate	Low	High	Moderate	High
Unknown Forest	High	Moderate	Low	Moderate	Moderate	High
Water ²	Moderate	Moderate	High	Low	Low	Low
Wetland	Moderate	Moderate	High	Low	Low	Moderate
Agriculture	Low	Low	Low	Low	Low	High
Anthropogenic	Moderate	Low	Moderate	Low	Low	Low
Sand	Low	Low	Low	Low	Low	Low
Sources:	Snaith et al. 2002, Herfindal et al. 2009, Mercer and McLaren 2002, Snaith and Beazley 2004, Thompson et al. 2003.	Mahoney and Virgl 2003, Mayor et al. 2009, Mahoney et al. 2016, Hébert and Weladji 2013, Faille et al. 2010, O'Brien et al. 2006.	Ouellet and Morin 2006, Viljugrein et al. 2001, Boutin and Birkenholz 1987, Naughton 2012.	Drew 1995, Gosse et al. 2005, Gosse and Hearn 2005, COSEWIC 2022.	Best and Henry 1994, Dalerum et al. 2017, Naughton 2012, Dodds 1960, Fitzgerald and Keith 1990, Hearn et al. 1987, SSAC 2012.	McFarland et al. 2015, Dominey 2021, COSEWIC 2015
Notes: 1. Refer to Table 15.3 Habitat Types within the Project Area, LAA and RAA for habitat descriptions. 2. Does not include ocean habitat, as the assessed species are terrestrial or semi-aquatic species that do not use marine habitats.						



15.2.2.2 Moose

Life History, Distribution and Limiting Factors

Moose were introduced to central Newfoundland in 1878 (Pimlott 1953) and to western Newfoundland in 1904 (Dodds 1983) and are now widespread across all the Island of Newfoundland (GovNL 2022a, McLaren et al. 2004). Moose are an important game species and are hunted throughout Newfoundland, with approximately 24,000 individuals harvested each year (GovNL 2022a). The Project Area overlaps MMAs 6, 9, 10 and 43 (Figure 15.2) within which a total of 3,930 licences were issued for the 2022-2023 hunting season, with MMA 6 (Corner Brook) issuing the most (1,500) (GovNL 2022b). Moose are also an important traditional use species harvested by Indigenous communities on the Island of Newfoundland (GovNL 2022a).

Moose are generally associated with mixedwood and boreal forests and are found in relatively high densities in younger, recently disturbed forests (e.g., forest harvesting, fire, insect outbreaks). The density of moose across the ranges from 0.5 moose/km² in non-forested areas to 2 or more moose/km² in forested areas but have been as high as 12 moose/km² in MMA 17 (Mercer and McLaren 2002). Black bear (*Ursus americanus*) is the main predator of moose; however, unlike regions with other predators such as wolves (e.g., Labrador), predation is not a limiting factor for Newfoundland moose, rather moose populations are limited by habitat and forage availability, and hunting (GovNL 2022a).

Moose were confirmed in the LAA and Project Area during baseline investigations in the Port au Port and Stephenville areas but are expected to occur throughout the RAA based on habitat availability and the general ubiquitousness of this species on the Island of Newfoundland. More detailed information on moose is available in the Terrestrial Environment Baseline Study (Appendix BSA 3).

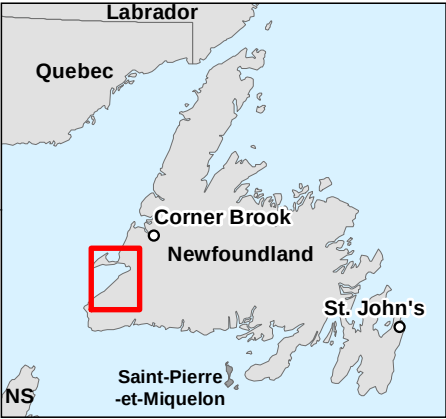
Habitat Occurrence in the Project Area

Newfoundland moose occur at high densities in area with younger forests that have been recently disturbed (e.g., forest harvesting, fire, insect outbreaks). Preferred spring and summer forage includes green and herbaceous materials such as leaves, terminal shoots of trees and shrubs, grasses, sedges, and aquatic vegetation, while during fall and winter moose consume woody portions of coniferous and deciduous trees such as balsam fir and white birch (*Betula papyrifera*) (McLaren et al. 2000, Thompson and Curran 1993, Dodds 1960).

Habitat types ranked as high value for moose include softwood, hardwood, mixedwood, and unknown forests (Table 15.4). Four of these treed/forested areas provide high value habitat given the suitable tree and shrub forage opportunities, as well as closed canopy to protect from the elements and predators in both summer and winter (Snaith et al. 2002). Habitat types ranked as moderate value for moose include coniferous scrub, deciduous scrub, water, and wetlands, each providing nutritional foraging requirements. Remaining habitat types (barrens, agriculture, anthropogenic, and sand) were ranked as low value habitat as they provide little foraging, protection, or resting opportunities. Based on the habitat rankings, habitat availability was summarized for moose for the Project Area, LAA and RAA. These results are presented in Table 15.5. Habitat availability in the Project Area, summarized by Project component, is presented in Table 15.6.



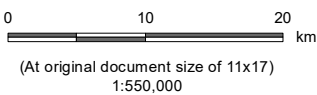
\\ca0151-cpps01\work_group\1214\active\121417233\03_data\gis_data\map\img\mxd\general\Basis_Veg_Other_Terr\121417233_021_Fig_15.2_AISites_MooseMA_RevA.mxd Revised: 2023-06-02 By: acuff



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: Client, Province of Newfoundland and Labrador, ACCDC, Stantec
3. Background: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

- Moose Management Area
- Caribou Management Area
- Local Assessment
- Proposed Project Features**
- Project Area
- Turbine Location
- Hydrogen / Ammonia Plant Location

- Other Features**
- Transmission Line, Existing
 - Trans-Canada Highway
 - Road
 - Contour (100 m)
 - Watercourse
 - Waterbody
 - Wetland
 - Forested Area



Project Location
Port au Port Peninsula
NL

Prepared by MB/AC on 2023-05-15
QR by AW on 2023-07-14

Client/Project
World Energy GH2
Project Nujio'qonik

121417233_021

Figure No.

15.2

Title

Provincial Moose and Caribou Management Areas in the Project Area

Table 15.5 Amount of Habitat by Habitat-Value Ranking for Moose in the Assessment Areas

Habitat Value Ranking ¹	Area in Project Footprint		Area in Project Area		Area in LAA ²		Area in RAA ²	
	km ²	% of Area	km ²	% of Area	km ²	% of Area	km ²	% of Area
High	19.6	48.1	126.8	45.0	396.0	52.0	1,866.6	54.8
Moderate	16.0	39.3	115.4	41.0	278.6	36.6	1,237.6	36.4
Low	5.1	12.6	39.3	14.0	87.2	11.4	299.5	8.8
Total ³	40.7	100.0	281.5	100.0	761.7	100.0	3,403.7	100.0
Notes:								
1. Refer to Table 15.4 for habitat value rankings.								
2. LAA = Local Assessment Area; RAA = Regional Assessment Area								
3. Excludes ocean habitat within LAA and RAA								

Table 15.6 Amount of Habitat by Habitat-Value Ranking for Moose in the Project Footprint by Project Component

Habitat Value Ranking	Port au Port Wind Farm		Codroy Wind Farm		Hydrogen / Ammonia Plant		Transmission Lines	
	km ²	% of Area	km ²	% of Area	km ²	% of Area	km ²	% of Area
High	7.1	50.7	5.8	41.0	0.2	8.4	6.5	59.8
Moderate	5.8	41.2	5.0	34.8	1.6	81.4	4.0	37.0
Low	1.1	8.1	3.4	24.2	0.2	10.1	0.4	3.3
Total	14.1	100.0	14.2	100.0	2.0	100.0	10.9	100.0
Note:								
Refer to Table 15.4 for habitat value rankings.								

15.2.2.3 Caribou

Life History, Distribution and Limiting Factors

The Newfoundland population of caribou was recently added to Schedule 1 of SARA as a species of Special Concern (Government of Canada 2023), based on the 2014 COSEWIC status assessment that upgraded the population status to Special Concern from Not at Risk (COSEWIC 2014). Caribou are a culturally important species for Indigenous communities in NL and many hunt the animal for subsistence purposes (Qalipu First Nation 2016). A portion of CMA 61 overlaps the Project Area (Figure 15.2) and a total of 55 licences were issued for this hunting area during the 2022-2023 hunting season (GovNL 2022b).



Caribou occur across much of the Island of Newfoundland as naturally occurring and introduced (relocated) sub-populations, with most sub-populations undergoing small seasonal migrations (COSEWIC 2014). In 1964-65, 20 caribou were introduced to the Port au Port Peninsula from the Middle Ridge caribou sub-population (Bergerud and Mercer 1989). By 1981, the herd had grown to 40 individuals; however, the animals eventually died off or relocated to other areas such that there is currently no identified sub-population on the peninsula (Bergerud and Mercer 1989, COSEWIC 2014). A population of caribou using the Stephenville Crossing area during winter (< 100 individuals) may have originated from the Port au Port herd (SaltWire 2019). The management area for the La Poile caribou herd (CMA 61) overlaps a small portion of the Project Area near the Cordroy wind farm. Global Positioning System (GPS) data from collared caribou from the La Poile herd indicate that seasonal ranges of the herd extend from an area east of Channel-Port-Aux-Basques to St. Albans, and northwards to Beothuk Lake (Marathon 2020), but caribou locations from collared individuals do not overlap the Project Area.

The Newfoundland caribou population has fluctuated in abundance over the past 100 years and experienced a dramatic decline between the mid-1990s and early 2000s. A research program initiated to understand factors affecting caribou abundance on the Island of Newfoundland concluded that the observed decline was a natural occurrence, related to density-dependent factors associated with unsustainably high number of caribou in the 1990s (NLDEC 2015). Secondary factors such as calf predation and hunting (of bull caribou) accelerated the decline, while human land use changes associated with habitat disturbance were not linked to caribou decline (NLDEC 2015). High predation rates of calves (by black bear or coyote [*Canis lantrans*]) weakened by density dependent effects (e.g., nutritional stress) was identified as a primary mechanism for caribou mortality during the decline (Weir et al. 2014). The current low but stable population of approximately 30,000 caribou may persist for decades before the broad-scale pattern of rapid population increase and decrease return to the Island of Newfoundland (NLDEC 2015). NLDEC (2015) state that long-term management of caribou population should be primarily focused on range quality and availability. Future potential risks to caribou include land use changes that result in the loss of spring and summer ranges, unmitigated disturbance associated with snowmachine and all-terrain vehicle (ATV) use, wolf recolonization of the Island of Newfoundland, and factors associated with climate change (e.g., parasites, severe weather) (NLDEC 2015).

Baseline investigations for the Project in winter 2023 confirmed the presence of caribou in an expected location north of Stephenville Crossing. Caribou are not expected to occur in the Project Area or LAA in CMA 61, based on seasonal ranges of GPS collared caribou from the La Poile herd (Marathon Gold 2020). More detailed information on caribou is available in Appendix BSA 3.

Habitat Occurrence in the Project Area

Adult caribou in western Newfoundland generally select rock and heath barrens and stands of mature coniferous forest more than other habitats in all seasons (Mahoney and Virgl 2003). During winter (mid-December-March), particularly in central regions of the Island of Newfoundland with deep snow, caribou migrate to areas with mature-old coniferous forests that reduce snow accumulation and reduce energetic costs associated with travelling and foraging in deep snow (Mahoney and Virgl 2003, Wells et al. 2011). Winter and fall forage for caribou in Newfoundland consists primarily of terrestrial lichens, such as *Cladonia* spp. (Mayor et al. 2007, Fortin et al. 2008, Mayor et al. 2009, Soulliere and Mahoney 2014). Arboreal



lichens and evergreens are also selected to a lesser extent (Soulliere and Mahoney 2014). Wetland complexes, barren lands, and shrub lands are preferred during snow-free seasons. In early spring (April-May), females migrate to traditional calving grounds, typically characterized by barren lands, low-lying vegetation surrounded by mature-old coniferous forests and wind-scarred trees (Saunders 2007). Caribou tend to avoid mixed forest during calving (McCarthy et al. 2011). Summer forage for Newfoundland caribou includes deciduous shrubs, sedges, terrestrial lichen (*Cladina* spp.) and fungi (Bergerud 1969).

Habitat type ranked as high value for caribou include softwood forests (Table 15.4). Softwood forests offer year-round forage potential with terrestrial lichen (*Cladina* spp.) as well as protection from predation and high snow accumulation (Hébert and Weladji 2013, Mahoney and Virgl 2003, Wells et al. 2011). Hardwood, mixedwood, and unknown forests were categorized as moderate value as they each provide canopy protection and resting potential as well as moderate foraging opportunities including deciduous shrubs, sedges, terrestrial lichen, and fungi. Barren, wetland, and water habitats have also been ranked as moderate value. Each of these provide temporal forage and denning features (Mahoney and Virgl 2003) but lack substantial predatorial protection with little canopy cover. Coniferous scrub, deciduous scrub, agriculture, anthropogenic, and sand ranked as low habitat value to the species based on the amount of foraging, protection, and resting opportunities (Table 15.4). While categorized as low value, deciduous scrub does provide marginal summer foraging (Bergerud 1969).

Based on the habitat rankings, habitat availability was summarized for caribou for the Project Area, LAA and RAA. These results are presented in Table 15.7. Habitat availability in the Project Area, summarized by Project component, is presented in Table 15.8.

Table 15.7 Amount of Habitat by Habitat-Value Ranking for Caribou in the Assessment Areas

Habitat Value Ranking ¹	Area in Project Footprint		Area in Project Area		Area in LAA ²		Area in RAA ²	
	km ²	% of Area	km ²	% of Area	km ²	% of Area	km ²	% of Area
High	15.6	38.4	105.0	37.3	311.9	40.9	1,363.4	40.1
Moderate	12.3	30.3	87.8	31.2	235.0	30.9	1,225.1	36.0
Low	12.8	31.3	88.7	31.5	214.8	28.2	815.1	23.9
Total ³	40.7	100.0	281.5	100.0	761.7	100.0	3,403.7	100.0
Notes:								
1. Refer to Table 15.4 for habitat value rankings.								
2. LAA = Local Assessment Area; RAA = Regional Assessment Area								
3. Excludes ocean habitat within LAA and RAA								



Table 15.8 Amount of Habitat by Habitat-Value Ranking for Caribou in the Project Footprint by Project Component

Habitat Value Ranking ¹	Port au Port Wind Farm ²		Codroy Wind Farm ²		Hydrogen / Ammonia Plant ²		Transmission Lines	
	km ²	% of Area	km ²	% of Area	km ²	% of Area	km ²	% of Area
High	6.4	45.7	4.4	30.9	0.1	2.6	4.8	43.9
Moderate	2.2	15.6	6.1	43.1	0.8	43.1	3.5	32.4
Low	5.5	38.8	3.7	26.0	1.1	54.2	2.6	23.7
Total	14.1	100.0	14.2	100.0	2.0	100.0	10.9	100.0
Notes:								
1. Refer to Table 15.4 for habitat value rankings.								
2. Species not expected to occur in these areas.								

15.2.2.4 Muskrat

Life History, Distribution and Limiting Factors

Muskrat are native to NL and are considered a distinct race and differ morphologically from muskrat in other areas (Rigby and Threlfall 1982). They are the most trapped furbearer in North America (Naughton 2012, Obbard et al. 1987) and are managed and trapped throughout much of Newfoundland (NLDFFA 2023). The muskrat is also a culturally important species to Indigenous communities in Newfoundland.

Emerging data indicate muskrat across North America are in decline (Sadowski and Bowman 2021, Gregory et al. 2019, Ward and Gorelick 2018, Ahlers and Heske 2017) and trends in trapping data suggest muskrat on the Island of Newfoundland are undergoing a similar decline (NLDFFA 2019). The cause of muskrat decline in North America is unknown but is likely related to wetland loss and alteration combined with predation, disease, and contaminants (Sadowski and Bowman 2021, Ganoe et al. 2020).

Muskrat is expected to occur in the Project Area and LAA, based on the availability of suitable habitat in these areas.

Habitat Occurrence in the Project Area

Muskrat are found in a variety of permanent wetlands and watercourses, including marshes, ponds, slough, lakes, and slow-moving creeks, and rivers, as well as anthropogenic wetlands such as ditches and dugouts are also used (Boutin and Birkenholz 1987). Muskrats also sometimes occupy brackish water (e.g., estuaries) and have been observed in saltwater (Naughton 2012). During winter, muskrats remain active and den in bank burrows or lodges made from aquatic vegetation (Naughton 2012). Muskrat in western Newfoundland tend to favor bank burrows for shelter (Lear 1952 in Soper 1995). Specialized “push ups” with a central plunge hole and walls of mud and vegetation are also built by muskrat on the ice surface during winter, these features provide a protected location under the snow for resting and feeding (Naughton 2012). Cattails (e.g., *Typha latifolia*) are a preferred food source and building material for muskrat lodges; however, cattails are relatively rare in Newfoundland and, in western



Newfoundland, sedge (*Carex* sp.), iris (*Iris versicolor*), horsetail (*Equisetum* sp.), pondweed, and rush (*Eleocharis* sp.) are the primary food source and lodge building material for muskrat (Soper 1995).

Habitat types ranked as high value for muskrat include wetland and water (Table 15.4). Water bodies and wetlands provide key critical foraging such as cattails (*Typha* spp.) and other aquatic plants. These high value habitats are also lodging sites for the species providing appropriate water levels, ice cover, and building materials for seasonal needs (Ouellet and Morin 2006). Anthropogenic habitats such as ditches and dugouts are considered moderate value as they may provide marginal amounts of all the critical elements (foraging, protection and resting) like wetlands and water, but are less favorable. Coniferous scrub, deciduous scrub, softwood, hardwood, mixedwood, unknown forest, agriculture, barren, and sand habitats ranked as low habitat value to the species based on the amount of foraging, protection, and resting opportunities (Table 15.4).

Based on the habitat rankings, habitat availability was summarized for muskrat for the Project Area, LAA and RAA. These results are presented in Table 15.9. Habitat availability in the Project Area, summarized by Project component, is presented in Table 15.10.

Table 15.9 Amount of Habitat by Habitat-Value Ranking for Muskrat in the Assessment Areas

Habitat Value Ranking ¹	Area in Project Footprint		Area in Project Area		Area in LAA ²		Area in RAA ²	
	km ²	% of Area	km ²	% of Area	km ²	% of Area	km ²	% of Area
High	3.3	8.2	27.2	9.7	68.9	9.1	468.7	13.8
Moderate	0.9	2.3	5.6	2.0	17.3	2.3	80.9	2.4
Low	36.5	89.5	248.6	88.3	675.5	88.7	2,854.0	83.9
Total ³	40.7	100.0	281.5	100.0	761.7	100.0	3,403.7	100.0
Notes:								
1. Refer to Table 15.4 for habitat value rankings.								
2. LAA = Local Assessment Area; RAA = Regional Assessment Area								
3. Excludes ocean habitat within LAA and RAA								



Table 15.10 Amount of Habitat by Habitat-Value Ranking for Muskrat in the Project Footprint by Project Component

Habitat Value Ranking	Port au Port Wind Farm		Codroy Wind Farm		Hydrogen / Ammonia Plant		Transmission Lines	
	km ²	% of Area	km ²	% of Area	km ²	% of Area	km ²	% of Area
High	0.4	2.5	1.3	8.8	0.5	27.2	1.5	14.1
Moderate	0.0	0.3	0.0	0.1	0.6	32.9	0.2	2.2
Low	13.7	97.2	13.0	91.1	0.8	39.9	9.1	83.8
Total	14.1	100.0	14.2	100.0	2.0	100.0	10.9	100.0
Note: Refer to Table 15.4 for habitat value rankings.								

15.2.2.5 Newfoundland Marten

Life History, Distribution and Limiting Factors

The Newfoundland population of American marten (*Martes americana atrata*) is a genetically and geographically distinct subspecies of marten (COSEWIC 2022) and is currently listed as Threatened under the NL ESA, and Threatened under Schedule 1 of SARA (Government of Canada 2023). In 2022, COSEWIC re-examined the status of Newfoundland marten and assessed the species as Special Concern (COSEWIC 2022). A federal recovery strategy, which delineates critical habitat, was released for the Newfoundland marten in 2013 (Environment Canada 2013) and a provincial recovery plan has been developed for Newfoundland marten with the goal of maintaining a viable, wild population on the Island of Newfoundland that is not at risk (NMRT 2010). Recent (2019) population estimates for Newfoundland marten are between 2,558–2,837 individuals (COSEWIC 2022).

According to Environment Canada, provincial population is distributed throughout areas in Little Grand Lake, Beothuk Lake, Georges Lake/Pinchgut Lake, Main River, Terra Nova National Park, and the northern portion of the Bay du Nord Wilderness area (Environment Canada 2013).

Incidental mortality associated with snaring and trapping is the primary threat for Newfoundland marten, while other threats include habitat loss associated with forest clearing, disease, and vehicle collisions (COSEWIC 2022).

The Port au Port East wind farm and Codroy wind farm are within the extent of marten occurrence and this species has been observed near the Project Area for both sites (COSEWIC 2022).



Habitat Occurrence in the Project Area

Newfoundland marten were thought to be strongly associated with mature/old-growth balsam fir forests and avoid open habitats such as recent clearcuts (COSEWIC 2007). While older forests are still recognized as an important component of marten habitat, recent data indicate they occupy a broader array of habitat types, including partially harvested and early successional forests regenerating after clearcut logging (Hearn et al. 2010, COSEWIC 2022). Hearn et al. (2010) state that forest composition for Newfoundland marten should be > 24% mature and overmature forest and should not exceed 29% younger aged forest. This range of habitats provides sufficient structure for denning sites and supports the key prey species for marten, which include meadow voles (*Microtus pennsylvanicus*), shrews (*Sorex* sp.), snowshoe hares (*Lepus americanus*), red squirrels (*Tamiasciurus hudsonicus*) and birds. Large-scale areas of critical habitat for the American marten in Newfoundland were identified by the Newfoundland Marten Recovery Team (NMRT 2010) and this habitat from the provincial plan was adopted by Environment Canada to assist with identification of critical habitat under SARA (Environment Canada 2013). Critical habitat was determined by combining marten occurrence data and information on habitat quality, providing an area of 6208 km² (Environment Canada 2013). A portion of the Project transmission line right-of-way (RoW) intersects the periphery of marten proposed critical habitat along the Trans-Canada Highway (TCH) near Barachois Pond Provincial Park. Approximately 4.0 km² or 0.36% of proposed Newfoundland marten critical habitat within the LAA/RAA is intersected by the Project Area near Stephenville Crossing. Of this, approximately 0.8 km² will be cleared for transmission line infrastructure.

Habitat types ranked as high value for marten include softwood and mixedwood forests (Table 15.4). Mature forests provide coverage and protection from predators while supporting favorable habitat for prey such as meadow vole (Gosse and Hearn 2005). Hardwood forests, unknown forests, and water habitat types were ranked as moderate value (Table 15.4). Like softwood and mixedwood, hardwood and unknown forests provide marginal amounts of forage, protection, and denning potential. Downed logs in these habitats may be used by the species for predation, denning, and cover from predators (Gosse et al. 2005). Coniferous scrub, deciduous scrub, agriculture, anthropogenic, barren, sand, water, and wetland ranked as low habitat value to the species based on the amount of foraging, protection, and resting opportunities (Table 15.4).

Based on the habitat rankings, habitat availability was summarized for marten for the Project Area, LAA and RAA. These results are presented in Table 15.11. Habitat availability in the Project Area, summarized by Project component, is presented in Table 15.12.



Table 15.11 Amount of Habitat by Habitat-Value Ranking for Marten in the Assessment Areas

Habitat Value Ranking ¹	Area in Project Footprint		Area in Project Area		Area in LAA ²		Area in RAA ²	
	km ²	% of Area	km ²	% of Area	km ²	% of Area	km ²	% of Area
High	18.0	44.2	115.9	41.2	360.9	47.4	1,681.5	49.4
Moderate	1.6	3.9	10.8	3.8	35.1	4.6	185.1	5.4
Low	21.1	51.9	154.7	55.0	365.8	48.0	1,537.1	45.2
Total ³	40.7	100.0	281.5	100.0	761.7	100.0	3,403.7	100.0
Notes:								
1. Refer to Table 15.4 for habitat value rankings.								
2. LAA = Local Assessment Area; RAA = Regional Assessment Area								
3. Excludes ocean habitat within LAA and RAA								

Table 15.12 Amount of Habitat by Habitat-Value Ranking for Marten in the Project Footprint by Project Component

Habitat Value Ranking ¹	Port au Port Wind Farm ²		Codroy Wind Farm ²		Hydrogen / Ammonia Plant ²		Transmission Lines	
	km ²	% of Area	km ²	% of Area	km ²	% of Area	km ²	% of Area
High	6.5	46.1	5.4	37.7	0.1	4.5	6.1	55.8
Moderate	0.6	4.5	0.5	3.3	0.1	4.0	0.4	4.0
Low	6.9	49.3	8.4	59.0	1.8	91.6	4.4	40.2
Total	14.1	100.0	14.2	100.0	2.0	100.0	10.9	100.0
Notes:								
1. Refer to Table 15.4 for habitat value rankings.								
2. Species not expected to occur in these areas.								



15.2.2.1 Arctic Hare

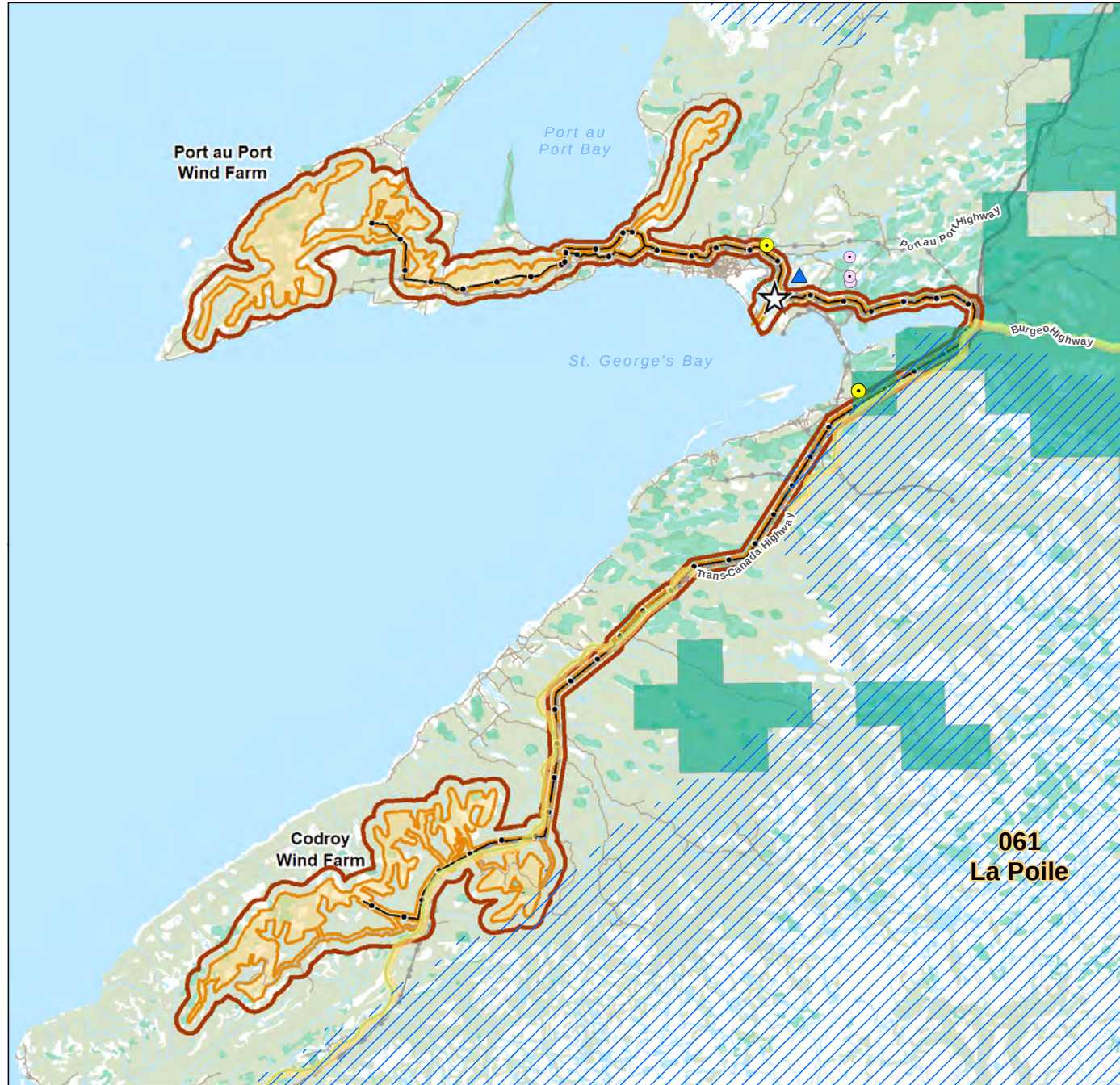
Life History, Distribution and Limiting Factors

Arctic hare is an SOCC and ranked S2/S3 (imperiled/vulnerable) by the AC CDC, indicating that there is a range of uncertainty about the status of the species (AC CDC 2023). The *bangsii* subspecies of arctic hare is unique to the Island of Newfoundland and southern Labrador (SSAC 2012).

Arctic hares on the Island of Newfoundland are at the southern limit of their distribution and occur at low densities (approximately 1 hare/km²) (Hearn et al. 1987, Naughton 2012, SSAC 2012). Their known range in western Newfoundland includes the Long Range Mountains, the Buchans-Gaff Topsails plateau complex, and nearby exposed coastal barrens, although there is uncertainty surrounding their distribution. A small, translocated population of arctic hare also occurs on Brunette Island (SSAC 2012). A population size fluctuating between 5,000 and 20,000 arctic hare has been estimated for the Island of Newfoundland (SSAC 2012), and cyclic fluctuation in arctic hare densities is known for local populations. Long-term monitoring by Gerrow and Anderson (2007) reported fluctuating densities of between 0.24 and 1.05 hares/km² in Gros Morne National Park and suggested a cycle with a periodicity of 6 to 7 years. Red fox (*Vulpes vulpes*) is the most important predator of arctic hare in Newfoundland (Hearn et al. 1987). Predation by other predators (e.g., Canada lynx [*Lynx canadensis*] and coyote) is of secondary importance, although changing predator distribution and density associated with introduced prey species (e.g., snowshoe hare) and climate change is a potential threat to arctic hare populations (SSAC 2012). Canada lynx prefer forested areas rather than barrens and are the primary predator of snowshoe hare on the Island of Newfoundland (Dodds 1965, Saunders 1963).

As the distribution of arctic hare is understudied on the Island of Newfoundland, range overlap with the LAA is possible as they are presumed present on barren lands located south of the TCH near the Codroy wind farm (Figure 15.3). There is also one record of this species (AC CDC 2023) near Stephenville (Figure 15.3). More detailed information on arctic hare is available in Appendix BSA 3.





SAR/SoCC

- ▲ Arctic Hare
- Yellow-banded Bumble Bee
- Caribou

- ▨ Arctic Hare Presumed Presence (WD)

- Newfoundland Marten Proposed Critical Habitat (ECCC)

- Caribou Management Area

- Local Assessment Area

Proposed Project Features

- ★ Hydrogen / Ammonia Plant Location

- Transmission Line 230 kV

- Project Area

Other Features

- Transmission Line, Existing

- Trans-Canada Highway

- Road

- Contour (100 m)

- Watercourse

- Waterbody

- Wetland

- Forested Area



0 10 km
(At original document size of 8.5x11)
1:550,000

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCAN CanVec, OpenStreetMap, ACCDC
3. Background: NRCAN CanVec



Project Location: Stephenville, NL
Prepared by AC/MB on 2023-07-19
QR by AW on 2023-07-19

Client/Project: 121417233_084
World Energy GH2
Project Nujio'qonik

Figure No.

15.3

Species at Risk, Species of Conservation Concern - Other Wildlife

Habitat Occurrence in the Project Area

Arctic hares occupy upland barrens in Newfoundland (Fitzgerald and Keith 1990). The Island of Newfoundland is one of the few locations where the geographic ranges of arctic hare and snowshoe hare overlap (Fitzgerald and Keith 1990); yet, as the two hare species occupy different habitats, competition from snowshoe hare is not believed to be responsible for the low density and distribution of arctic hare on the Island of Newfoundland (Fitzgerald and Keith 1990, Hearn et al. 1987). However, Small (1990) suggests that introduction of snowshoe hare could result in localized reduction of arctic hare populations from forested regions with small patches of barrens (particularly via indirect, predator-mediated competition). Both species of hare feed on graminoid and herbaceous vegetation in spring and summer and switch to a diet of predominantly woody plants in winter (Naughton 2012, Dodds 1960). White birch is a preferred forage species of hares in Newfoundland (Naughton 2012, Dodds 1960).

Only barrens are ranked as high value for arctic hare (Table 15.4). Arctic hare in Newfoundland primarily use upland rocky barrens as the preferred habitat providing optimal forage, protection, and resting opportunities (SSAC 2012). Coniferous scrub, deciduous scrub, softwood, hardwood, mixedwood, and unknown forest were ranked as moderate habitat for arctic hare (Table 15.4). During the winter months arctic hare have been shown to utilize forested areas adjacent to forage, protection, and resting (SSAC 2012). Agriculture, anthropogenic, sand, water, and wetland ranked as low habitat value to the species based on the amount of foraging, protection, and resting opportunities (Table 15.4).

Based on the habitat rankings, habitat availability was summarized for arctic hare for the Project Area, LAA and RAA. These results are presented in Table 15.13. Habitat availability in the Project Area, summarized by Project component, is presented in Table 15.14.

Table 15.13 Amount of Habitat by Habitat-Value Ranking for Arctic Hare in the Assessment Areas

Habitat Value Ranking	Area in Project Footprint		Area in Project Area		Area in LAA		Area in RAA	
	km ²	% of Area	km ²	% of Area	km ²	% of Area	km ²	% of Area
High	5.0	12.4	38.8	13.8	82.0	10.8	253.2	7.4
Moderate	19.6	48.1	126.8	45.0	396.0	52.0	1,866.6	54.8
Low	16.1	39.5	115.9	41.2	283.7	37.2	1,283.8	37.7
Total ³	40.7	100.0	281.5	100.0	761.7	100.0	3,403.7	100.0
Notes:								
1. Refer to Table 15.4 for habitat value rankings.								
2. LAA = Local Assessment Area; RAA = Regional Assessment Area								
3. Excludes ocean habitat within LAA and RAA								



Table 15.14 Amount of Habitat by Habitat-Value Ranking for Arctic Hare in the Project Footprint by Project Component

Habitat Value Ranking ¹	Port au Port Wind Farm ²		Codroy Wind Farm		Hydrogen / Ammonia Plant ²		Transmission Lines ²	
	km ²	% of Area	km ²	% of Area	km ²	% of Area	km ²	% of Area
High	1.1	8.0	3.4	24.2	0.2	10.1	0.3	2.4
Moderate	7.1	50.7	5.8	41.0	0.2	8.4	6.5	59.8
Low	5.8	41.3	5.0	34.8	1.6	81.4	4.1	37.8
Total	14.1	100.0	14.2	100.0	2.0	100.0	10.9	100.0
Notes:								
1. Refer to Table 15.4 for habitat value rankings.								
2. Species not expected to occur in these areas.								

15.2.2.2 Yellow-banded Bumble Bee

Life History, Distribution and Limiting Factors

The yellow-banded bumble bee (*Bombus terricola*) was first assessed as Special Concern in 2015 by COSEWIC and added to Schedule 1 of SARA in 2018 with the same status (Government of Canada 2023). This bumble bee species, once common in Canada, has declined by at least 34% in southern areas. Causes remain unclear, but factors like pesticide use, habitat conversion, and pathogen transmission and spill over from managed bee populations in greenhouses are suspected (COSEWIC 2015).

Yellow-banded bumble bees are eusocial and have three adult forms (queen, workers, and males) that form annual colonies with one generation per year. Mating occurs in the fall, after which the males die and only the queen overwinters (COSEWIC 2015). Yellow-banded bumble bees require constant floral resources like pollen and nectar for colony growth. Its sex determination also makes them highly susceptible to extinction in small population sizes (ECCC 2022).

The distribution of yellow-banded bumble bees in Canada is extensive, ranging from eastern British Columbia to the Island of Newfoundland. The yellow-banded bumble bee has primarily been discovered in Newfoundland's coastal regions, particularly those around the Gulf of St. Lawrence (COSEWIC 2015). According to requested data from the AC CDC, the yellow-banded bumble bee has not been observed in the Project Area but has been observed within the RAA on several occasions (AC CDC 2023). A total of 13 observations of the yellow-banded bumble bee were recorded between 2015 and 2016 at two agricultural farms near the Project: two observations at a farm near Stephenville (within LAA boundaries) and 11 observations at a farm near Barachois Brook (outside of LAA boundaries). Citizen science initiatives such as iNaturalist have also recorded occurrences of the yellow-banded bumble bee outside of LAA boundaries with one observation from 2021 near Blue Beach, on the Port au Port Peninsula (iNaturalist 2023). As the distribution of the yellow-banded bumble bee is understudied on the Island of Newfoundland, range overlap with the LAA is likely, given their broad habitat preferences.



Habitat Occurrence in the Project Area

Yellow-banded bumble bees inhabit various habitats, including mixed woodlands, farmlands, urban areas, montane meadows, prairie grasslands, and boreal areas. They forage on flowers for pollen and nectar from various plant genera and establish nests in abandoned burrows, grassy hummocks, or dead wood (COSEWIC 2015). Yellow-banded bumble bee queens are known to overwinter underground in pre-existing cavities like abandoned rodent burrows and rotten logs and emerge in early spring to forage and search for suitable nest sites.

Habitat types ranked as high value for yellow-banded bumble bee include softwood, hardwood, mixedwood, unknown forest, and agriculture (Table 15.4). Bumble bees have been cited as habitat and forage generalist, gathering pollen and nectar from a variety of habitats/flowering plants and nesting in a wide range of habitats, particularly those listed above (COSEWIC 2015, McFarland and Richardson 2015). Wetlands were ranked as moderate value habitat (Table 15.4) based on marginal foraging opportunities as well as potential burrowing habitat (COSEWIC 2015). Coniferous scrub, deciduous scrub, anthropogenic, barren, sand, and water ranked as low habitat value to the species based on the amount of foraging, protection, and resting opportunities (Table 15.4).

Based on the habitat rankings, habitat availability was summarized for the yellow-banded bumble bee for the Project Area, LAA and RAA. These results are presented in Table 15.15. Habitat availability in the Project Area, summarized by Project component, is presented in Table 15.16.

Table 15.15 Amount of Habitat by Habitat-Value Ranking for Yellow-banded Bumble Bee in the Assessment Areas

Habitat Value Ranking	Area in Project Footprint		Area in Project Area		Area in LAA		Area in RAA	
	km ²	% of Area	km ²	% of Area	km ²	% of Area	km ²	% of Area
High	19.7	48.4	127.3	45.2	401.0	52.6	1,908.8	56.1
Moderate	2.6	6.3	22.4	8.0	54.9	7.2	345.6	10.2
Low	18.5	45.4	131.8	46.8	305.9	40.2	1,149.2	33.8
Total ³	40.7	100.0	281.5	100.0	761.7	100.0	3,403.7	100.0
Notes:								
1. Refer to Table 15.4 for habitat value rankings.								
2. LAA = Local Assessment Area; RAA = Regional Assessment Area								
3. Excludes ocean habitat within LAA and RAA								



Table 15.16 Amount of Habitat by Habitat-Value Ranking for Yellow-banded Bumble Bee in the Project Footprint by Project Component

Habitat Value Ranking ¹	Port au Port Wind Farm ²		Codroy Wind Farm ²		Hydrogen / Ammonia Plant ²		Transmission Lines	
	km ²	% of Area	km ²	% of Area	km ²	% of Area	km ²	% of Area
High	7.1	50.7	5.8	41.0	0.2	8.4	6.6	60.6
Moderate	0.3	2.3	1.2	8.5	0.1	5.1	0.9	8.4
Low	6.6	47.0	7.2	50.5	1.7	86.4	3.4	31.0
Total	14.1	100.0	14.2	100.0	2.0	100.0	10.9	100.0
Notes:								
1. Refer to Table 15.4 for habitat value rankings.								
2. Species occurrence is uncertain in these areas.								

15.3 Assessment Criteria and Methods

This section describes the criteria and methods used to assess environmental effects on other wildlife. Residual environmental effects (Section 15.5) are assessed and characterized using criteria defined in Section 15.3.1, including direction, magnitude, geographic extent, timing, duration, frequency, reversibility, and ecological or socio-economic context. The assessment also evaluates the significance of residual effects using threshold criteria or standards beyond which a residual environmental effect is considered significant. The definition of a significant effect for other wildlife is provided in Section 15.3.2. Section 15.3.3 identifies the environmental effects to be assessed for other wildlife, including effect pathways and measurable parameters. This is followed by the identification of potential Project interactions with other wildlife (Section 15.3.4). Analytical assessment techniques employed for the assessment of potential Project-related environmental effects on other wildlife are provided in Section 15.3.5. The assumptions that were made to support a conservative approach to the assessment of residual effects on other wildlife are described in Section 15.3.5.1.

15.3.1 Residual Effects Characterization

Table 15.17 presents definitions for the predicted environmental effects characterization of the undertaking on other wildlife. The criteria are used to describe the potential residual effects that remain after mitigation measures have been implemented. Quantitative measures have been developed, where possible, to characterize residual effects. Qualitative considerations are used where quantitative measurement is not possible.



Table 15.17 Characterization of Predicted Environmental Effects of the Undertaking on Other Wildlife

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Nature	The long-term trend of the residual effect	• Neutral – No net change in the measurable parameter(s) for other wildlife relative to baseline • Positive – A residual effect that moves the measurable parameter(s) in a direction beneficial to other wildlife relative to baseline • Adverse – A residual effect that moves the measurable parameter(s) in a direction detrimental to other wildlife relative to baseline
Magnitude	The amount of change in measurable parameter(s) of the VEC relative to existing conditions	• Negligible – No measurable change • Low: <u>Change in habitat:</u> less than 10% of other wildlife habitat in the RAA is lost, or less than 5% of SAR/SOCC habitat in the RAA <u>Change in mortality:</u> a measurable change in mortality in the LAA is not anticipated, although individuals may be affected • Moderate: <u>Change in habitat:</u> – 10-20% of other wildlife habitat in the RAA is lost, or 5-10% of SAR/SOCC habitat in the RAA <u>Change in mortality:</u> a measurable change in mortality in the LAA might occur, however a measurable change in the RAA is not anticipated • High: <u>Change in habitat:</u> >20% of other wildlife habitat in the RAA is lost, or >10% of SAR/SOCC habitat in the RAA <u>Change in mortality:</u> a measurable change in mortality in the RAA may occur
Geographic Extent	The geographic area in which a residual effect of a defined magnitude occurs	• Project Area – Residual effect is restricted to the Project Area • LAA – Residual effect extends into the LAA • RAA – Residual effect extends into the RAA
Timing	Considers when the residual environmental effect is expected to occur, where applicable or relevant to the VEC.	• No Sensitivity – Residual effect does not occur during a critical life stage (e.g., calving, denning) or timing does not affect other wildlife considered in this VEC. • Moderate Sensitivity – Residual effect may occur during a lower sensitive period of a critical life stage. • High Sensitivity – Residual effect occurs during a critical life stage (e.g., calving, denning) or culturally important activities (e.g., hunting, trapping).



Table 15.17 Characterization of Predicted Environmental Effects of the Undertaking on Other Wildlife

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Duration	The period of time required until the measurable parameter(s) or the VEC returns to its existing (baseline) condition, or the residual effect can no longer be measured or otherwise perceived	• Short-term – Residual effect is restricted to the duration of the construction phase (4 years). • Medium-term – Residual effect extends beyond the construction phase OR includes both the construction and decommissioning and rehabilitation phase. • Long-term – Residual effect extends through the operation and maintenance phase of the Project (30 years), or extend beyond the life of the Project.
Frequency	Identifies how often the residual effect occurs during the Project, during a specific phase of the Project, or during another specified time period	• Single event • Multiple irregular event – Occurs at no set schedule • Multiple regular event – Occurs at regular intervals • Continuous – Occurs continuously
Reversibility	Describes whether a measurable parameter(s) or the VEC can return to its existing condition after the Project activity ceases, including through active management techniques	• Reversible – Residual effect is likely to be reversed after activity completion and rehabilitation • Irreversible – Residual effect is unlikely to be reversed
Ecological / Socio-economic Context	Existing conditions and trends in the area where the residual effect occurs	• Undisturbed – Area is relatively undisturbed or not adversely affected by human activity • Disturbed – Area has been substantially previously disturbed by human development or human development is still present

15.3.2 Significance Definition

A significant residual adverse effect on other wildlife and their habitat is one that, following the application of avoidance and mitigation measures, causes or further contributes to the exceedance of a conservation-based threshold or threatens the long-term persistence or viability of species of management concern, or species of cultural or traditional importance, in the RAA.

15.3.3 Potential Environmental Effects, Project Pathways, and Measurable Parameters

Table 15.18 lists the potential Project effects on other wildlife and provides a summary of the Project effect pathways and measurable parameters and units of measurement to assess potential effects. Potential environmental effects and measurable parameters were selected based on review of recent EAs for large development projects in NL, renewable energy projects in other parts of Canada, comments provided during engagement, and professional judgment.



Table 15.18 Environmental Effects, Effect Pathways, and Measurable Parameters for Other Wildlife

Environmental Effect(s)	Effect Pathway(s)	Measurable Parameter(s) and Units of Measurement
Change in habitat	• Direct loss or alteration of habitat arising from vegetation clearing and ground disturbance • Change in movement paths or patterns arising from habitat loss, edge effects and/or sensory disturbance (e.g., avoidance of Project-related infrastructure)	• Area (hectares) of high suitability habitat directly lost for the assessed species, including SAR that may be present in the RAA • Qualitatively, amount of habitat indirectly lost for the assessed species • Qualitatively, changes in the distribution and use of movement paths of moose and caribou
Change in mortality	• Direct or indirect change in mortality from vegetation clearing, collisions, human-wildlife conflicts and/or predation and harvest pressure	Qualitatively and quantitatively: • changes in traffic volumes over the life of the Project • likelihood of interactions with Project vehicles, equipment, and infrastructure • changes in predator-prey dynamics and harvest pressure

The Project may affect habitat quantity and quality. A change in habitat includes the loss or alteration of habitat, both direct and indirect, that would affect its availability to the assessed species. The quantity (area) of suitable habitat will decrease as a result of land clearing and conversion for Project components (i.e., direct habitat loss) and habitat will be indirectly affected by sensory disturbance (e.g., noise, light) and habitat fragmentation. Avoidance behaviour from sensory disturbance can also affect the movement patterns of moose and caribou in suitable habitat.

The Project may also affect the mortality of other wildlife species through direct encounters with Project-related equipment, infrastructure, and traffic, and indirectly as a result of altered predator-prey dynamics and hunting pressure.

15.3.4 Project Interactions with Other Wildlife

Table 15.19 uses checkmarks to indicate the routine Project activities that could interact with the VEC and result in the identified environmental effect(s) to be assessed. Immediately following Table 15.19, environmental effects pathways are briefly described for potential routine Project-related environmental effects and justification is provided in cases where no Project interaction with the Other Wildlife VEC (and therefore no potential environmental effect on the VEC) is predicted.



Table 15.19 Project Interactions with Other Wildlife, Environmental Effects, and Environmental Effect Pathways

Project Activities	Environmental Effect(s) to be Assessed	
	Change in Habitat	Change in Mortality
Construction		
Site Preparation and Civil Works (including turbine foundations, road construction, quarries, clearing, grubbing, blasting, cement production, and watercourse crossings)	✓	✓
Transportation of Resources and Equipment (includes trucking, shipping and barging of materials)	✓	✓
Construction / Installation, Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure	✓	✓
Installation and Commissioning of Wind Turbines	✓	✓
Installation and Commissioning of Collector Systems	✓	✓
Installation and Commissioning of Transmission Lines and Substations (including marine cable crossing)	✓	✓
Installation and Commissioning of Hydrogen / Ammonia Production, and Storage Facilities and Associated Infrastructure (including Industrial water supply infrastructure)	✓	✓
Restoration of Existing Port Facilities (including pile driving and dredging)	-	-
Emissions, Discharges, and Wastes ¹	✓	✓
Employment and Expenditures ²	-	✓
Operation and Maintenance		
Presence, Operation, and Maintenance of Wind Farms (including wind turbines, access roads, and collector systems)	✓	✓
Presence, Operation, and Maintenance of Transmission Lines and Substations	✓	✓
Presence, Operation, and Maintenance of Hydrogen / Ammonia Production, and Storage, Facilities and Associated Infrastructure (includes marine discharge from treatment plant)	✓	✓
Presence, Operation, and Maintenance of Port Facilities (includes loading of ammonia and vessel maneuvering within Port)	-	-
Emissions, Discharges, and Wastes ¹	✓	✓
Employment and Expenditures ²	-	-



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Project Activities	Environmental Effect(s) to be Assessed	
	Change in Habitat	Change in Mortality
Decommissioning and Rehabilitation		
Transportation of Resources and Equipment (includes trucking, shipping and barging of materials)	✓	✓
Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure	✓	✓
Decommissioning and Rehabilitation of Wind Farms (including wind turbines, access roads, and collector systems)	✓	✓
Decommissioning and Rehabilitation of Transmission Lines and Substations	✓	✓
Decommissioning and Rehabilitation of Hydrogen / Ammonia Production, and Storage, Facilities and Associated Infrastructure	✓	✓
Decommissioning and Rehabilitation of Port Facilities	-	-
Emissions, Discharges, and Wastes ¹	✓	✓
Employment and Expenditures ²	-	-
Notes: ✓ = Potential interaction – = No interaction ¹ Emissions (e.g., light, noise, vibration, air contaminants and greenhouse gases), discharges (e.g., wastewater and other liquid effluents), and hazardous and non-hazardous wastes are generated by many Project activities. Rather than acknowledging this by placing a checkmark against each of these activities, “Emissions, Discharges, and Wastes” is listed as a separate item under each phase of the Project. ² Project employment and expenditures are generated by most Project activities and are the main drivers of many potential socio-economic effects. Rather than acknowledging this by placing a checkmark against each of these activities, “Employment and Expenditures” is listed as a separate item under each phase of the Project.		



In the absence of mitigation, the Project may interact with other wildlife in the following ways:

- Project activities during the construction phase are expected to affect other wildlife through vegetation clearing and site preparation activities, transportation of resources and equipment, and the construction (or restoration) and installation of Project-related infrastructure that will have direct and indirect effects on habitat, including potential changes to movement patterns that may result from habitat loss or alteration. Indirect effects on habitat include emissions such as noise and light.
- Direct changes to habitat are anticipated to occur primarily during the construction phase, while indirect effects from sensory disturbance will persist throughout the operations and maintenance and decommissioning and rehabilitation phases. However, once the Project is operating, Project-related human activity and associated sensory disturbance is expected to decrease.
- Project activities may affect wildlife mortality directly through collisions with vehicles or during site preparation activities and the installation of Project infrastructure. There is also a low risk of mortality from ice throw (seasonally) during operations and maintenance. Potential indirect effects on a change in mortality include altered predator-prey dynamics following the loss or alteration of habitat and increased harvest pressure through increased access (via access roads and the transmission line RoW). Direct effects on mortality are expected to primarily occur during the construction phase of the Project, when Project-related transportation will be greatest. Potential indirect effects on a change in mortality are expected to persist throughout the operations and maintenance and decommissioning and rehabilitation phases.

The following Project activities are not expected to result in a change in habitat and/or mortality of other wildlife:

- Employment and expenditures
- Restoration of existing port facilities (including pile driving and dredging)
- Presence, operation, and maintenance of port facilities
- Decommissioning and rehabilitation of port facilities

Employment and expenditures are not expected to have adverse effects on a change in habitat of other wildlife. However, Project-related employment and expenditures could result in an increase in the number of people purchasing licenses to hunt species, such as muskrat, where no limits exist on the number of licences issued, with potential adverse effects on mortality (Section 15.5.2).

No interaction was identified between other wildlife and activities occurring at the port facilities, as there is no apparent pathway between these activities and habitat and mortality of the species considered in this VEC. The wildlife species assessed in this VEC are not expected to occur at the port facilities.

With regards to emissions, discharges and wastes, the effects considered in this VEC are related to noise and light emissions as sensory disturbance. No interaction was identified between waste discharges (including hazardous or non-hazardous wastes and the mortality of other wildlife, as emissions and discharges will be treated to meet regulatory thresholds that are designed to prevent adverse health effects to wildlife. As well, a Project-specific waste management plan to manage hazardous and non-hazardous wastes will be implemented to reduce the potential for human-wildlife conflicts. Emissions,



Discharges and Wastes may, however, have adverse effects on a change in habitat for other wildlife, through sensory disturbance (Section 15.5.1).

15.3.5 Analytical Assessment Techniques and Level of Knowledge

Environmental effects of this Project on species considered in the Other Wildlife VEC have been determined through a literature review. The effects of wind turbines on terrestrial, non-volant wildlife are comparably less understood than for species such as bats or birds (Lopucki et. al 2017). As such, existing literature on the effects of sensory disturbance and habitat loss / alteration have been used in the assessment of Project-related residual effects on other wildlife.

Direct change in habitat (i.e., loss of physical habitat) was calculated as the loss of suitable habitat from clearing and development of the Project footprint. Habitat types were ranked as low, moderate, or high quality, and those ranked as high or moderate were categorized as suitable habitat. Indirect changes in habitat result primarily from sensory disturbance and potential avoidance behaviours. Indirect effects on habitat were assessed qualitatively through a review of the literature and professional judgment.

Change in mortality (direct and indirect) was also assessed qualitatively through a review of the literature and professional judgment. Direct sources of mortality were estimated through predictions of increases in construction activities (equipment and vehicular traffic), and indirect sources of mortality assessed predicted changes in human-wildlife conflicts, predator-prey interactions, and forage availability.

15.3.5.1 Assumptions and Conservative Approach

Species presence in the Project Area was determined based on the habitat characteristics of the desktop habitat assessment. The assumption of species presence was informed by known habitat preferences of the species based on published literature, previous studies of their occurrence in similar habitat types on the Island of Newfoundland, areas of presumed presence (arctic hare), and through field studies (moose and caribou). A conservative prediction of residual effects assumed that the assessed species would be present in available suitable habitat throughout the Project Area (e.g., direct habitat loss was calculated using the entire Project footprint) when in fact not all species are expected to occur ubiquitously throughout the Project Area (e.g., caribou range does not overlap the Port au Port or Codroy wind farms and arctic hare range is restricted to high elevations).



15.4 Mitigation Measures

A series of environmental management plans will be developed by WEGH2 to mitigate the effects of Project development on the environment. A full list of mitigation measures to be applied throughout Project construction, operation and maintenance, and decommissioning and rehabilitation is provided in Section 26.2. Key measures to mitigate the potential effects of the Project on other wildlife are listed in Table 15.20, by category and Project phase.

Table 15.20 Mitigation Measures: Other Wildlife

ID #	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
4	Mitigation	Sensitive areas (e.g., wetlands, rare plant occurrences, hibernacula, mineral licks, roosts) identified prior to Project activities will be flagged and appropriate buffers maintained around these areas, where feasible.	X	X	X
5	Mitigation	Clearing for temporary road construction will be limited to the width required for road embankment, drainage requirements, and safe line of sight requirements. Trees will be cut close to ground level, and only large tree stumps will be removed, where practicable. Low ground shrubs will be left in place for soil stability and erosion protection purposes, where possible.	X	-	-
8	Mitigation	Project staff and contractors will adhere to the waste management procedures to be included in the EPP and the Waste Management Plan.	X	X	X
9	Mitigation	Construction areas will be kept clear of rubbish and debris. Rubbish and debris will be appropriately stored and managed.	X	-	-
10	Mitigation	Waste materials and debris will be collected and stored in acceptable containers on-site and disposed of off-site in an environmentally acceptable and approved site. Materials that can be recycled will be sorted and taken to an approved facility.	X	X	X
11	Mitigation	Volatile wastes and materials, such as fuel, mineral spirits, oil, or paint thinner will be stored appropriately and will not be permitted to enter into waterways or storm drains. They will be disposed of at an approved site.	X	X	X
12	Mitigation	Where portable toilets are required, waste will be removed from the site by the supplier in a timely manner for appropriate disposal. These toilets will be located more than 30 m from the boundaries of wetlands or watercourses.	X	X	X
13	Mitigation	Burning of rubbish and waste materials on-site will not be permitted. Rubbish and waste materials will not be buried on-site.	X	X	X



Table 15.20 Mitigation Measures: Other Wildlife

ID #	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
14	Mitigation	Bulk fuel and lubricants will be stored in secure areas (i.e., with bund walls and impervious flooring) that have the capacity to trap more than the volume of petroleum hydrocarbons being stored; this will serve as a secondary containment should the primary containment fail. Other petroleum hydrocarbon products will not be stored in large quantities on-site, and secondary containment (e.g., drip trays) will be used in areas of storage and transfer.	X	X	X
16	Mitigation	Fuelling and servicing will be conducted using appropriate containment equipment, including spill kits.	X	X	X
17	Mitigation	Fuelling and servicing areas will be sited more than 100 m away from watercourses, coastlines, waterbodies, and wetlands.	X	X	X
18	Mitigation	The potential for spills will be reduced through the use of standard good practices, such as the use of appropriate containers, and avoiding overfilling.	X	X	X
19	Mitigation	Vehicles, heavy equipment, and machinery will be properly maintained to reduce the risk of leakage. Routine preventative maintenance and inspection of hydraulic equipment and machinery will be undertaken to avoid a hazardous material release.	X	X	X
20	Mitigation	Project footprint and disturbed areas will be limited to the extent practicable.	X	X	X
21	Mitigation	The limits for approved clearing, grubbing and topsoil overburden removal will be clearly identified (flagging/survey stakes) in the field prior to the commencement of work.	X	-	-
22	Mitigation	Project vehicles, heavy equipment, machinery, and associated exhaust systems and mufflers (and/or other appropriate sound attenuation devices) will be regularly inspected and maintained so that they remain operating in accordance with manufacturer's recommendations.	X	-	-
23	Mitigation	Project vehicles, heavy equipment, and machinery will be shut down when stationary for long periods of time. The idling of vehicles and equipment will be avoided whenever practical.	X	-	-
24	Mitigation	Dust from Project activities will be controlled where required by using applications of water or other approved agents. Waste oil will not be used for dust controls.	X	-	-
26	Mitigation	Re-seeding of areas will follow standard methods in compliance with permit conditions. These methods will be included the Project EPP.	-	-	X
29	Mitigation	Project vehicles will drive within the speed limit to reduce engine noises as vehicles travel on roadways within adjacent communities, and horns will be used only as necessary for safety purposes.	X	-	-



Table 15.20 Mitigation Measures: Other Wildlife

ID #	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
32	Air/Noise Control	An Explosives and Blasting Management Plan will be developed by the blasting contractor to provide direction for the safe storage, handling and use of explosives and explosive components at the Project site, to address the safety of the public and Project personnel, and protection of both the environment and Project components.	X	-	-
33	Mitigation	Areas to be cleared will have sediment and erosion control measures implemented per the site-specific Erosion & Sediment Control Plan prior to the initiation of clearing activities. The sediment and erosion control measures will be adapted to suit the field conditions associated with the specific construction activities as construction proceeds.	X	-	-
34	Mitigation	Construction areas will be routinely monitored to identify areas of potential erosion and to apply appropriate mitigation. Best practice erosion and sediment control measures will be implemented, as required.	X	-	-
39	Mitigation	Environmental personnel responsible for site monitoring during construction will receive training to recognize SAR / SOCC that may be present in Project Area.	X	-	-
40	Mitigation	WEGH2 will work with Wildlife Division to manage interactions with identified sensitive areas.	X	-	-
41	Mitigation	Artificial lighting will be limited to the amount required for safety and security purposes, and will be directional, or otherwise designed, to reduce spill-over light, wherever feasible, without compromising site safety or security. Lights will be side-shielded and directed downward to reduce the attraction of birds, where possible.	X	-	-
44	Mitigation	To avoid attracting wildlife, wastes will be securely stored, frequently removed from site, and properly disposed of in an environmentally acceptable manner at an approved site.	X	X	X
45	Mitigation	Known occurrences of plant SAR / SOCC will be avoided through micro-siting of Project infrastructure, when practicable. If avoidance of plant SAR / SOCC is not possible, seed collection or transplant of the plant will be considered in consultation with the applicable regulators.	X	-	-
65	Mitigation	Project drivers will be cautioned to obey the speed limit and other traffic laws.	X	-	-
70	Mitigation	Waste generated on-site will be removed on a regular basis and disposed of appropriately at an approved facility.	X	X	X
72	Mitigation	Turbine lighting levels will be at, or above, the minimum allowed by Transport Canada for aeronautical safety, and white or red strobe lights may be used with the minimum intensity and flashes per minute allowable.	-	X	-



Table 15.20 Mitigation Measures: Other Wildlife

ID #	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
77	Mitigation	Best practices for the proper handling, storage, and disposal of spilled hazardous chemicals and fuels will be included in the EPP and implemented by the Project personnel and contractors.	X	-	-
80	Mitigation	Emergency response plans will be developed, including spill prevention and response, emergency response measures, training, responsibilities, clean-up equipment and materials, and contact and reporting procedures.	X	X	X
81	Mitigation	Appropriate Project personnel will be trained in fuel handling, equipment maintenance, and fire prevention and response measures.	X	X	X
82	Design	Fire prevention and suppression systems will be maintained on site and will consider proper suppression systems for the various potential ignition sources.	X	X	X
83	Mitigation	Spill response kits will be available on-site. Project vehicles will be equipped with appropriately sized spill kits.	X	X	X
84	Mitigation	In the event of a spill, dry clean up and mopping techniques will be used, as appropriate. The area will not be "washed down" as this could cause the spills to spread to the surrounding environment and potentially enter drainage works or environmentally sensitive areas.	X	X	X
85	Mitigation	Soil that may have become contaminated will be remediated. This may be done on-site or removed from site for disposal at an approved location.	X	X	X
148	Mitigation	Wildlife surveillance will be conducted prior to, and post, noise elevated activities. Activities may be delayed until wildlife have been allowed to leave the area as directed by the OSEM.	X	-	-
149	Mitigation	Blasting patterns and procedures will be used to reduce shock or instantaneous peak noise levels, in accordance with a Blast Management Plan that will be developed for the Project.	X	-	-
150	Mitigation	Explosives will be used in a manner that will reduce damage or defacement of landscape features, trees, ecologically sensitive areas such as wetlands, and other surrounding objects, by controlling through standard best practice (including precisely calculated explosive loads and adequate stemming), the scatter of blasted material beyond the limits of activity. Outside of cleared areas, inadvertently damaged trees will be cut, removed, and salvaged, if merchantable (refer to Section, "Clearing of Vegetation"). Fly rock, which inadvertently enters a waterbody, watercourse, or ecologically sensitive area and that can be recovered without further damage to the environment, will be removed. Instances where larger fly rocks (boulders) enter these areas or deep waterbodies, recovery of this will be discussed with the OSEM.	X	-	-



Table 15.20 Mitigation Measures: Other Wildlife

ID #	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
151	Mitigation	Time delay blasting cycles or blasting mats will be used, if necessary, to control the scatter of blasted material.	X	-	-
159	Design	Proposed ecological reserves on the Port au Port Peninsula and Codroy area will be avoided to the extent possible.	X	-	-
334	Mitigation	Hunting will be strictly prohibited at the Project site. Workers will not be permitted to hunt while staying at the accommodations camp and will not be permitted to bring firearms to site.	X	X	X
335	Mitigation	The on-site environmental team will be notified if caribou are observed within the Project Area. If caribou are in proximity of Project infrastructure or activities, the environmental team will investigate and determine a course of action to be taken to limit interaction and/or sensory disturbance with the animal(s) as described in the Impact Mitigation and Monitoring Plan.	X	-	-
336	Mitigation	Snowbanks will typically be < 1 m tall in designated areas to facilitate caribou and moose crossing roadways.	X	X	X
337	Mitigation	Visual surveys for wildlife (including moose and caribou) will be undertaken prior to blasting. Blasting will be delayed if moose or caribou are observed within 500 m of the blast site.	X	-	-
338	Mitigation	Dens/nests/lodges of Newfoundland marten, arctic hare or muskrat identified prior to construction will be flagged and appropriate buffers will be maintained around these features.	X	-	X
339	Mitigation	Any known hives of yellow-banded bumble bee will be flagged and appropriate avoidance buffers will be maintained.	X	-	X
340	Mitigation	Vegetation removal and herbicide application will be in accordance with relevant permit conditions and regulatory requirements, including prescribed timing windows.	X	-	X
341	Mitigation	Vegetation management activities will be conducted in accordance with the <i>Pesticide Control Regulations</i> under the Newfoundland and Labrador NL EPA and are subject to approval from NLDECC Pesticide Control Section.	-	X	-
342	Mitigation	Collisions, near misses or observations of mortalities on site roads and/or involving Project vehicles will be reported and adaptive management measures will be implemented should any locations of high-frequency interactions be identified.	X	X	X
343	Mitigation	Feeding, hunting or harassment of wildlife by on-site Project personnel will be prohibited.	X	X	X



Table 15.20 Mitigation Measures: Other Wildlife

ID #	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
344	Mitigation	Safe driving practices, including speed limits, will be implemented to avoid collisions with SAR and other wildlife.	X	X	X
* Note: "ID #" denotes the mitigation master identification number, Appendix 26-A. "C" denotes the construction phase of the Project. "O" denotes the operation and maintenance phase of the Project. "D" denotes the decommissioning and rehabilitation phase of the Project. "X" denotes the relevant Project phase to mitigation measure					

15.4.1 Application of the Precautionary Principle to Project Mitigation Measures

The mitigation measures in Section 15.4 have been selected in consideration of the environmental effects pathways and include standard proven mitigation measures for wildlife. The precautionary principle was used in determining mitigation measures for the Project. For example, although several of the assessed species in this VEC only occur in certain portions of the Project Area, mitigation measures assume that all species are present ubiquitously in suitable habitat across the landscape.

Because there is some uncertainty around the magnitude of effects on other wildlife, an adaptive management framework will be used, which allows for mitigation to be changed or strengthened if unexpected, or higher magnitude than expected, effects are observed.

As a result of using the precautionary principle, it is expected that the mitigation measures presented are more than adequate for reducing effects to acceptable levels that are below thresholds for what would be considered an unacceptable effect.



15.5 Residual Environmental Effects

15.5.1 Change in Habitat

15.5.1.1 Construction

Vegetation Clearing and Edge Effects

Most direct habitat loss for other wildlife will occur during the construction phase because of land clearing and land conversion. This will occur during the site preparation and civil works project activities. Vegetated habitat will be cleared for roads, transmission lines, turbine pads, the hydrogen / ammonia plant, and other Project infrastructure. The amount of the assessed habitat loss varies by species, ranging from a loss of 6.0% to 7.8% of high and moderate value habitat in the RAA. Note that this assessment is conservatively based on the area in the Project Area, which is larger than the actual amount of habitat that will be cleared for Project construction (i.e., within the Project Footprint). The highest amount of habitat loss relative to the availability in the RAA occurs for moose and arctic hare, with a loss of 7.8% for both species (Table 15.21). This is followed by caribou, with a loss of 7.4% of high and moderate valued habitat in the RAA, and marten, with a loss of 6.8% (Table 15.21). Approximately 0.8 km² of proposed critical habitat is included in the direct loss of 4.2 km² of high and moderate value habitat for marten. The remaining two species have an assessed loss of 6.6% and 6.0% of high and moderate value habitat in the RAA, for yellow-banded bumble bee and muskrat, respectively. Given that >90% of moderate and high ranked habitat for the assessed species will not be directly affected in the RAA, it is anticipated that wildlife will be able to move to other nearby areas of suitable habitat when habitat is lost.

Given that 98 to >99% of moderate and high ranked habitat for the focal species will not be directly affected in the RAA, it is anticipated that wildlife will be able to move to other nearby areas of suitable habitat when habitat is lost.

Vegetation clearing can result in habitat fragmentation, which can have particularly detrimental effects on species with large ranges, and those that require large patches of interior forest or other types of homogenous habitat. Habitat fragmentation can cause increased barriers to wildlife movement, which can reduce gene flow among populations (Bare et al. 2009). This may be particularly important for caribou, which have been observed avoiding linear features and other areas of resource development (e.g., well sites) (COSEWIC 2014, Dyer et al. 2001, Nagy 2011). Newfoundland marten may also be sensitive to habitat fragmentation and the creation of edge habitats. This species prefers mature forest and require forest habitats with horizontal and vertical structure (COSWEIC 2007). Marten, as well as other wildlife species, select habitats with shrub or tree cover for travel, as these habitats provide increased security cover from predators (including humans). In one study that involved radiotracking marten, it was found that patch size was a good predictor of marten occurrence, where larger patches were used more frequently than small patches (Chapin et al. 1998). This suggests that forest fragmentation could have adverse effects on marten if the remaining habitat patches are not large enough.



Table 15.21 Residual Project-Related Change in Habitat in the RAA for the Assessed Species

Species	Direct Habitat Loss (Project Footprint) (km ²)			Assessed Habitat Loss (Project Area) (km ²)			Availability in RAA (km ²)			Percent of High and Moderate Value Habitat Loss in the RAA ^{2,3} (Percent of Direct Loss) ⁴
	Habitat Value Ranking ¹									
	High	Moderate	Total	High	Moderate	Total	High	Moderate	Total	
Moose	19.6	16.0	35.6	126.8	115.4	242.2	1,866.6	1,237.6	3,104.1	7.8 (1.1)
Caribou⁵	15.6	12.3	28.0	105.0	87.8	192.8	1,363.4	1,225.1	2,588.5	7.4 (1.1)
Muskrat	3.3	0.9	4.2	27.2	5.6	32.8	468.7	80.9	549.6	6.0 (0.8)
Marten⁵	18.0	1.6	19.6	115.9	10.8	126.8	1,681.5	185.1	1,866.6	6.8 (1.0)
Arctic Hare⁵	5.0	19.6	24.6	38.8	126.8	165.6	253.2	1,866.6	2,119.8	7.8 (1.2)
Yellow-banded Bumble Bee⁵	19.7	2.6	22.3	127.3	22.4	149.7	1,908.8	345.6	2,254.5	6.6 (1.0)
Notes:										
1. Refer to Table 15.4 for habitat value rankings for assessed species of other wildlife										
2. RAA = Regional Assessment Area; excludes ocean in total										
3. Percent of high and moderate value habitat loss is calculated based on habitat in the Project Area relative to the availability in the RAA. This is the value used to assess the magnitude of effects on a change in habitat for other wildlife.										
4. Percent of high and moderate value habitat loss based on direct habitat loss in the Project footprint relative to the availability in the RAA										
5. Bold indicates a SAR or SOCC										



New edges will be created within the wind farms for access roads and transmission lines. However, most transmission lines outside of the wind farms follow existing transmission lines, which will reduce the amount of new edge created. The creation of the RoW for the new transmission lines will create a wider gap in vegetation cover which may alter or impede movement for species, such as marten, that avoid open areas due to increased predation risk (Moriarty et al. 2015). For marten, the proposed critical habitat overlaps approximately 11.4 km of transmission line, and approximately 0.8 km² of proposed critical habitat will be lost. One other study, involving hair snag (genetic) sampling of 40 marten occupying critical habitat overlapping the Labrador-Island Transmission link on the Northern Peninsula of Newfoundland, found that individuals that crossed the RoW before it was cleared continued to do so during and after clearing (Nalcor Energy 2017). At least four marten crossed the cleared RoW on one or more occasions, and 13 remained in the area despite ongoing clearing activities (Nalcor Energy 2017). As such, it is possible that marten will continue to use the transmission line habitat after it has been cleared.

Transmission line RoWs also have the potential to provide bee-friendly habitat when vegetation management activities allow for flower availability and provide potential nesting habitat (Russell et al. 2005).

Sensory Disturbance

Construction may result in indirect effects on wildlife habitat through sensory disturbance (e.g., noise, light pollution, vibrations, or visual effects). The magnitude of indirect effects on habitat are directly associated with the level of nearby Project activity, and primarily occur at habitat edges. Noise caused by construction may cause some wildlife to avoid the area or to alter their behaviour and may cause stress or other physiological effects (Shannon et al. 2016, Naguib 2013, Barber et al. 2010). Noise can also affect the ability of wildlife to communicate, which can interfere with finding mates (Naguib 2013). These effects are generally considered greatest if disturbance occurs during critical life stages, such as courtship or breeding. Noise is expected to affect all of the five mammal species being considered in this VEC.

Artificial light can result in a decrease in species richness. Prey species may avoid lit areas because of increased risks of predation (Willems et al. 2022). As such, artificial light used during the construction phase may result in a reduction of suitable habitat for some species.

Vegetation clearing and fragmentation creates habitat edges, and subsequently results in edge effects. Edge effects include changes in microclimate, light, vegetation structure, and change to wildlife behaviour and presence (Harper et al. 2005, Murcia 1995). Edge effects vary by species, and the greatest and most detrimental effects typically occur for species that prefer interior and mature forests as core habitat, including marten. These species may avoid edges. Other species, such as a moose, preferentially chose edge habitats. Edges provide high quality browse for moose, who may choose these areas for foraging year-round (Ardea Biological Consulting 2004).

Moose and caribou may change their movement patterns because of Project activities. Avoidance behaviours may result in a shift in home range (e.g., MacNearney et al. 2016), or a change in the timing and direction of migration (e.g., Mahoney and Schaefer 2002). Both moose and caribou move seasonally between different habitat types, and these movements may be affected by the Project. For moose, these



effects could occur anywhere within the Project Area, as moose occur throughout western Newfoundland. For caribou, the effects are likely restricted to the Stephenville area, where caribou are known to occur seasonally during winter.

While a fair amount of research has been conducted on caribou, marten, and moose, less is known about the effects of sensory disturbance on muskrat, Arctic hare, and yellow-banded bumble bee. It is anticipated that muskrat and arctic hare would be affected in the same way as other mammals, through avoidance or other behavioural changes. The effects of sensory disturbance on yellow-banded bumble bees are not well understood due to a lack of studies. It is expected that effects on the yellow-banded bumble bee will be restricted to the direct effects of land clearing and subsequent habitat loss.

Summary

The six assessed species of wildlife included in this VEC will experience direct habitat loss due to construction. All species, with the possible exception of yellow-banded bumble bee, are also expected to experience indirect effects, through disturbance caused by noise, light, or visual changes.

The residual effects of Project construction on habitat for other wildlife are expected to be adverse and low in magnitude for assessed non-SAR/SOCC (moose and muskrat) and moderate in magnitude for assessed SAR/SOCC (caribou, marten, arctic hare and yellow-banded bumble bee). Residual effects are predicted to be restricted to the LAA, occur in times of high sensitivity, be short-term, continuous, and reversible. A summary of residual effects on a change in habitat during the construction phase is provided in Table 15.22.

Table 15.22 Summary of Effects by Project Component During Construction

Project Site	Summary of Effect during Construction
Temporary Workforce Accommodations	Vegetation clearing for project infrastructure will result in a direct loss of habitat for other wildlife, where areas of suitable habitat occur. This includes approximately 0.8 km² of proposed marten critical habitat along the transmission line near Stephenville Crossing. Given that habitat loss accounts for ≤1.2 % of the RAA, species are expected to be able to move to other areas of suitable habitat. Vegetation clearing will also result in habitat fragmentation, which may cause barriers to animal movement and gene flow. Edge effects will occur, which will have negative effects on interior species (e.g., marten), but potentially positive effects on species that use edge habitats (e.g., moose). Construction will result in sensory disturbance, caused by noise, light or visual effects. This may result in behavioural changes, such as avoidance, for assessed species. Avoidance may result in changes in movement patterns or a shift in home range for moose or caribou. Residual effects on habitat described above have the potential to occur at these Project sites during construction. However, residual effects are limited to other wildlife species that occur (or are likely to occur) at the Project sites (Table 15.1). Moose and muskrat are likely to occur throughout the Project Area, caribou are expected near the transmission line during winter, arctic hare are presumed present in the Codroy wind farm area, and marten may occur in proposed critical habitat along the transmission line. The distribution of yellow-banded bumble bee is uncertain, but they have been confirmed in agricultural areas near the transmission line and within the RAA on the Port-au-Port peninsula.
Port au Port Wind Farm and Associated Infrastructure	
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	



Table 15.22 Summary of Effects by Project Component During Construction

Project Site	Summary of Effect during Construction
Hydrogen / Ammonia Production and Storage Facilities	Construction will result in sensory disturbance, caused by noise, light or visual effects. This may result in behavioural changes, such as avoidance, for assessed species that have the potential to occur near these facilities (i.e., moose, muskrat, and possibly yellow-banded bumble bee),
Port Facilities	No interaction was identified between other wildlife and the port facilities, as there is no apparent pathway between these activities and habitat for the assessed species.

15.5.1.2 Operation and Maintenance

Vegetation Clearing

Vegetation clearing and the direct loss of habitat will occur during the construction phase of the Project and therefore no additional direct loss of habitat is anticipated. However, RoW clearing of encroaching vegetation or the use of herbicides may affect the yellow-banded bumble bee.

During the operations and maintenance phase, maintenance measures will include vegetation clearing in collector and transmission line RoWs using hand clearing methods. When compared to routinely mowing RoWs, this method of vegetation management provides a better alternative for maintaining bee-friendly habitat (Russell et al. 2005). If used for vegetation management, herbicides can affect foraging availability of the yellow-banded bumble bee (Cullen et al. 2019). Vegetation management activities will be conducted in accordance with the *Pesticide Control Regulations* under the NL EPA and are subject to approval from the NLDECC Pollution Prevention Division.

Sensory Disturbance

Sensory disturbance from noise, light and activity in the Project Area will continue to affect mammal species in the LAA throughout the operations phase of the Project. As discussed in Section 15.5.1.1, wildlife may avoid Project activities, resulting in an indirect loss of suitable habitat. Activity along access roads and the use of heavy machinery is expected to be less during the operations and maintenance phase than during the construction phase. During this phase, disturbance related to the wind farms will be primarily visual and noise related.

Caribou may experience behavioural changes as a result of the visual effects of the wind turbines. Research has shown that caribou may shift their home range away from habitats where wind turbines are visible (Skarin et al. 2018). In addition, these effects were observed to be more adverse during the operations phase than during the construction phase, as caribou appeared to be more affected by the constant presence and noise of the wind turbines than they were by construction activities (Skarin et al. 2018). Caribou presence in the Project Area is expected to be limited to the Stephenville area, where they occur seasonally during winter. Turbines may not be visible from this area, as screening caused by vegetation and landforms would prevent many long-distance views or may result in seeing a small portion of the proposed turbines (Appendix 19A – Visual Impact Study). There is limited potential for caribou to



occur near the Codroy wind farm, and caribou do not occur on the Port au Port Peninsula. As such, the visual effects of wind turbines on caribou are expected to be low.

Although the effects of wind turbines on arctic hare are not fully understood, a study on European hare showed avoidance of wind farm interiors during operation. During a winter survey, a decrease in track density was observed with decreasing distance to wind turbines (Lopucki et al. 2017). Although the mechanism for this avoidance is not fully understood, it is hypothesized that it is related to noise. Hare are susceptible to noise disturbance, as they rely on hearing more than other sense to avoid predators and other dangers (Lopucki et al. 2017, Molinari-Jobin et al. 2004).

For moose, sensory effects during the operations phase are expected to be less than those during construction, as a result of decreased human activity and use of heavy machinery. Moose typically do not seem to avoid wind farms, and may use the new edge habitats and/or low traffic access roads (Helldin et al. 2012, Reksten 2016). Less is known about visual impacts of wind farms on muskrat and Newfoundland marten. Effects on these species are anticipated to be associated with changes in habitat and noise/light disturbance.

Summary

The residual effects of operations and maintenance on other wildlife are expected to be adverse in nature, low in magnitude, be restricted to the LAA, occur during times of high sensitivity, be long-term, continuous, and reversible. A summary of residual effects on a change in habitat during the operation and maintenance phase is provided in Table 15.23.

Table 15.23 Summary of Effects by Project Component During Operation and Maintenance

Project Site	Summary of Effect during Operation and Maintenance
Port au Port Wind Farm and Associated Infrastructure	Sensory disturbance through noise and light will may result in behavioural changes, such as avoidance, for all assessed species. Avoidance may result in changes in movement patterns or a shift in home range for moose or caribou.
Codroy Wind Farm and Associated Infrastructure	Caribou may avoid wind farms as a result of visual effects; however, they are not expected to regularly be in areas within sight of either wind farm. Arctic hare may also avoid wind farms due to increased predation risk. Moose typically do not seem to avoid wind farms. Residual effects are limited to other wildlife species that occur (or are likely to occur) at the wind farms (Table 15.1), including moose, muskrat, and arctic hare. The distribution of yellow-banded bumble bee is uncertain in the Project Area.
230 kV Transmission Lines and Substations	RoW maintenance may affect foraging availability of the yellow-banded bumble bee.
Hydrogen / Ammonia Production and Storage Facilities	Sensory disturbance through noise and light may result in behavioural changes, such as avoidance, for all assessed species. Avoidance may result in changes in movement patterns or a shift in home range for moose. Residual effects are limited to other wildlife species that occur (or likely to occur) near the facilities (Table 15.1), including moose, muskrat, and possibly yellow-banded bumble bee.
Port Facilities	No interaction was identified between other wildlife and the port facilities, as there is no apparent pathway between these activities and habitat for the assessed species.



15.5.1.3 Decommissioning and Rehabilitation

Sensory disturbance will continue through the decommissioning and rehabilitation phase. Noise and light will be generated by decommissioning and rehabilitation activities. These activities will involve the use of heavy machinery and may result in a temporary increase in noise.

Habitat rehabilitation will have effects on wildlife in the area that will differ by species. Species that have gained habitat from the construction phase (e.g., moose), may lose this habitat during rehabilitation, as edge habitats regenerate and forests are restored. For species that rely on interior habitat (e.g., marten), these changes will be positive in nature. The restoration of mature interior habitat will be slow and take decades after the Project has been decommissioned. Potential visual effects of the wind turbines will be eliminated during this phase.

Summary

The residual effects of decommissioning and rehabilitation on other wildlife are expected to be generally adverse in nature, although there will be some changes that are positive in comparison to the operational conditions. Following decommissioning and rehabilitation, the site is expected to gradually progress from open habitat to forested habitat, reversing habitat loss for some species. Residual effects are expected to be low in magnitude, be restricted to the LAA, occur during times of high sensitivity, be short-term, continuous, and reversible. A summary of residual effects on a change in habitat during the decommissioning and rehabilitation phase is provided in Table 15.24.

Table 15.24 Summary of Effects by Project Component During Decommissioning and Rehabilitation

Project Site	Summary of Effect during Decommissioning and Rehabilitation
Temporary Workforce Accommodations	Sensory disturbance will continue through the decommissioning and rehabilitation phase.
Port au Port Wind Farm and Associated Infrastructure	Habitat rehabilitation will have both positive and adverse effects, which vary by species. Effects will be positive for interior species (e.g., marten) when open and edge habitats regenerate. These effects may be negative for species that prefer edge habitats. Residual effects on habitat described above have the potential to occur at these Project sites during decommissioning and rehabilitation. However, residual effects are limited to other wildlife species that occur (or are likely to occur) at the Project sites (Table 15.1). Moose and muskrat are likely to occur throughout the Project Area, caribou are expected near the transmission line during winter, arctic hare are presumed present in the Codroy wind farm area, and marten may occur in proposed critical habitat along the transmission line. The distribution of yellow-banded bumble bee is uncertain, but they have been confirmed in agricultural areas near the transmission line and in the RAA on the Port-au-Port peninsula.
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	No interaction was identified between other wildlife and the port facilities, as there is no apparent pathway between these activities and habitat for the assessed species.



15.5.2 Change in Mortality

15.5.2.1 Construction

Site Preparation and Civil Works

Site preparation activities have the potential to result in the direct mortality of other wildlife, particularly of young or non-mobile animals and species that use underground nests or dens such as yellow-banded bumble bee and marten. However, the risk of direct mortality from site preparation is expected to be low for the assessed species given a limited range overlap with Project features or restricted distribution in the Project footprint (i.e., caribou during winter, marten, arctic hare, and yellow-banded bumble bee), a low potential for preferred habitats to be cleared during site preparation (i.e., open water habitat for muskrat) and/or the mobility and size of the assessed species (i.e., moose and caribou are highly visible compared to other species and are likely to avoid the area due to ongoing sensory disturbance from site preparation activities). If vegetation clearing occurs outside of the general nesting period for migratory birds, this will further reduce the risk of mortality for species with the potential to den or nest (i.e., marten, muskrat, arctic hare, and yellow-banded bumble bee), or calve (i.e., moose and caribou). within the Project Area during that period.

Vehicular Collisions

The most likely Project-related effect on direct mortality is through collisions with vehicles and machinery. Traffic volumes are expected to be highest during the construction phase, when Project components and equipment are being transported into the Project Area. It is expected that the turbine installation will generate the highest traffic volumes which mainly include turbine component delivery trips, construction material (e.g., concrete) delivery trips, and trips generated by construction staff and other personnel. The risk of direct mortality from Project-related vehicular traffic is expected to be greatest for moose, which are expected throughout the Project Area and frequently occur on roads. Species that can be difficult for drivers to see, such as nocturnal marten and yellow-banded bumble bee, are also susceptible to direct mortality caused by vehicles and machinery. WEGH2 has prepared a Traffic Management Plan (Appendix 2-F) for project-related vehicular traffic that includes safe driving measures (e.g., speed limits) that will be implemented and help avoid collisions with SAR and other wildlife. Collisions, near misses or observations of mortalities on site roads and/or involving Project vehicles will be tracked and reported as outlined in the Environmental Protection Plan and adaptive management measures implemented should locations of high frequency interactions be identified. Details will be determined through the Environmental Protection Plan and follow-up monitoring plans.

Human-Wildlife Conflicts

An increase in human presence during the construction phase may result in increased human-wildlife conflicts. Human-wildlife conflicts can result if wastes are improperly disposed of or if pets (i.e., dogs) are brought on site, which can attract potential predators (e.g., American black bear) and result in unintended injury or mortality. Project staff and contractors will adhere to the waste management procedures to be included in the EPP and the Waste Management Plan. Measures include the secure storage of wastes on



site and their frequent removal, to avoid attracting wildlife, until being properly disposed of in an environmentally acceptable manner at an approved site. Project staff and contactors will be prohibited from bringing pets on site.

Sensory Disturbance

Sensory disturbance (e.g., noise, light, human presence) will be generated from construction activities throughout the Project Area, and are the same as discussed above for a change in habitat. Avoidance behaviours can have adverse effects on wildlife if they shift into areas with reduced availability of preferred forage and/or increased risk of predation, which could affect survival or reproductive rates. Sensory disturbance also has the potential to affect stress levels, with potential implications for mortality. For example, studies have found evidence of increased stress hormones in caribou exposed to anthropogenic disturbance (Freeman 2008, Wasser et al. 2011, Renaud 2012, Ewacha et al. 2017, Plante et al. 2020). Increased stress levels have been linked to reduced body condition and reproductive rates and increased susceptibility to parasites and disease, with potential adverse effects on survival (Hughes et al. 2009, Escribano-Avila et al. 2013, Hing et al. 2016).

Summary

Based on the information above, the effects of the Project construction on other wildlife mortality are expected to be positive or adverse, low in magnitude, and restricted to the Project Area, but may occur in times of high sensitivity. Residual effects on a change in mortality are predicted to be short term in duration, to occur irregularly, and will be reversible. A summary of residual effects on mortality during the construction phase is provided in Table 15.25.

Table 15.25 Summary of Effects by Project Component During Construction

Project Site	Summary of Effect during Construction
Temporary Workforce Accommodations	There is a low risk of mortality during site preparation activities for young animals or species that nest or den on or below ground. There is also a low risk of mortality from vehicle collisions. Human-wildlife conflicts can result if wastes are improperly disposed of or if pets are brought on site, which can attract potential predators and result in unintended injury or mortality. Sensory disturbance (e.g., noise, light, human presence) from Project activities may cause avoidance of the Project Area and potentially shift wildlife into less suitable areas where they may be subject to increased predation or reduced forage availability. Residual effects on habitat described above have the potential to occur at wind farms and along the transmission line during construction. However, residual effects are limited to other wildlife species that occur (or are likely to occur) at the Project sites (Table 15.1). Moose and muskrat are likely to occur throughout the Project Area, caribou are expected near the transmission line during winter, arctic hare are presumed present in the Codroy wind farm area, and marten may occur in proposed critical habitat along the transmission line. The distribution of yellow-banded bumble bee is uncertain, but they have been confirmed in agricultural areas near the transmission line and in the RAA on the Port-au-Port peninsula.
Port au Port Wind Farm and Associated Infrastructure	
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	



Table 15.25 Summary of Effects by Project Component During Construction

Project Site	Summary of Effect during Construction
Hydrogen / Ammonia Production and Storage Facilities	Human-wildlife conflicts can result if wastes are improperly disposed of or if pets are brought on site, which can attract potential predators and result in unintended injury or mortality. Sensory disturbance (e.g., noise, light, human presence) from Project activities may cause avoidance of these facilities and potentially shift wildlife into less suitable areas where they may be subject to increased predation or reduced forage availability. Residual effects are limited to other wildlife species that occur (or likely to occur) near these facilities (Table 15.1), including moose, muskrat and possibly yellow-banded bumble bee.
Port Facilities	No interaction was identified between other wildlife and the port facilities, as there is no apparent pathway between these activities and mortality of the assessed species.

15.5.2.2 Operation and Maintenance

Vehicle Collisions

Direct effects on mortality during the operation phase will be the same as during construction in terms of Project-vehicle collisions. However, the risk of vehicle collisions is expected to be low relative to the construction phase, as it is expected that Project-related traffic will be limited to a few weekly maintenance and site visit trips after sites become fully operational.

The presence of new access roads and RoWs also has the potential to increase the volume of off-highway vehicles (e.g., snowmobiles and ATVs) in some areas, leading to increased collision or injury risk.

Herbicide Use

There is also a low potential of direct mortality from vegetation management if herbicides are used in nesting areas of yellow-banded bumble bees, as some types of herbicides may have lethal effects on bees or increase their susceptibility to infections (ECCC 2022). Bees may be exposed to these substances orally through contaminated nectar and pollen or directly through contact exposure during or after application (Cullen et al. 2019). Herbicide use may also affect factors such as bee navigation, learning, and larval development (Balbuena et al. 2015, Dai et al. 2018, Mengoni Goñalons and Farina 2018). Vegetation removal and herbicide application will be conducted in accordance with relevant permit conditions and regulatory requirements, including prescribed timing windows.

Predation and Harvest Pressure

The creation of access roads and RoWs can have indirect effects on the mortality of other wildlife through increased access, with implications on predator-prey dynamics and harvest pressure (e.g., Johnson et al. 2019). Approximately 197 km of new access roads will be required within the boundaries of the Port au Port wind farm site and approximately 151.5 km within the boundaries of the Codroy wind farm site (Chapter 2 - Table 2.2). In addition, approximately 37.4 km of upgraded access roads will be required to



connect the wind farm sites to local highways. The Port au Port and Codroy wind farms will be connected to the terminal station via 230 kV transmission lines, with a combined total length of approximately 145 km; however, the amount of increased access along the transmission line will be relatively low given the proximity of the RoW to existing linear features (transmission lines and roads, including the TCH).

The alteration of habitats has the potential to alter predator-prey dynamics. The creation of regenerating habitat along RoWs may increase moose abundance, as areas of forest regrowth provide attractive habitat for moose (GovNL 2022a). The presence of moose could result in an increase in predators such as black bear, coyote, and red fox, which are also known predators of other wildlife species including muskrat (while traveling on land), caribou, and arctic hare (Banfield 1974, Hearn et al., 1987, GovNL 2015, Rayl 2012, Mumma 2014). Predators such as coyote and red fox could benefit from linear features through improved lines-of-sight (and potential increased hunting efficiency) as well as reduced energetic costs for travel in otherwise deep snow conditions.

Moose, caribou, and muskrat are hunted and trapped on the Island of Newfoundland (GovNL 2022b), and while trapping or hunting of marten and arctic hare are prohibited, there is potential for non-targeted mortality during legal trapping of other species (Environment Canada 2013, SSAC 2012). For species such as moose and caribou, where the number of licences issued is allocated annually by the NLDDFA – WD the Project will not change the amount of legal hunting. However, linear features could open up lines-of-sight for hunters.

Sensory Disturbance

Potential indirect effects on other wildlife mortality from sensory disturbance (e.g., noise, light, human presence) during the operation phase will be the same as during construction. Avoidance of the Project Area due to sensory disturbance can have adverse effects on wildlife if they shift into areas with reduced availability of preferred forage and/or increased risk of predation, which could affect survival or reproductive rates. Sensory disturbance also has the potential to affect stress levels, with potential implications for mortality.

Increased recreational off-highway vehicle activity along linear features also has the potential to affect daily energetic balances for species such as caribou (GovNL 2015) and arctic hare (SSAC 2012) if these activities cause avoidance of the Project Area or displace them from traditional wintering habitats.

Summary

Based on the information above, the effects of the Project during operation and maintenance on other wildlife mortality is expected to be adverse, low in magnitude, and restricted to the Project Area. Residual effects on a change in mortality may occur in times of high sensitivity, will be long-term in duration, occur irregularly, and will be reversible. A summary of residual effects on mortality during the operation and maintenance phase is provided in Table 15.26.



Table 15.26 Summary of Effects by Project Component During Operation and Maintenance

Project Component	Summary of Effect during Operation and Maintenance
Port au Port Wind Farm and Associated Infrastructure	Human-wildlife conflicts can result if wastes are improperly disposed of or if pets are brought on site, which can attract potential predators and result in unintended injury or mortality. There is a low potential of direct mortality of yellow-banded bumble bees if herbicides are used for vegetation management.
Codroy Wind Farm and Associated Infrastructure	Residual effects are limited to other wildlife species that occur (or are likely to occur) near these sites (Table 15.1), including moose, muskrat, arctic hare, and possibly yellow-banded bumble bee.
230 kV Transmission Lines and Substations	The presence of new linear features (access roads and transmission line RoWs) can have indirect effects on mortality through increased predation and harvest pressure. Sensory disturbance (e.g., noise, light, human presence) from Project activities and from increased recreational use of linear features may cause avoidance of the Project Area and potentially shift wildlife into less suitable areas where they may be subject to increased predation or reduced forage availability. There is a low potential of direct mortality of yellow-banded bumble bees if herbicides are used for vegetation management. There is also a low risk of direct mortality from vehicle collisions during regular maintenance activities. Residual effects are limited to other wildlife species that occur (or are likely to occur) along the RoW (Table 15.1), including moose, marten, muskrat, and yellow-banded bumble bee.
Hydrogen / Ammonia Production and Storage Facilities	Human-wildlife conflicts can result if wastes are improperly disposed of or if pets are brought on site, which can attract potential predators and result in unintended injury or mortality. Residual effects are limited to other wildlife species that occur (or are likely to occur) near these facilities (Table 15.1), including moose, muskrat and possibly yellow-banded bumble bee.
Port Facilities	No interaction was identified between other wildlife and the port facilities, as there is no apparent pathway between these activities and mortality of the assessed species.

15.5.2.3 Decommissioning and Rehabilitation

The risk of vehicle collisions during decommissioning and rehabilitation would be similar as during construction but will occur over a shorter duration and reduced scope. Project-related activities during this phase are not expected to further affect mortality through increased predation or hunting.

Summary

Based on the information above, the effects of the Project during decommissioning and rehabilitation on other wildlife mortality is expected to be adverse, low in magnitude, restricted to the Project Area, have the potential to occur in times of high sensitivity, be short-term in duration, occur irregularly, and are reversible. A summary of residual effects on mortality during the decommissioning and rehabilitation phase is provided in Table 15.27.



Table 15.27 Summary of Effects by Project Component During Decommissioning and Rehabilitation

Project Component	Summary of Effect during Decommissioning and Rehabilitation
Temporary Workforce Accommodations	There is a low risk of direct mortality from vehicle collisions during the removal and rehabilitation of Project infrastructure. Human-wildlife conflicts can result if wastes are improperly disposed of or if pets are brought on site, which can attract potential predators and result in unintended injury or mortality. Residual effects on habitat described above have the potential to occur at wind farms and along the transmission line during decommissioning and rehabilitation. However, residual effects are limited to other wildlife species that occur (or are likely to occur) at the Project sites (Table 15.1). Moose and muskrat are likely to occur throughout the Project Area, caribou are expected near the transmission line during winter, arctic hare are presumed present in the Codroy wind farm area, and marten may occur in proposed critical habitat along the transmission line. The distribution of yellow-banded bumble bee is uncertain, but they have been confirmed in agricultural areas near the transmission line and in the RAA on the Port-au-Port peninsula.
Port au Port Wind Farm and Associated Infrastructure	
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	No interaction was identified between other wildlife and the port facilities, as there is no apparent pathway between these activities and mortality of the assessed species.
Port Facilities	

15.5.3 Residual Environmental Effects Summary

15.5.3.1 Residual Environmental Effects Characterization

Table 15.28 summarizes the predicted environmental effects (residual effects) of the undertaking on other wildlife. Overall, residual effects of the Project on the assessed species are predicted to be adverse (with the exception of some positive effects during rehabilitation) for all assessed species. Residual effects are assessed as low in magnitude for moose and muskrat, given that less than 10% of habitat in the RAA is lost, and a measurable change in mortality in the LAA is not anticipated, although individuals may be affected. For the four assessed SAR/SOCC (i.e., caribou, marten, arctic hare, and yellow-banded bumble bee), residual effects are assessed as moderate in magnitude, based on the conservative assessed loss of between 6.6% and 7.8% of moderate and high value habitat in the RAA. However, the actual loss of habitat due to vegetation clearing will be much less than the assessed loss (less than 5% relative to the availability in the RAA for all assessed SAR/SOCC). Further, aside from yellow-banded bumble bee (SAR) whose distribution on the Island of Newfoundland is uncertain, seasonal ranges of caribou (SAR), marten (SAR) and arctic hare (SOCC) are expected to have a limited overlap with the Project Area (whereas the assessment of change in habitat and mortality conservatively assumes they occur in all areas of suitable habitat). Although some individual SAR/SOCC may be affected, a measurable change in the mortality of SAR/SOCC in the LAA is not anticipated.

Residual effects are anticipated to be limited to the LAA for a change in habitat and to the Project Area for a change in mortality, and range in duration from short- to long-term. During all Project phases, effects may occur during periods of high sensitivity, as Project activities will occur year-round. Residual effects on habitat will generally occur continuously and be reversible although the restoration of some habitats (e.g., mature interior forests) is expected to take decades after the Project has been decommissioned. Residual



effects on mortality will generally occur irregularly and be reversible following decommissioning and rehabilitation. Residual effects on other wildlife will occur in areas that range from primarily undisturbed (i.e., at the wind farm sites) to previously disturbed (i.e., at the sites of the hydrogen / ammonia production, storage, and transportation facilities and marine port facilities).

Table 15.28 Summary of Predicted Environmental Effects of the Undertaking on Other Wildlife

Residual Effect	Residual Effects Characterization							
	Nature	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological and Socio-economic Context
Construction								
Change in Habitat	A	L-M	LAA	HS	ST	C	R	U/D
Change in Mortality	A	L	PA	HS	ST	IR	R	U/D
Operation and Maintenance								
Change in Habitat	A	L	LAA	HS	LT	C	R	U/D
Change in Mortality	A	L	PA	HS	LT	IR	R	U/D
Decommissioning and Rehabilitation								
Change in Habitat	A	L	LAA	HS	ST	C	R	U/D
Change in Mortality	A	L	PA	HS	ST	IR	R	U/D
KEY: Nature: P: Positive A: Adverse N: Neutral Magnitude: N: Negligible L: Low M: Moderate H: High Geographic Extent: PA: Project Area LAA: Local Assessment Area RAA: Regional Assessment Area Duration: ST: Short-term MT: Medium-term LT: Long-term Timing: NS: No Sensitivity MS: Moderate Sensitivity HS: High Sensitivity Frequency: S: Single Event IR: Irregular Event R: Regular Event C: Continuous Reversibility: R: Reversible I: Irreversible Ecological / Socio-Economic Context: D: Disturbed U: Undisturbed								



15.5.3.2 Summary of Predicted Environmental Effects

With mitigation, the Project is anticipated to result in primarily adverse effects to change in habitat during all phases. Moose, caribou, muskrat, Newfoundland marten, arctic hare and yellow-banded bumble bee will all lose some suitable habitat in the LAA during vegetation clearing. There is also potential for some positive effects during construction and decommissioning, where habitat is converted to a more favorable land cover, depending on the species. For example, moose may use edge habitats for foraging. Other wildlife may also be affected by sensory disturbance as a result of noise, light, and visual effects of the Project. Sensory disturbance may result in avoidance of some areas, or changes in home ranges or movement patterns. These changes in habitat are anticipated to be low in magnitude. During all Project phases, effects may occur during periods of high sensitivity, as Project activities will occur year-round. In the construction and decommissioning and rehabilitation phases, effects are expected to be short-term. However, effects will be long-term during the operation and maintenance phase, as they will occur throughout the 30-year timeframe of that phase. Effects are anticipated to be continuous, but be reversible after the lifespan of the Project has been completed.

With mitigation, the Project is anticipated to result in adverse changes to mortality. There is a low risk of direct mortality from site preparation activities for young animals or species that nest or den on or below ground (e.g., marten, yellow-banded bumble bee), and a low risk from Project-related vehicle collisions. The risk of direct mortality from collisions, while anticipated to be low, will be greatest during the construction phase when Project-related traffic activity is anticipated to be greatest. There is also a low potential of direct mortality of yellow-banded bumble bees if herbicides are used for vegetation management during the operations and maintenance phase. Indirect residual effects on the mortality of other wildlife include increased predation and harvest pressure, human-wildlife conflicts, and sensory disturbance (avoidance behaviours). The creation of new linear features (access roads and RoWs) can provide efficient travel corridors for predators, can attract moose which may in turn attract more predators, and provide increased access to hunters and trappers. Residual effects on predation and harvest pressure are anticipated to occur following road and RoW construction and will extend through operation and maintenance. Sensory disturbance from Project activities and along linear features may cause avoidance of the Project Area and potentially shift wildlife into less suitable areas where they may be subject to increased predation or reduced forage availability. The improper disposal of wastes or presence of pets on site can attract potential predators and could result in unintended injury or mortality of other wildlife. Residual effects from sensory disturbance and human-wildlife conflicts have the potential to occur during all Project phases. In the construction and decommissioning and rehabilitation phases, effects on mortality are expected to be short-term. However, effects will be long-term during the operation and maintenance phase, as they will occur throughout the 30-year timeframe of that phase. Effects are anticipated to be irregular and be reversible after the lifespan of the Project has been completed.

Prior to the Project, the ecological and socio-economic context is disturbed in some areas (e.g., the more populated portions of Port au Port Peninsula), and undisturbed in other areas (e.g., the Anguille Mountains).



The effects on caribou are expected to be restricted to the Stephenville area (winter only), as this is the only portion of the Project Area known to be used by caribou (Section 15.2.2.3). Similarly, the effects on arctic hare are likely restrict to the portion of the LAA near the Codroy wind farm, and potentially near Stephenville. The effects on marten are expected to be restricted to the Port au Port East wind farm and the Codroy wind farm. The ranges of muskrat, moose, and yellow-banded bumble bee, and associated effects, are expected to be more widespread.

15.6 Determination of Significance

In consideration of the VEC-specific significance criteria defined above, the residual effect(s) of routine Project activities on other wildlife (i.e., change in habitat and change in mortality) are predicted to be not significant. Suitable habitat for other wildlife that will be lost due to Project construction, including some SAR/SOCC and proposed critical habitat for marten, is relatively low compared the availability in the RAA and effects are not expected to jeopardize the sustainability of individual populations. There is also a low risk of increased mortality from wildlife-vehicle collisions or changes in predation and hunting pressure. Therefore, the Project is not expected to threaten the long-term persistence, viability, or recovery of other wildlife in the RAA. In addition, the Project is not expected to have effects that, following the application of avoidance and mitigation measures, cause or further contribute to the exceedance of a conservation-based threshold or threaten the long-term persistence or viability of species of management concern, or species of cultural or traditional importance. The level of confidence in this prediction is discussed in Section 15.7.

15.7 Prediction Confidence

The level of confidence in the predictions for Project-related residual effects on other wildlife is moderate. The predictions are based on information collected as part of desktop data compilation, an understanding of existing conditions, GIS data analyses, understanding of Project activities, baseline surveys in the area, the known effectiveness of mitigation measures, and experience of the assessment team. The level of confidence for the prediction is moderate (and not high) because habitat use in the Project Area is not fully understood for some other wildlife. For example, the distribution of arctic hare, muskrat and yellow-banded bumble bee in the Project Area and LAA is unconfirmed. However, a conservative approach was employed to identify suitable habitat for the assessed species of other wildlife and to predict habitat loss, and this compensates for some uncertainty, as not all assessed species are expected to occur in suitable habitat where it exists in the Project Area. Habitat occurrence and loss was mapped using available GIS data, which allowed for a detailed quantitative analysis. Mitigation measures identified in Section 15.4 are standard practice and have been implemented for other projects and demonstrated to be effective.



15.8 Follow-Up and Monitoring

Additional surveys will be conducted for arctic hare, muskrat, moose, and caribou. Baseline surveys for arctic hare and muskrat have not yet been conducted, but as allowed by the EIS Guidelines, surveys for these species will be conducted in the Project Area and LAA prior to construction.

The objective of the arctic hare survey is to determine presence/absence in areas where historical distribution overlaps the Codroy wind farm Project area (i.e., Anguille and Long Range Mountains) (SSAC 2012, Mercer et al. 1981), following the general approach provided by NLDDFA – WD. The survey is proposed for late April/early May 2024, during the snow-free season to minimize any detection bias associated with snow cover. The survey will be completed using land cover types to stratify survey effort focusing on areas of suitable habitat including upland barren lands (exposed ground) and coniferous scrub habitats that overlap the Project. A time-constrained search will be used to search for arctic hare activity signs withing sampling grids, including pellets, tracks, active runways and trails in suitable habitat such as small, exposed hilltops/knobs and boulder outcrops. The presence of arctic hare pellets will be differentiated from snowshoe hare based on size (i.e., arctic hare pellets are relatively larger).

The goal of the muskrat survey is to assess the current distribution (presence/non-detection) and relative abundance of muskrat in the Project Area. The muskrat survey will follow the provincial muskrat survey protocol for the Island of Newfoundland (NLDDFA 2019). A subset of potential muskrat habitat, mapped as permanent wetlands and watercourses, within the Project Area will be surveyed for muskrat, prioritizing locations with current or historic muskrat sites as identified by trappers, NLDDFA, and local knowledge. Surveys will be completed in fall between September 1 and November 1, 2023, when population levels are at their highest and there is the greatest likelihood of detecting fresh muskrat sign (e.g., food caches, clippings, burrows, trails, feed beds, houses, tracks, and scat). Where possible, recent muskrat sign (indicative of present occupation) will be distinguished from old muskrat sign (indicative of past occupation).

Additional moose and caribou surveys are proposed for winter 2024 to gather additional baseline (pre-construction) information related to moose abundance and caribou presence/absence in the Project Area. Surveys will follow provincial survey protocols (Government NL 2022) used during initial surveys in winter 2023, as described in the Terrestrial Baseline Study (Appendix BSA 3).

World Energy will continue to consult with NLDDFA – WD in planning and conducting these surveys, as well as additional surveys that may become a requirement through the consultation process.



15.9 Capacity of Renewable Resources and Effects on Biological Diversity

The potential environmental effects of the Project on other wildlife were thoroughly assessed. The assessment concluded that routine Project activities are not likely to result in significant residual adverse effects on other wildlife. Therefore, adverse Project-related effects on the capacity of renewable resources to meet the needs of the present and those of the future are not anticipated with respect to other wildlife. Similarly, adverse Project-related effects on biological diversity that exceed the limits of natural variability or affect the long-term viability of biological diversity in the RAA are not anticipated with respect to other wildlife.

15.10 Predicted Future Environmental Conditions if the Project Does Not Proceed

If the Project is not allowed to proceed, the existing conditions as described in the baseline section will continue to prevail, including current land use and natural conditions. It is possible that future development may occur in the area, including wind energy (given those Project areas are designated by the Province of NL for wind farm development), but neither the likelihood nor extent of such development can be reasonably predicted at this time based on currently known information. Future projects are anticipated to have similar effects on other wildlife. Should the Project Area remain undeveloped, the predicted future condition of the acoustic environment would be relatively unchanged from what was documented during the existing environment assessment presented in Section 15.2.

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15.11.2 Personal Communication

2023. Garland, S. E Ecosystem Management Ecologist, Endangered Species, Newfoundland and Labrador Department of Fisheries, Forestry and Agriculture – Wildlife Division. Email with Senior Environmental Scientist, Stantec Consulting Ltd., Dartmouth, NS, April 11, 2023.



16.0 Areas of Conservation Concern

This chapter assesses the potential environmental effects of routine Project activities on Areas of Conservation Concern (AoCC); cumulative environmental effects are assessed separately in Chapter 24. Environmental effects of potential Project-related accidents and malfunctions are assessed separately in Chapter 25.

16.1 Scope of Assessment

A number of terrestrial and marine areas in Newfoundland and Labrador (NL) are protected under federal, provincial, international and/or other legislation or agreements due to their ecological characteristics and importance. AoCC have been included as a valued environmental component (VEC) because they provide ecological, cultural, recreational, and economic value to stakeholders including the public, Indigenous groups, local businesses, and government agencies. As AoCC are valued by stakeholders, it is important to maintain their integrity to the extent possible within the region. AoCC occur within the Project Area as well as in the marine and terrestrial environments surrounding the Project Area (i.e., Local Assessment Area / Regional Assessment Area [LAA / RAA]) and may be affected by planned Project activities. Some AoCC are protected by federal and provincial legislation, with the scope of the assessment being guided by the Provincial Environmental Impact Statement (EIS) Guidelines (Table E.1), as well as applicable legislation, policies, and guidance protecting AoCC in Canada and NL. The EIS guidelines for this Project required a description of terrestrial environments within the study area of the VECs selected that include: designated critical habitat under the NL *Endangered Species Act* and federal *Species at Risk Act*; environmentally sensitive areas such as national, provincial, and regional parks and reserves; ecologically and biologically significant areas (EBSA); protected areas; conservation agreement lands and habitat enhancement projects.

AoCC can be affected by Project-related changes to vegetation and wetlands, air or water quality, through Project-related land clearing, and sensory disturbance (e.g., noise, dust). The AoCC VEC is also inherently linked to Project-related changes described in the other following VECs:

- Atmospheric Environment (Chapter 6)
- Acoustic Environment (Chapter 7)
- Groundwater (Chapter 8) and Surface Water (Chapter 9)
- Freshwater Fish and Fish Habitat (Chapter 10)
- Marine Environment (Chapter 11)
- Wetlands and Vegetation, including Rare Plants (Chapter 12)
- Avifauna (Chapter 13)
- Bats (Chapter 14)
- Other Wildlife (Chapter 15)



- Land and Resource Use (Chapter 20)
- Heritage and Cultural Resources (Chapter 22)

16.1.1 Regulatory and Policy Setting

AoCC include protected areas designated under Canadian or provincial legislation (Table 16.1), and other special or sensitive areas that are designated federally or provincially but not protected by legislation.

Table 16.1 Federal and Provincial Legislation Applicable to Areas of Conservation Concern

Legislation	Purpose
Federal	
<i>Fisheries Act</i>	Enabling Act for Fisheries Closure Areas and Marine Refuges by Fisheries and Oceans Canada (DFO)
<i>Canada Wildlife Act</i>	Allows for the creation, management and protection of wildlife areas for wildlife research activities, or for conservation or interpretation of wildlife
<i>Oceans Act</i>	Enabling Act for Marine Protected Areas by DFO
<i>Canada National Marine Conservation Areas Act</i>	Enabling Act for National Marine Conservation Areas by Parks Canada
<i>Migratory Birds Convention Act (MBCA) and Regulations</i>	Protect and conserve migratory bird populations and individuals, as well as enabling creation of Migratory Bird Sanctuaries
<i>Species at Risk Act (SARA)</i>	Enabling Act for designating and protected critical habitat for SAR
Provincial	
<i>Provincial Parks Act</i>	Provincial Parks (Parks Division, NL Department of Tourism, Culture, Arts and Recreation)
<i>Endangered Species Act (NL ESA) and Endangered Species Regulations</i>	Established to oversee the protection of endangered species in the province
<i>Wild Life Act and Wild Life Act Regulations</i>	Oversee the management and protection of wildlife in the province
<i>Wilderness and Ecological Reserves (WER) Act</i>	Established to designate wilderness and ecological reserves
<i>Wilderness Reserve Regulations under the WER Act</i>	Established to protect a wilderness reserve set aside under the Act
<i>Botanical Ecological Reserve Regulations under the WER Act</i>	Protect botanical ecological reserves set aside under the Act
<i>Seabird Ecological Reserve Regulations under the WER Act</i>	Protect seabird ecological reserves set aside under the Act
<i>Little Grand Lake Provisional Ecological Reserve Regulations and Little Grand Lake Provisional Ecological Reserve Order under the WER Act</i>	Protect representative portions of three ecodistricts contributing to the Natural Areas Systems Plan and protecting the habitat of the Newfoundland marten
<i>Little Grand Lake Wildlife Reserve Regulations under the WER Act</i>	Established to protect the Newfoundland marten
<i>Forestry Act</i>	Oversee the management, protection, and use of the forest resources of the province



The province of NL subscribes to the World Conservation Union's definition of a protected area: *An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.* The province manages 53 protected areas. (NL Department of Environment and Climate Change [NLDECC] n.d.[a]). The protected areas that intersect the AoCC LAA / RAA are described in Sections 16.2.2 to 16.2.4. The four national parks in the province are managed by the federal government and occur outside the LAA / RAA. In addition to protected areas, other AoCC occurring within the LAA / RAA include proposed provincial reserves, private reserves, proposed critical habitat for species at risk (SAR), Sensitive Wildlife Areas for rare plants, Important Bird Areas (IBAs), Community Nominated Priority Areas, and salmon rivers.

Federal Legislation

The federal *Fisheries Act* is the primary legislation protecting fish and fish habitat and provides a legal basis for conserving and protecting fish and fish habitat in Canada. Marine conservation areas are also designated by Fisheries and Oceans Canada (DFO) under the *Oceans Act* and by Parks Canada under the *Canada National Marine Conservation Areas Act*.

The *Migratory Birds Convention Act, 1994* (MBCA) provides protection and conservation to migratory bird populations, individuals, and their nests within Canada. Most bird species in Canada are afforded protection, except for specific species and species groups (e.g., cormorants, pelicans, grouse, quail, pheasants, ptarmigan, hawks, owls, eagles, falcons, kingfishers, and corvids). The MBCA is the enabling statute for the *Migratory Birds Regulations*, which were updated in May 2022 (*Migratory Birds Regulations, 2022*). Section 6 of this regulation states that without the authorization of a permit, the disturbance, destruction, or taking of a nest, egg, nest shelter, eider duck shelter, or duck box of a migratory bird, or possession of a migratory bird, carcass, skin, nest, or egg of a migratory bird are prohibited. Under the *Migratory Birds Regulations, 2022*, nests for 18 specific bird species receive year-round protection for a prescribed length of time ranging from 24 to 36 months (Schedule 1 of the Regulations), and other nests of migratory birds are protected when they contain a live bird or viable egg (Section 5(2)(b) of the Regulations). Migratory Bird Sanctuaries are established under the authority of the MBCA and provide a refuge for migratory birds in the marine and terrestrial environments.

Environment and Climate Change Canada (ECCC) establishes marine and terrestrial National Wildlife Areas through the *Canada Wildlife Act* for the purposes of conservation, research and interpretation. National Wildlife Areas are established to manage and protect wildlife areas, and to enable wildlife research activities as well as the conservation and interpretation of wildlife. The Act's purpose is to preserve habitats that are critical to migratory birds and other wildlife species, particularly those that are at risk.

SARA provides a framework across Canada to provide protection for SAR and to facilitate recovery of species listed as threatened, endangered or extirpated, and to prevent species listed as special concern from becoming threatened or endangered. SAR and their identified critical habitats are protected under SARA, which prohibits: 1) the killing, harming, or harassing of endangered or threatened SAR (Sections 32 and 36), and 2) the destruction of critical habitat of an endangered or threatened SAR



(Sections 58, 60, and 61). Critical habitat, defined as the habitat that is necessary for the survival or recovery of a listed wildlife species, may also be defined and protected under SARA Section 58.

Provincial Legislation

The NL *Water Resources Act* provides legislation to manage water resources in the province, with the intent of providing clean water for environmental, social, and economic well-being. Works in freshwater waterbodies require a permit for the construction of water crossing structures (e.g., culvert, bridge, ford).

In NL, SAR are protected under the NL *Endangered Species Act* (NL ESA). Designation under the Act follows the recommendations of the Species Status Advisory Committee (SSAC) on the appropriate assessment of a species and referring concerns about the status of species to Committee on the Status of Endangered Wildlife in Canada (COSEWIC), where the species is of national importance.

The purpose of NL ESA is to:

- Prevent listed species from being extirpated from NL
- Provide for the recovery of species listed as extirpated, endangered, or threatened as a result of human activity
- Conserve species listed as special concern to prevent them from becoming endangered or threatened

Prohibitions of NL ESA include Section 16, which states “a person shall not disturb, harass, injure, or kill an individual of a species designated as threatened, endangered or extirpated”. Species are listed under the *Endangered Species List Regulations*.

For this Project, SAR are defined as species that are:

- Listed on Schedule 1 of SARA as extirpated, endangered, threatened, or special concern
- Listed as extirpated, endangered, threatened, or vulnerable under the NL ESA

Species of Conservation Concern (SOCC) are defined as those species that are:

- Assessed as extirpated, endangered, threatened, or special concern by the COSEWIC but have not yet been added to Schedule 1 of SARA
- Recommended for listing by the SSAC as endangered, threatened, or vulnerable but are not yet listed under the NL ESA
- Ranked as provincially rare by the Atlantic Canada Conservation Data Centre (AC CDC), including species with provincial status (S-ranks) of S1 (critically imperiled), S2 (imperiled) or combinations thereof (e.g., S1S2) upon review by the AC CDC (AC CDC 2023)

The NL Department of Fisheries, Forestry and Agriculture (NL DFFA) is responsible for administering provincial legislation pertaining to natural areas and wildlife, including the NL ESA, the *Wild Life Act*, the *Wilderness and Ecological Reserves Act* (WER Act), and associated regulations.



Under Section 7 of the provincial *Wild Life Act*, the Minister, with the approval of the Lieutenant-Governor in Council, has the authority to establish, by regulation, wildlife reserves “in which wild life or a specified class of wild life may not be hunted, taken or killed or may be hunted, taken or killed, subject only to conditions and restrictions set out in the regulations, and within which camping or travelling may be prohibited or may be permitted subject to restrictions” (*Wild Life Act*, RSNL 1990, c W-8). There are three wildlife reserves in NL (NLDECC n.d.[b]), including the Little Grand Lake Wildlife Reserve which is within the LAA / RAA (Section 16.2.2).

The Government of NL designates wilderness and ecological reserves under the WER Act. Twenty wilderness and ecological reserves have been created in the province since the WER Act was passed in 1980 (NLDECC n.d.[c]). Wilderness and ecological reserves are administered by the Natural Areas Program, Policy, Planning, and Natural Areas Division within the NLDECC. The Wilderness and Ecological Reserves Advisory Council (WERAC), an independent group of government-appointed volunteers from across the province, was established under the WER Act. Its mandate is to advise the provincial government on the establishment of new reserves and the management of existing ones (NLDECC n.d.[c]).

Wilderness and ecological reserves are managed differently depending on the particular protection objectives for the reserve, such as a unique species, habitat, or landscape. Although most wilderness and ecological reserves have little infrastructure or services, some reserves have outfitting and adventure touring operations and/or offer backcountry hiking trails, hunting, fishing, and/or snowmobiling (NLDECC n.d.[c]). Wilderness reserves are open to a range of low-impact recreational activities, but a Wilderness Reserve Entry Permit is required (NLDECC n.d.[c]). Entry permits are not required for ecological reserves. Other permits that may be required in a wilderness or ecological reserve are: a Commercial Operator Permit (for commercial operators, including outfitters and tour guides, whose activities take them inside a reserve's borders); Educational Tour Permit (for groups, including school, university, or conference group, conducting a tour within a reserve); or Scientific Research Permit (for conducting scientific research in a reserve) (NLDECC n.d.[c]). The following activities are strictly prohibited in wilderness and ecological reserves (NLDECC n.d.[c]):

- Disturbing, destroying, or removing plants, animals, or fossils
- Introducing plants, animals, or anything else to the reserve landscape
- Forestry, mining (including exploration), hydro development, agriculture, new roads, tracks, or buildings
- Driving off-road vehicles, including all-terrain vehicles (ATVs)

The Parks Division (Parks NL) of the NL Department of Tourism, Culture, Arts and Recreation (NLDTCAR) is responsible for the management, preservation, control, protection, and development of provincial parks as defined in the *Provincial Parks Act*. The Division has two primary objectives (Parks NL n.d.[a]):

- The provision of a diverse range of outdoor recreation opportunities that encourage residents and visitors to discover and appreciate nature
- The conservation of biological diversity through the establishment and management of a system of provincial parks



In addition to camping and outdoor recreation, Parks NL supports scientific research and monitoring, education, and sustainable tourism activities in provincial parks (Parks NL n.d.[a]).

16.1.2 Boundaries

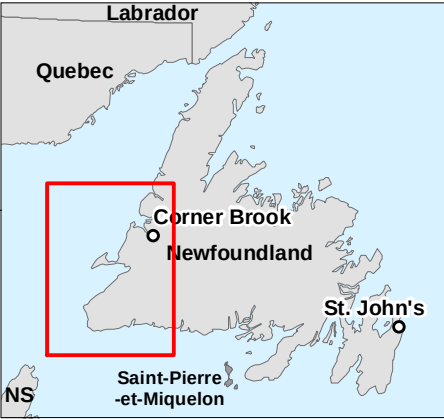
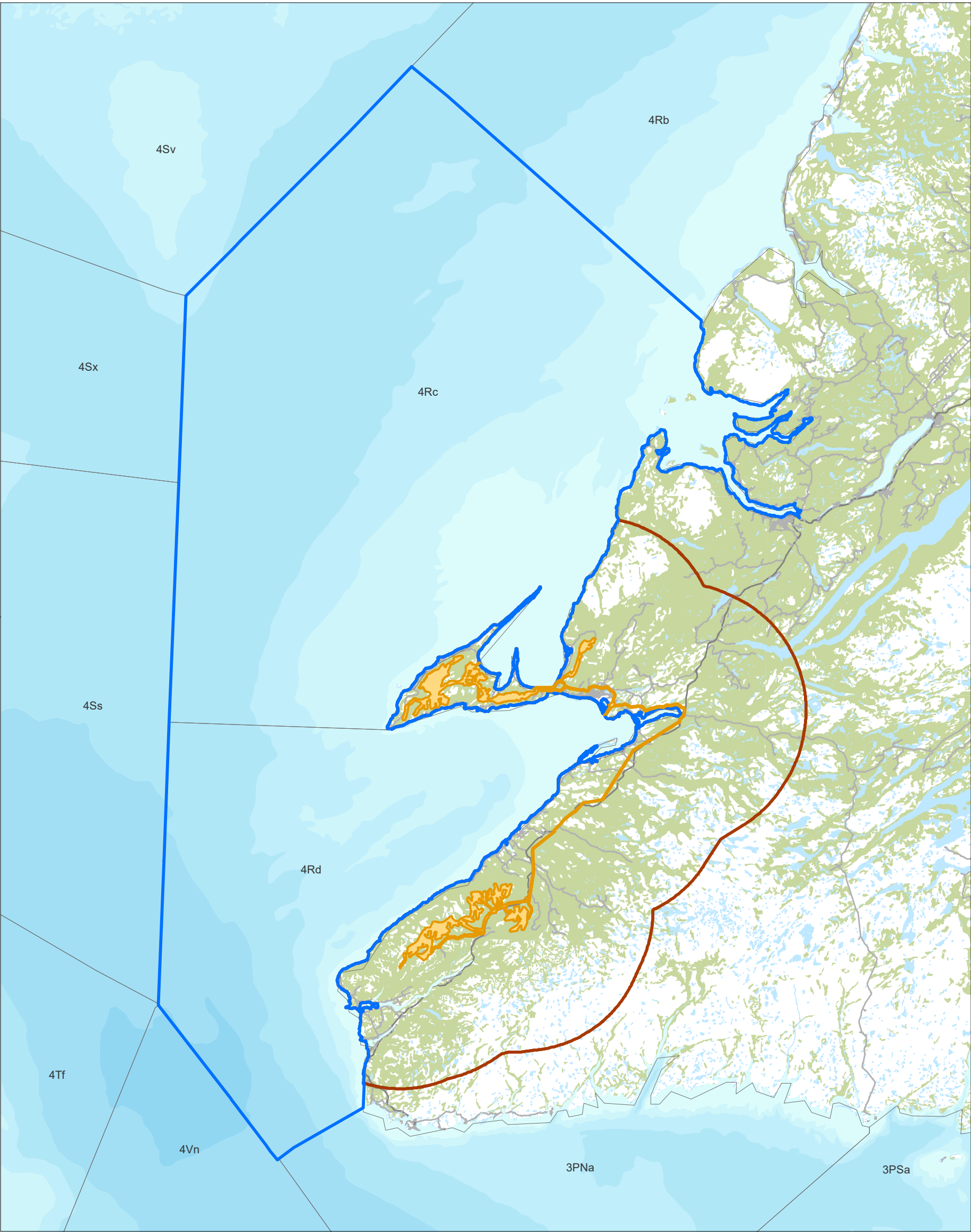
Spatial Boundaries

The following spatial boundaries were used to assess Project effects, including residual environmental effects, on the AoCC VEC in areas surrounding the Project components (Figure 16.1):

- **Project Area** – The Project Area encompasses the immediate area in which the Project activities and components occur and is comprised of following distinct areas: the Port au Port Wind Farm, the Codroy Wind Farm, the Hydrogen/Ammonia Production and Storage Facility (hydrogen / ammonia plant), Port Facilities, and the 230 kV transmission lines, as well as associated infrastructure including roads, substations, and water supply infrastructure. The Project Area is the anticipated area of direct physical disturbance associated with the construction, operation and decommissioning, rehabilitation and closure of the Project. In addition to encompassing the immediate area in which Project components and activities will occur, the Project Area also includes a buffer of up to 300 m for access roads and turbines and a 350 m corridor to accommodate the 70 to 75 m wide RoW for the transmission line. These buffers allow flexibility for the micro-siting of Project components during detailed design, based on technical considerations as well as the avoidance of environmentally sensitive areas, where practicable.
- **LAA** - The LAA for this VEC contains both marine and terrestrial components and is considered the same as the RAA
- **RAA**
 - The Terrestrial RAA extends 30 kilometres (km) from a Project component boundary, including the Port au Port Wind Farm, the hydrogen / ammonia plant and the Codroy Wind Farm, as well as associated transmission line RoWs
 - The Marine RAA encompasses the nearshore marine environments of St. George's Bay and Port au Port Bay and was selected to capture potential Project effects of marine-based activities occurring in these areas. The RAA occurs in the Estuary and the Gulf of St. Lawrence Marine Bioregion and is defined as the Northwest Atlantic Fisheries Organization Division 4Rcd and was selected in recognition of biophysical features including sensitive areas in the region.

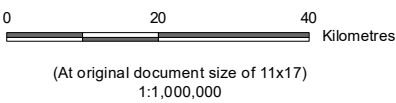


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Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, Environment and Climate Change Canada, Canadian Wildlife Service, Fisheries and Oceans Canada, IBA Canada, Province of Newfoundland and Labrador, ACCDC, Stantec
3. Background: NRCan CanVec

- Project Area
- Local / Regional Assessment Area (Marine)
- Local / Regional Assessment Area (Terrestrial)
- Trans-Canada Highway
- Road
- NAFO Unit
- Waterbody
- Forested Area



Project Location Port au Port Peninsula NL	Prepared by AC on 2023-05-01 Revised by NW on 2023-07-06 QR by AW on 2023-07-07
Client/Project World Energy GH2 Project Nujio'qonik	121417233_058a

Figure No.
16.1

Title
Project Area, Local Assessment Area, and Regional Assessment Area

Temporal Boundaries

The temporal boundaries for the assessment of potential effects on the AoCC VEC include:

- **Construction Phase** – Overall the construction phase of the Project will be from Q4 2023 through Q2 2027, pending EA approval and receipt of other required permits and approvals. Early civil works are planned to start Q4 2023 through Q3 2024. Construction of the Port au Port Wind Farm and associated infrastructure is expected to start in Q3 2024 with completion of the construction in Q4 2026. Construction of the Codroy Wind Farm and associated infrastructure is expected to start Q4 2025 with completion in Q1 2027. The hydrogen / ammonia plant will be constructed in phases from Q2 2024 to Q1 2026. Grid power sources are planned for hydrogen production in 2025 until March 2026, when the electrolyzer is commissioned.
- **Operation and Maintenance Phase** – Wind farm commissioning is anticipated to start Q1 2026 at the Port au Port Wind Farm and Q2 2027 at the Codroy Wind Farm. The 600 megawatt electrolyzer expected to be commissioned in Q1 2026. The operational life of the Project is 30 years at each site.
- **Decommissioning and Rehabilitation** – After a 30-year operational life, the decommissioning phase is anticipated to occur during 2057 and 2058. Decommissioning is anticipated to begin Q1 2057 at the Port au Port Wind Farm, with completion in Q3 2058 at the Codroy Wind Farm

16.2 Existing Environmental Conditions

The following sections provide an overview of the existing environmental conditions of AoCC. Additional detail can be found in Section 7 of the Terrestrial Environment Baseline Study (BSA-3) and Chapter 6 of the Aquatic Environment Baseline Study for the Project (BSA-2). Baseline information was collected to provide information on relevant topics to support the assessment of Project effects on AoCC.

16.2.1 Methods

The terrestrial and marine AoCCs were identified through desktop review of publicly available datasets. Current conditions within AoCC have, in many cases, been and/or are being influenced by historical and present activities in the Project Area and LAA / RAA. To identify potential areas of conservation, separate terrestrial and marine RAAs were defined (Section 16.1.2.1). More detailed information on AoCCs intersecting the Project Area and LAA / RAA is found in BSAs 1 and 4 for aquatic and terrestrial and environments.

Datasets reviewed for identification of terrestrial AoCC within the Terrestrial LAA / RAA include:

- Canadian Protected and Conserved Areas (Government of Canada 2023a)
- Nature Conservancy of Canada (NCC)
- National Parks (Government of Canada 2023b)
- Provincially Protected Areas (Government of NL 2023a)
- Ecological Reserves (Government of NL 2023b)
- Ramsar Sites (Ramsar International Convention on Wetlands 2023)



- Pine marten proposed critical habitat (Government of Canada 2023c)
- Piping plover proposed critical habitat (Government of Canada 2023d)
- Water supply intake infrastructure (Government of NL 2023c)
- Sensitive Wildlife Areas – Plants (Government of NL 2023d)
- IBAs (Birds Canada 2023)
- Community Nominated Priority Places (CNPP) (Government of Canada 2023e)
- Proposed Protected Areas (Government of NL 2023a)
- Newfoundland T'Railway (T'Railways Association 2023)

Datasets reviewed for identification of marine AoCC within the Marine LAA / RAA include:

- Federal Marine Bioregions – Canada Marine Planning Atlas – Atlantic (Government of Canada 2023f)
- Ecologically or Biologically Significant Marine Areas (EBSAs) (Government of Canada 2023f)
- National Marine Conservation Areas (NMCAs) (Parks Canada 2019)
- Marine refuges, fish closures, and lobster closure areas (Government of Canada 2023f; Fisheries and Oceans Canada [DFO] 2019a; 2019b; 2019c; 2019d)
- Significant Benthic Areas (SiBAs) (Government of Canada 2023f)
- SAR critical habitat for northern (*Anarhichas denticulatus*) and spotted (*A. minor*) wolffish (Government of Canada 2023f)
- Scheduled salmon rivers (Government of Canada 2023f)

The NCC is the only land trust organization in NL (NCC 2023a) and protects land within designated nature reserves on private property, including within the LAA / RAA. The NCC's nature reserves within the LAA / RAA are described in Section 16.2.2.3.

Based on the desktop review, a number of terrestrial, marine, and proposed protected AoCC occur within the terrestrial and marine LAA / RAAs; seven AoCCs were identified that directly intersect the Project Area.

16.2.2 Existing Environment for Terrestrial AoCC

Provincial Parks

Six provincially managed protected areas (i.e., provincial parks) overlap the LAA / RAA: Barachois Pond Provincial Park, Grand Codroy Provincial Park, Codroy Valley Provincial Park, J. T. Cheeseman Provincial Park, Blow Me Down Provincial Park, and the T'Railway Provincial Park. These protected areas are described in Table 16.2 and shown on Figure 16.2. The benefits of provincial parks extend beyond conservation and outdoor recreation to include economic activity generated by government and visitor spending, rural employment, physical and mental health, green spaces, ecosystem services, and climate change adaptation and mitigation (Parks NL n.d.[a]).



Table 16.2 Provincial Parks in the LAA / RAA

Provincial Park (Approximate Size)	Approximate Spatial Overlap of Provincial Park with LAA / RAA and Project Area Approximate Distance of Provincial Park from LAA / RAA and/or Project Area	Reason for Protection
Barachois Pond Provincial Park (30 km ²)	- Overlap with LAA / RAA: 30 km² (100% of park area) - No overlap with Project Area - Distance from Project Area: 0.05 km	Barachois Pond is one of the largest provincial parks in western Newfoundland. It protects 1.6% of the St. George's subregion and is dominated by forests mainly consisting of balsam fir (<i>Abies balsamea</i>). This park is home to many wildlife species; over 100 bird species, caribou (<i>Rangifer tarandus</i>), moose (<i>Alces alces</i>), and the Newfoundland population of American marten (<i>Martes americana atrata</i> ; a SAR that is also referred to as Newfoundland marten and Newfoundland pine marten), can be found here. Outdoor activities are encouraged including hiking the Erin Mountain trail, which offers a view of the natural and scenic landscape over Barachois Pond and Bay St. George.
Grand Codroy Provincial Park (0.07 km ²)	- Overlap with LAA / RAA: 0.07 km² (100% of park area) - No overlap with Project Area - Distance from Project Area: 10.5 km	Grand Codroy Provincial Park is considered a park reserve; it was designed to protect natural features but does not offer visitor services such as campgrounds. Grand Codroy protects a portion of a fluvial delta and estuarine waters which provides habitat for many species of birds. This park reserve is also listed as a wetland of International Importance under the Ramsar Convention on Wetlands (i.e., the Grand Codroy Estuary Ramsar Site). It is located in the Codroy subregion and offers scenic views of the Long Range Mountains.
Codroy Valley Provincial Park (0.3 km ²)	- Overlap with LAA / RAA: 0.3 km² (100% of park area) - No overlap with Project Area - Distance from Project Area: 14 km	The Codroy Valley Provincial Park is known for its white sandy beach that separates the Atlantic Ocean from the Grand Codroy River. Located in the Codroy subregion, this area provides habitat for many bird species, including protected beach nesting grounds for piping plover (<i>Charadrius melodus</i>), which is a SAR. Codroy Valley Provincial Park is also spatially overlapped by the Grand Codroy Estuary Ramsar Site and is internationally designated as an IBA.
Blow Me Down Provincial Park	- Overlap with LAA / RAA: 2.4 km² - No overlap with Project Area - Distance from Project Area: 47km	The Blow Me Down Provincial Park is located northeast of the Project within the Serpentine Range subregion of the Western Newfoundland Forest ecoregion. Approximately 2.4 km ² of Blow Me Down Provincial Park is intersected by the Terrestrial LAA / RAA. The Park is a mountainous area with elevations in some sections exceeding 800 m. Fir-dominated forests with moss and fern understories represent the most common community type within the park, though coastal cliffs dominated by rock barrens can also be found. Plant and wildlife species endemic to the Gulf of St. Lawrence have been observed within the area (Protected Areas Association of Newfoundland and Labrador [PAANL] 2008a).

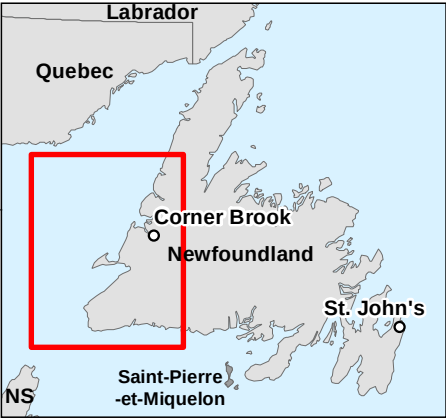
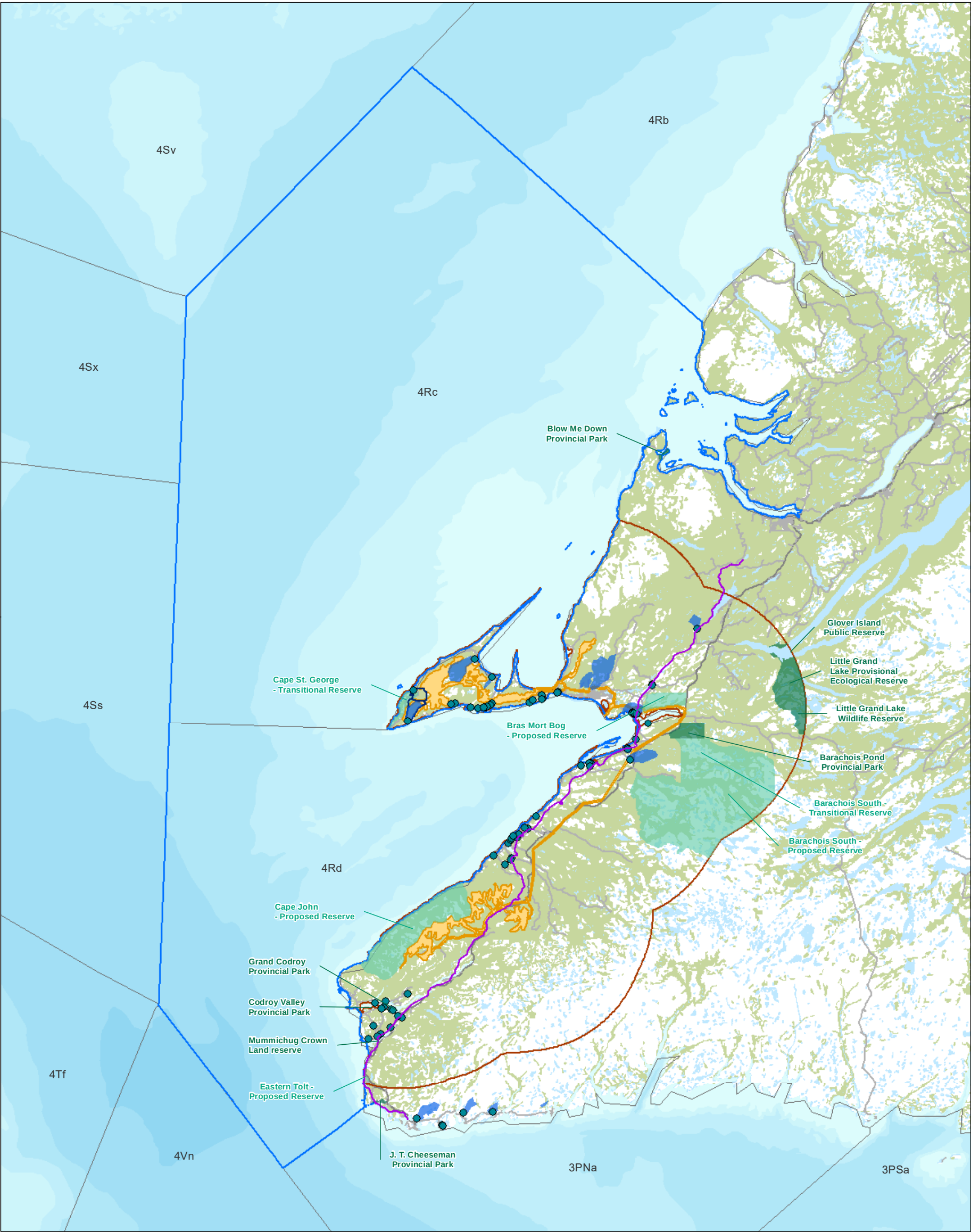


Table 16.2 Provincial Parks in the LAA / RAA

Provincial Park (Approximate Size)	Approximate Spatial Overlap of Provincial Park with LAA / RAA and Project Area Approximate Distance of Provincial Park from LAA / RAA and/or Project Area	Reason for Protection
J.T. Cheeseman Provincial Park	• Overlap with LAA / RAA: 2.0 km² • No overlap with Project Area • Distance from Project Area: 32.7km	J.T. Cheeseman Provincial Park is located south of the Project within the South Coast Barrens subregion of the Maritime Barrens ecoregion. Approximately 2.0 km ² of the Park is within the Terrestrial LAA / RAA. The park contains a mixture of wetland and upland habitat and supports a diverse array of plant species. Forested areas typically contain balsam fir, pine species (<i>Pinus</i> spp.), tamarack (<i>Larix laricina</i>) and mountain ash (<i>Sorbus decora</i>). Sand dunes and beaches occur along coastal areas and are important habitat for many migratory bird species, including some of the largest variety of shorebirds in the province (PAANL 2008a). Habitat for endangered piping plover is also found within the park. A variety of seashells, mussels, and clams can also be found in coastal areas, including some historically valued by Indigenous people for traditional uses (PAANL 2008a).
T'Railway Provincial Park (883 km in length)	• Overlap with LAA / RAA: 204.9 km (23% of park area) • Overlap with Project Area: 2.9 km (0.3% of Park area)	The T'Railway Provincial Park stretches almost 900 km, varying in width, from St. John's to Port aux Basques along the main line of the old abandoned Canadian National railbed. This Island-long Park corridor provides access to many of the Island's representative natural and scenic landscapes and serves as the Island's portion of the Trans-Canada Trail system. ATVs and snowmobiles are allowed on the T'Railway for access and year-round enjoyment. Hiking, scenic touring, and nature observation is encouraged and promoted, especially to residents and visitors to the province. Approximately 204 km of the Newfoundland T'Railway is intersected by the Terrestrial RAA, with sections also directly intersecting with the Project area near the Codroy Wind Farm, as well as proposed transmission line RoWs.
Note: km² = square kilometre Source: Parks NL n.d.[b] and GIS calculations		



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Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, Province of Newfoundland and Labrador, Stantec
3. Background: NRCan CanVec

- Intakes & Wellheads
- NL T'Railway
- NL Public Water Supplies
- ILUC Water Supplies
- Provincial Protected Areas
- Provincial Protected Areas (Proposed)
- Project Area
- Regional Assessment Area (Marine)
- Regional Assessment Area (Terrestrial)
- Other Features**
 - Trans-Canada Highway
 - Road
 - NAFO Unit
 - Waterbody
 - Forested Area

0 20 40 Kilometres
(At original document size of 11x17)
1:1,000,000



Project Location
Port au Port Peninsula
NL

Prepared by AC on 2023-05-01
Revised by NW on 2023-07-07
QR by AW on 2023-07-07

Client/Project
World Energy GH2
Project Nujio'qonik

Figure No.

16.2

**Provincial Areas of Conservation Concern
Within the Marine and Terrestrial Regional
Assessment Areas**

Existing and Proposed Provincial Reserves in the RAA

There is one existing ecological reserve within the LAA / RAA (i.e., Little Grand Lake Provisional Ecological Reserve), as well as several proposed protected areas that are currently in the process of becoming ecological and transitional reserves under the WER Act (i.e., Barachois South Proposed Ecological Reserve, Cape John Proposed Ecological Reserve, Bras Mort Bog Proposed Ecological Reserve, Eastern Tolt Proposed Ecological Reserve, Barachois South Transitional Reserve, and Cape St. George Transitional Reserve) (Figure 16.2; Table 16.3).

Table 16.3 Existing and Proposed Provincial Reserves in the LAA / RAA

Reserve (Approximate Size)	Approximate Spatial Overlap of Reserve with LAA / RAA and Project Area Approximate Distance of Reserve from LAA / RAA and / or Project Area	Reason for Protection
Existing and Provisional Reserves		
Little Grand Lake Wildlife Reserve (572 km ²)	• Overlap with LAA / RAA: 25 km² (4% of reserve area) • No overlap with Project Area • Distance from Project Area: 23 km	Little Grand Lake Wildlife Reserve was established in 2002 to protect the habitat of Newfoundland marten, which is a SAR. The reserve is in two parcels that abut Little Grand Lake Provisional Ecological Reserve (described below). The north and south parcels combined protect 572 km ² of core habitats for Newfoundland marten.
Little Grand Lake Provisional Ecological Reserve (735 km ²)	• Overlap with LAA / RAA: 77 km² (11% of reserve area) • No overlap with Project Area • Distance from Project Area: 22 km	Little Grand Lake Provisional Ecological Reserve protects extensive bogs and barrens, as well as mature boreal forest that is prime habitat for Newfoundland marten, which is a SAR. It is one of three protected areas surrounding Little Grand Lake. The other two are the Little Grand Lake Wildlife Reserve (described above) and the Glover Island Public Reserve (outside of the RAA). These reserves extend the area of Newfoundland marten habitat under protection, and provide buffers against the effects of any human activity that would be harmful to the marten's recovery. The Little Grand Lake Provisional Ecological Reserve was legally established in 2002, after a long history of interest in and concern about the area and its wildlife. The Little Grand Lake Wildlife Reserve and Glover Island Public Reserve were also created in 2002. Public consultations on a draft management plan were held in February 2004. WERAC summarized the public comments and provided recommendations to the Government of NL in January 2005.



Table 16.3 Existing and Proposed Provincial Reserves in the LAA / RAA

Reserve (Approximate Size)	Approximate Spatial Overlap of Reserve with LAA / RAA and Project Area Approximate Distance of Reserve from LAA / RAA and / or Project Area	Reason for Protection
Proposed and Transitional Reserves		
Barachois South Ecological and Transitional Reserves (910 km ² [487 km ² Ecological Reserve; 423 km ² Transitional Reserve])	<u>Ecological Reserve</u> - Overlap with LAA / RAA: 274 km² (56% of reserve area) - No overlap with Project Area - Distance from Project Area: 13 km <u>Transitional Reserve</u> - Overlap with LAA / RAA: 423 km² (100% of reserve area) - No overlap with Project Area - Distance from Project Area: 2.7 km	The two Barachois South proposed reserves are intended to protect the natural landscapes that represent the Western Newfoundland Forest and the Long Range Barrens. Most of the landscape consists of barrens and wetlands with patches of tuckamore. The northern portion of the transitional reserve contains an intact forested valley that represents the forests on the west coast. White pine (<i>Pinus strobus</i>), yellow birch (<i>Betula alleghaniensis</i>), balsam fir, and white (<i>Picea glauca</i>) and black (<i>P. mariana</i>) spruce can be found here. The transitional reserve is intended to shift into an ecological reserve after the 10-year period.
Cape John Ecological Reserve (213 km ²)	- Overlap with LAA / RAA: 213 km² (100% of reserve area) - No overlap with Project Area - Distance from Project Area: adjacent	This proposed ecological reserve is situated along a remote coastline encompassing the western portion of the Anguille Mountains. It is defined by rugged coastal valleys containing windswept forests dominated by balsam fir with ferns and mosses along the forest floor. Yellow birch and trembling aspen (<i>Populus tremuloides</i>) have also been noted to be present. Although, the use of ATVs has affected the barrens in the upper regions of the watersheds, Cape John remains largely undeveloped and intact. This forested area serves as an accurate depiction of the Western Newfoundland Forest natural region. It is understood that this proposed reserve has been nominated as a representative forested habitat in western Newfoundland.
Bras Mort Bog Ecological Reserve (36 km ²)	- Overlap with LAA / RAA: 36 km² (100% of reserve area) - Overlap with Project Area: 0.9 km² (2.5% of reserve area)	The Bras Mort Bog proposed reserve is located east of Stephenville Crossing and is one of the largest undisturbed plateau bogs on the Island of Newfoundland. The bog features gently sloping topography that dips progressively from east to west with deep, rich soils. It is blanketed by mosses and stunted black spruce and is an important area for woodland caribou during fall and winter.



Table 16.3 Existing and Proposed Provincial Reserves in the LAA / RAA

Reserve (Approximate Size)	Approximate Spatial Overlap of Reserve with LAA / RAA and Project Area Approximate Distance of Reserve from LAA / RAA and / or Project Area	Reason for Protection
Eastern Tolt Ecological Reserve (0.8 km ²)	- Overlap with LAA / RAA: 0.8 km² (100% of reserve area) - No overlap with Project Area - Distance from LAA / RAA: 26 km - Distance from Project Area: 28 km	This small, proposed reserve resides in an extremely windy area of the province known as 'the Wreckhouse', which has helped shape the landscape into globally rare wave forests. The wave forests are made up of varying bands of dead and intact balsam fir trees that spread across the steep slope and become more stunted as elevation increases. It is one of the world's most visible and accessible wave forests.
Cape St. George Transitional Reserve (18 km ²)	- Overlap with LAA / RAA: 18 km² (100% of reserve area) - No overlap with Project Area - Distance from Project Area: adjacent	Cape St. George proposed reserve is situated on the southwestern tip of the Port au Port Peninsula. Apart from being an important limestone barrens site, this area is also home to several provincially endangered plant species (Mackenzie's sweetvetch (<i>Hedysarum boreale</i> subsp. <i>Mackenzii</i>), rock-dwelling sedge (<i>Carex petricosa</i> var. <i>misandroides</i>) and wooly arnica (<i>Arnica angustifolia</i> ssp. <i>tomentosa</i>) and several rare plant species. The proposed reserve also provides habitat for black-legged kittiwakes (<i>Rissa tridactyla</i>). Once the 10-year period is over, this area is intended to transition into an ecological reserve. Certain areas on the Port au Port Peninsula, including the proposed reserve, are designated as sensitive plant areas (further discussed in the Terrestrial Environment Baseline Study, BSA-3).
Mummichog Crown Land Reserve	- Overlap with LAA / RAA: 100% - No overlap with Project Area - Distance from Project Area: 19.6km	Mummichog Crown Land Reserve is a small conservation area located south of the Project Area within the Terrestrial RAA (Figure 16.2). The reserve is approximately 0.0051 km ² in size. Limited information currently exists on Mummichog Crown Land Reserve.
Sources: WERAC 2020; AC CDC 2022; NLDECC n.d.[b]; NLDECC n.d.[d]; GIS metrics		

Proposed ecological reserves are lands that are intended for immediate protection, whereas proposed transitional reserves are lands that are intended for future protection as wilderness and ecological reserves. The staking of new mineral claims and the issuance of new petroleum licences on transitional reserve lands will be allowed to continue for four years from the time that the transitional reserve is established and a further six years allowed for further exploration. If no significant mineral or petroleum discovery is made at a transitional reserve site within that 10-year timeframe, the site will transition into a protected wilderness or ecological reserve (WERAC 2020).

Proposed wilderness and ecological reserves in NL must undergo a legislated process led by WERAC. The first step in the process is for WERAC to gather information from the public about the proposed reserve and current uses of the area. Once an area is established as a provisional reserve, public



consultation is formally undertaken, and the results of the public consultation process inform the development of a draft management plan and a proposed final boundary. Following completion of the public consultation phase, WERAC submits its recommendations on whether to establish a reserve and how it should be managed. The Government of NL reviews these recommendations and makes a final decision. If approved, the reserve is formally established (WERAC 2020).

Private Nature Reserves

In addition to the existing and proposed provincially managed protected areas within the LAA / RAA, the NCC currently protects and manages nature reserves in several areas across the Island. The lands associated with these nature reserves are privately owned and open to the public where accessible. There are currently four NCC nature reserves that overlap the LAA / RAA (Table 16.4; Figure 16.3): Barachois Brook, Grand Codroy Estuary, Sandy Point, and The Grasses. NCC secured the lands for these nature reserves through purchase or donation; the titles to the lands have been transferred to NCC (NCC 2023b).

Table 16.4 Private Nature Reserves in the LAA / RAA

Nature Reserve (Approximate Size)	Approximate Spatial Overlap of Reserve with LAA / RAA and Project Area Approximate Distance of Reserve from LAA / RAA and/or Project Area	Reason for Protection
Barachois Brook (1 km ²)	- Overlap with LAA / RAA: 1 km² (100% of nature reserve area) - No overlap with Project Area - Distance from Project Area: 0.7 km	The Barachois Brook Nature Reserve encompasses Barachois Brook, an Atlantic salmon (<i>Salmo salar</i>) river, and borders Barachois Pond Provincial Park. The area has boreal forest habitat, which is home to red fox (<i>Vulpes vulpes</i>), American beaver (<i>Castor canadensis</i>), and several bird species.
Grand Codroy Estuary (2 km ²)	- Overlap with LAA / RAA: 2 km² (100% of nature reserve area) - No overlap with Project Area - Distance from Project Area: 7.7 km	The NCC manages 21 parcels of land that constitute the Grand Codroy Estuary Nature Reserve in the Codroy Valley area. This area is classified as a Ramsar Wetland of International Importance (Figure 16.3), due to a high number and diversity of waterfowl being present in spring and autumn. It also supports a variety of other bird species, small mammals, and rare plant species. The Nature Reserve offers a walking trail and a Wetland Interpretation Centre for visitors. It is also listed as an IBA.
Sandy Point (0.3 km ²)	- Overlap with LAA / RAA: 0.3 km² (100% of nature reserve area) - No overlap with Project Area - Distance from Project Area: 4.6 km	Situated within St. George's Bay, the Sandy Point Nature Reserve consists of 16 parcels of land on the uninhabited island of Sandy Point. This area is known for its tidal flats, salt marshes, and sandy beaches, which is uncommon habitat for NL coastlines.



Table 16.4 Private Nature Reserves in the LAA / RAA

Nature Reserve (Approximate Size)	Approximate Spatial Overlap of Reserve with LAA / RAA and Project Area Approximate Distance of Reserve from LAA / RAA and/or Project Area	Reason for Protection
The Grasses (16 km ²)	• Overlap with LAA / RAA: 16 km² (100% of nature reserve area) • No overlap with Project Area • Distance from Project Area: 20.8 km	The Grasses Nature Reserve is an ecologically significant remote area that is named for its natural riverside grasses. The largest wetland of its type in the province is found here and provides habitat for the Newfoundland marten and woodland caribou, both of which are SAR. This reserve also overlaps with proposed critical habitat for the Newfoundland marten.
Source: Government of Canada 2023g; NCC n.d.; GIS metrics		

Proposed Critical Habitat

There are no designated critical habitat areas within or intersecting the AoCC LAA/RAA. There are three proposed critical habitats described below.

American Pine Marten

Newfoundland populations of American pine marten are genetically distinct populations of the subspecies *Martes americana atrata* and have been assessed as a species of special concern under COSEWIC (COSEWIC 2022) and listed as threatened under the NL ESA. Approximately 1,120 km² of proposed critical habitat for Newfoundland marten is intersected by the Terrestrial LAA / RAA and approximately 4.0 km² is intersected by the Project Area, with intersection occurring in the proposed transmission line RoWs for the Project near Stephenville Crossing (Figure 16.3).

Piping Plover

ECCC data indicate critical habitat for piping plover occurs at 13 points within the terrestrial and marine LAA / RAAs (Government of Canada 2023d). The closest known location of piping plover critical habitat occurs approximately 1.3 km from the Project Area, situated near the proposed transmission line RoW between Stephenville and Stephenville Crossing (Figure 16.3).

Bobolink

ECCC has prepared a proposed recovery strategy, as per section 37 of SARA, for the bobolink (*Dolichonyx oryzivorus*), a migratory songbird, in Canada (Government of Canada 2023h). There is approximately 100 km² of critical habitat occurring in the LAA / RAA. At the closest point, the critical habitat is approximately 850 m south of the Project Area Codroy Wind Farm (Figure 16.3).



Important Bird Areas (IBAs) and Ramsar Sites

Bird Studies Canada and Nature Canada are Canadian co-partners in BirdLife International, a global alliance of non-governmental organizations dedicated to the conservation of birds, their habitats, and biodiversity. BirdLife in Canada deliver the Important Bird and Biodiversity Areas (IBA) Program (Canadian Important Bird Areas [ibacanada.ca]). IBAs are designated as areas of importance for the survival of bird species. The criteria used to identify IBAs include presence of SAR, species with restricted range, habitats holding representative species assemblages, or a congregation of an important proportion of a species' population during one or more season (Birds Canada 2023). The Terrestrial LAA / RAA intersects three IBAs, with a total area of 71.95 km². IBAs intersected by the Terrestrial LAA / RAA include Grand Bay West to Cheeseman Provincial Park (NF038), Codroy Valley IBA (NF040), and Codroy Valley Estuary IBA (NF041). Codroy Valley Estuary is the closest IBA to the Project Area, located approximately 9 km to the southwest (Figure 16.3).

Grand Bay West to Cheeseman Provincial Park (NF038) includes section of sand beach and rocky coastline and represents important nesting habitat for piping plover. The IBA is also an important fall migration stopover for shorebirds (Birds Canada 2023).

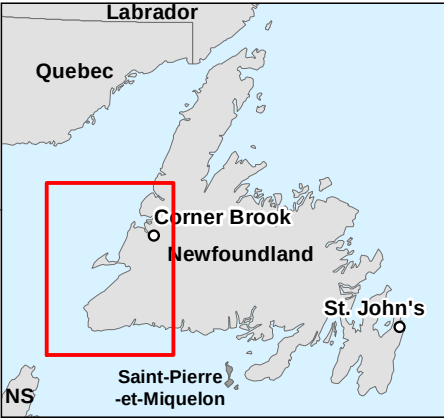
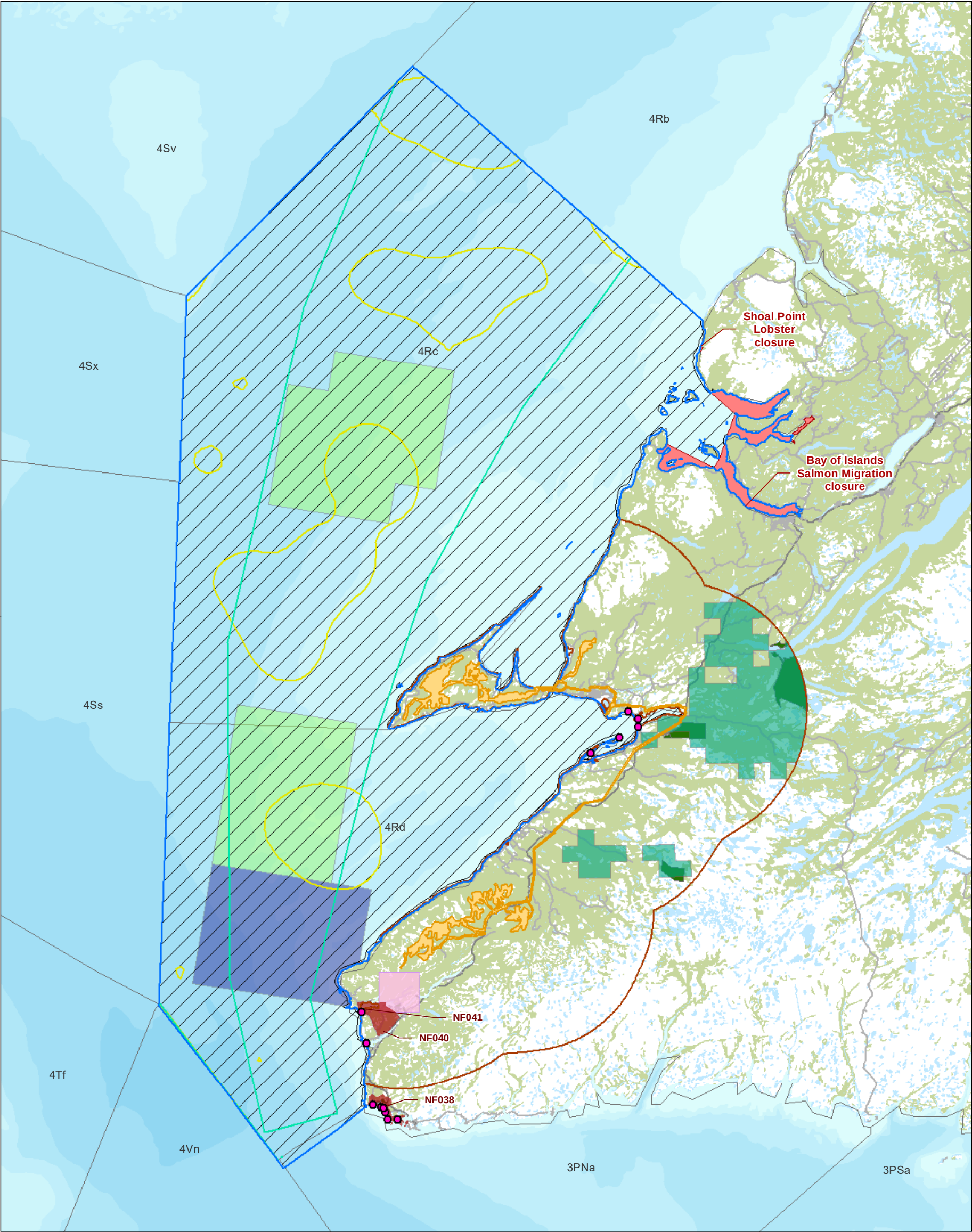
Codroy Valley IBA (NF040) is located between the Little Codroy River and the Grand Codroy River. Many forest bird species, including two species of restricted range, the ovenbird (*Seiurus aurocapilla*) and the red crossbill (*Loxia curvirostra*), have been documented within this area. Several species that are uncommon or absent elsewhere in Newfoundland have been documented within this IBA, including ruby-throated hummingbird (*Archilochus colubris*), gray catbird (*Dumetella carolinensis*), red-eyed vireo (*Vireo olivaceus*), and rose-breasted grosbeak (*Pheucticus ludovicianus*). The IBA is also a breeding ground for bobolink (Birds Canada 2023).

Codroy Valley Estuary IBA (NF041) is located at the mouth of the Grand Codroy River and is an important breeding and staging site for waterfowl. Rare ducks such as Eurasian wigeon (*Mareca penelope*) and tufted duck (*Aythya fuligula*) have been seen in this IBA, as well as the first NL breeding record for northern shoveler (*Spatula clypeata*). Piping plover has also been documented within this IBA and nests on Grand Codroy Beach (Birds Canada 2023).

Ramsar sites are designated by The Convention on Wetlands which is an intergovernmental treaty under the United Nations providing the framework for the conservation and wise use of wetlands and their resources. The Grand Codroy Estuary, located 7.7 km south of the Project Area (Figure 16.3) and co-located with the Codroy Valley Estuary IBA, is the only Ramsar site in the LAA/RAA and the only Ramsar site in the province. The site (Ramsar Site No. 364) is one of the most productive of Newfoundland's few estuarine wetland sites. The site includes four islands, intertidal sandbars, and mudflats supporting eelgrass. The eelgrass beds are an important food source for up to 3,000 fall staging Canada geese (*Branta canadensis*). Large numbers of other waterfowl species also use the area for staging (RSS 2001).



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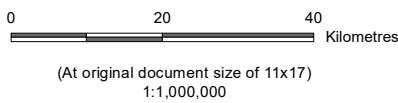


Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, Environment and Climate Change Canada, Canadian Wildlife Service, Fisheries and Oceans Canada, Province of Newfoundland and Labrador, ACCDC, Stantec
3. Background: NRCan CanVec

Protected Areas

- Marine Refuges (Coastal Sites)
- Nature Conservancy of Canada
- Critical Habitat**
 - Piping Plover (ECCC)
 - American Pine Marten (ECCC)
 - Bobolink, Proposed (ECCC)
 - Northern Wolffish (DFO)
 - Spotted Wolffish (DFO)
 - Ecologically and Biologically Significant Area (DFO)
 - Important Bird Areas (IBA Canada)
 - Significant Benthic Area (DFO)

- Project Area
- Regional Assessment Area (Marine)
- Regional Assessment Area (Terrestrial)
- Other Features**
 - Trans-Canada Highway
 - Road
 - Marine Bioregion (DFO)
 - NAFO Unit
 - Waterbody
 - Forested Area



Project Location
Port au Port Peninsula
NL

Prepared by AC on 2023-05-01
Revised by NW on 2023-07-06
QR by AW on 2023-07-07

Client/Project
World Energy GH2
Project Nujio'qonik

Figure No.

16.3

Title

**Federal Areas of Conservation Concern
Within the Marine and Terrestrial Regional
Assessment Areas**

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Sensitive Wildlife Areas – Plants

Sensitive wildlife areas (SWA) as included in publicly available provincial land use datasets identify sensitive areas where listed rare plants are known to occur. SWAs for listed rare plants cover a total of 64.41 km² within the LAA/RAA and maintain surface level restrictions for development (Figure 16.4) (Government of NL 2023d). An SWA of approximately 3.44 km² occurs along the Barachois River and intersects the Project Area, i.e., transmission line RoW, by 0.18 km² or 5.2%, and the LAA / RAA by 100%. The length of the proposed 230 kV transmission line that intersects the Barachois River SWA is 740.65 m (0.74 km)

An SWA of approximately 3.19 km² occurs along the Robinson River and is also 100% contained within the LAA / RAA (Figure 16.4).

There is also an SWA-containing limestone barren habitat that is located within the Cape St. George Transitional Reserve, on the southwestern tip of the Port au Port Peninsula, outside of the Project Area. There are two other SWAs that the Project Area on the top of Port au Port Peninsula on Table Mountain. These two SWAs include areas of limestone bedrock that support vegetation communities such as low tuckamore (mostly associated with the NLDDFA coniferous scrub land use), windswept areas dominated by stunted balsam fir and black spruce, and dwarf shrub heath (mostly associated with the NLDDFA soil barrens land use). These areas are much smaller than the areas identified as limestone barrens within the Limestone Barrens Species at Risk Recovery Plan (Limestone Barrens Species at Risk Recovery Team 2021) (Section 12.2.2.1). A discussion of potential effects and mitigation is presented in greater detail in Chapter 12.

Community Nominated Priority Places

Community Nominated Priority Places (CNPPs) for SAR is a multi-partner initiative that looks to fund opportunities to protect and recover species and the habitat they live in. CNPPs intersecting the Terrestrial LAA / RAA include the “Long Range Biodiversity” area on the western coast of the Island. Ecosystem conservation plans will focus on areas from Port aux Basques to Cape Norman at the tip of the Great Northern Peninsula, covering approximately 32,427 km² and targeting wildlife and plant SAR such as piping plover or Long’s braya (*Braya longii*). The initiative aims to address key threats to SAR and their habitat such as human disturbance, by-catch, and resource extraction (Government of Canada 2023e).





Sensitive Wildlife Area	Other Features
Proposed Project Features	Transmission Line, Existing
Transmission Line 230 kV	Trans-Canada Highway
Project Area	Road
	Resource Road / Trail
	Contour (20 m)
	Watercourse
	Waterbody
	Wetland
	Forested Area



0 2 km
(At original document size of 8.5x11)
1:75,000

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCAN, CanVec, OpenStreetMap, Stantec
3. Background: NRCAN CanVec



Project Location
Stephenville
NL

Prepared by AC on 2023-07-19
QR by AW on 2023-07-19

Client/Project
World Energy GH2
Project Nujio'qonik

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Figure No.

16.4

Title

**Sensitive Wildlife Areas along
Robinson and Barachois Rivers**

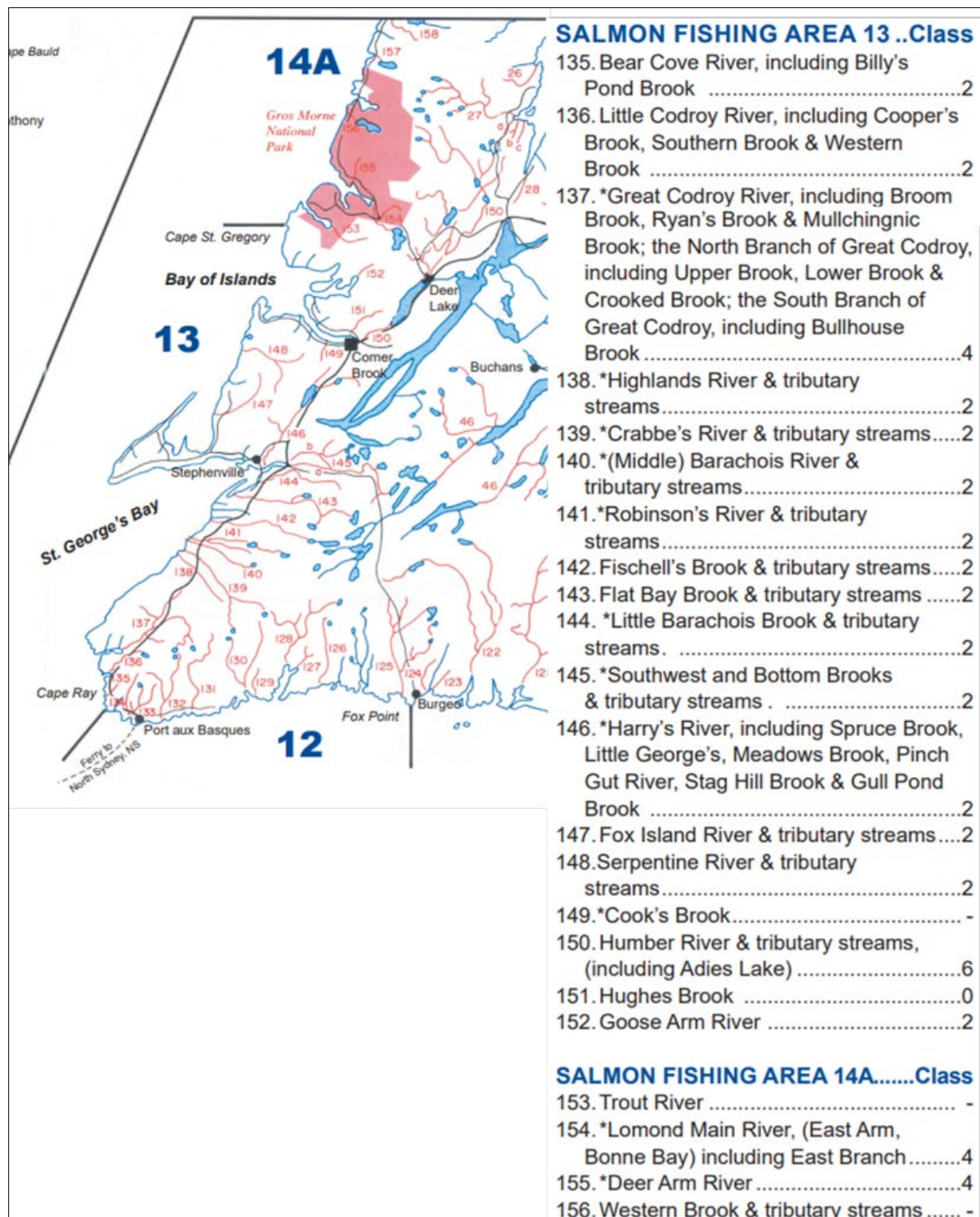
Salmon Rivers

As noted in Section 5.3.1.2 in the Aquatics Environment Baseline Study (BSA-2), NL has some of the highest percentage of active resident anglers (96%) and the highest overall proportion of fish retained (80%) in Canada (DFO 2019e). Although the dominant species caught in freshwater in NL is brook trout (*Salvelinus fontinalis*) (DFO 2019e), recreational salmon fishing is highly valued and is carried out on 11 scheduled salmon rivers intersected by the Project boundary (Figure 16.5). The scheduled salmon rivers listed below are Class 2 rivers, meaning one fish possession limit per day, and three fish per day catch-and-release. In all cases below, the river mouth meets the Marine LAA / RAA, overlaps the Terrestrial RAA, and crosses over the transmission line area of the Project Area:

- Great Codroy River and its tributaries (Broom Brook, Ryan's Brook, and Mullchingnic Brook; the North Branch of Great Codroy, including Upper Brook, Lower Brook, and Crooked Brook; the South Branch of Great Codroy, including Bullhouse Brook) (Class 4) Highlands River and its tributaries (Class 2)
- Crabbe's River and its tributaries (Class 2)
- (Middle) Barachois River and its tributaries (Class 2)
- Robinson's River and its tributaries (Class 2)
- Fischell's Brook and its tributaries (Class 2)
- Flat Bay Brook and its tributaries (Class 2)
- Little Barachois Brook and its tributaries (Class 2)
- Southwest and Bottom Brooks and its tributaries (Class 2)
- Harry's River and its tributaries (Spruce Brook, Little George's, Meadows Brook, Pinch Gut River, Stag Hill Brook, and Gull Pond Brook (Class 2)
- Fox Island River and its tributaries (Class 2)

Although regulated, there are no legislated land protections in place for salmon rivers and their tributaries. However, the *Environmental Assessment Regulations, 2003* under the *NL Environmental Protection Act* (O.C. 2003-220) restricts development within 200 m of a salmon river under Section 28 of the Regulations by requiring a formal EA of the proposed undertaking. Conservation concerns specific to Atlantic salmon are generally managed through seasonal angling windows, size and retention limits, closed angling zones, and closures based on environmental conditions.





Source: DFO 2003

Figure 16.5 Salmon Rivers in the LAA / RAA



Waterbodies used for salmon angling are categorized into classes that determine the daily bag limit/seasonal retention (Table 16.5). Salmon less than 63 centimetres (cm) can be retained based on the river class (Table 16.5). Salmon (e.g., fry, parr, and smolt) less than 30 cm cannot be retained. Retention of salmon is also not permitted in non-scheduled waters (DFO 2023).

Table 16.5 Salmon River Classification and Catch Limits

River Classification	Limit (Seasonal Retention)
Class 0	Catch and Release – two fish
Class 2	One fish
Class 4	Two fish
Class 6	Two fish
Unclassified (Zone 1 and 2)	Two fish

16.2.3 Existing Environment for Marine AoCC

The Project is anticipated to include a number of activities in the marine environment, including improvements at the port and installation of a jettyless mooring / loading system, re-activation of the existing marine wastewater outfall, arrival of supplies at the port, loading and shipment of product, barging of wind turbine components from the port to the Port au Port Peninsula, and a short subsea transmission cable in Port au Port Bay adjacent to the isthmus.

No marine AoCC intersect the Project Area; however, there are a number of AoCC that intersect the marine LAA/RAA:

- Estuary and Gulf of St. Lawrence Marine Bioregion (Federal Marine Bioregion)
- West Coast of Newfoundland EBSA
- Marine refuges
 - Shoal Point Lobster Closure Area
 - Bay of Islands Salmon Migration Closure Area
- Five SiBAs intersect the Marine RAA
- Critical habitat for northern and spotted wolffish

Estuary and Gulf of St. Lawrence Marine Bioregion

The Marine LAA/RAA is located in the Estuary and Gulf of St. Lawrence Marine Bioregion, a Federal Marine Bioregion, and intersects a total of 21,863 km² (Figure 16.4), or 9% of the Bioregion. The Estuary and Gulf of St. Lawrence Marine Bioregion is one of the largest and most productive estuarine / marine ecosystems in Canada. The St. Lawrence marine ecosystem is exposed to a wide variety of human pressures that pose threats to its integrity and sustainable use, including fisheries and navigation (particularly as a transportation route to the Great Lakes via the St. Lawrence seaway and river), as well as mariculture (sea-farming) activities. Coastal development and recreational use (including marine



mammal observation tourism) also represent important activities in the bioregion. Other activities in and around the bioregion include industrial and municipal activities, agriculture, and river damming (for water level control and hydropower). These activities have had effects on nutrient, organic matter, and contaminant inputs to the marine environment (Government of Canada 2023f).

Ecologically and Biologically Significant Areas

EBSAs are identified by DFO under the *Oceans Act* to designate marine areas with high ecological or biological activity relative to surrounding areas. Criteria for EBSA designation include uniqueness / distinctness compared with surrounding areas, species use in the area, and importance of the area to the life history of the species found within it (DFO 2005). The Marine LAA / RAA is located within the Estuary and Gulf of St. Lawrence Large Ocean Management Area and intersects one EBSA, the West Coast of Newfoundland EBSA. This EBSA is located approximately 4.44 km from the Project Area at its closest point. The Marine LAA / RAA intersects approximately 1,842 km², or 58.6%, of the West Coast of Newfoundland EBSA (Figure 16.3).

The West Coast of Newfoundland EBSA is an important spawning area of Northern Gulf cod (*Gadus morhua*), is the only known overwintering area for Northern gulf herring (*Clupea harengus*) and capelin (*Mallotus villosus*), is a main migration corridor for demersal fish species, and serves as an important feeding area for many marine mammals observed in the region. Large quantities of fish larvae (particularly capelin and herring), as well as juveniles of northern Gulf cod, redfish (*Sebastes* spp.), American plaice (*Hippoglossoides platessoides*) and Atlantic wolffish (*Anarhichas lupus*), can also be found within this EBSA (DFO 2009).

Marine Refuges

Marine Refuges are designated by DFO as conservation areas with fishing restrictions. The Marine LAA/RAA intersects two Marine Refuges: Shoal Point Lobster Closure area and the Bay of Islands Salmon Migration Closure area (Figure 16.3). The Project is approximately 76 km from Shoal Point Lobster Closure area and approximately 45 km from the Bay of Islands Salmon Migration Closure area. The Marine LAA/RAA intersects approximately 0.03 km² or 5% of Shoal Point Lobster Closure area and approximately 217 km² or 100% of the Bay of Islands Salmon Migration Closure area.

The Shoal Point Lobster Closure area aims to protect spawning habitat, specifically inshore shallow, and rocky areas to increase lobster (*Homarus americanus*) egg production. Lobster fishing is prohibited in these closure areas. Other human activities that could also negatively affect lobster spawning are also prohibited (DFO 2019b). The Bay of Islands Salmon Migration Closure has been implemented to protect salmon migration habitat, which is an important part of the salmon's life cycle, linking marine and freshwater salmon environments. Pelagic fixed-gear fisheries are prohibited in the closure area. Other human activities that could negatively affect salmon migration in this closure area are also prohibited (DFO 2019d).



Significant Benthic Areas

Significant Benthic Areas (SiBAs) are defined in DFO's Ecological Risk Assessment Framework as "significant areas of cold-water corals and sponge dominated communities". These areas are not protected; however, they identify key marine species distribution and may indicate areas of future restoration activities (DFO 2013). The closest SiBA to the Project Area is approximately 17.6 km away. Five SiBAs for small and large size gorgonian coral, sea pen and sponge dominated communities overlap with the Marine LAA/RAA. Approximately 3,364 km² of SiBAs are intersected by the Marine LAA/RAA (Figure 16.3).

Critical Habitat for Northern and Spotted Wolffish

Northern and spotted wolffish are listed as threatened under Schedule 1 of SARA. These species have declined in abundance and size of range area since the 1970s or 1980s, when research surveys were initiated. Though some recovery has been recorded, the population of both species is low compared to initial research surveys. Limited information is available on northern and spotted wolffish habitats, particularly in offshore areas. However, the results of research surveys indicate that habitat preference may be related to sea bottom temperature and depth. Based on these criteria, critical habitat areas have been defined. While the entire areas are not considered to be critical habitat, they contain sufficient habitat for survival or recovery (DFO 2020).

Two critical habitat areas for spotted wolffish and one critical habitat area for northern wolffish occur within the Marine LAA/RAA. The closest identified spotted wolffish critical habitat occurs 11.7 km from the Project, while the closest identified northern wolffish critical habitat occurs 9.7 km from the Project. Approximately 2,626 km² of spotted wolffish critical habitat and approximately 1,172 km² of northern wolffish critical habitat are intersected by the Marine LAA/RAA (Figure 16.3).

National Marine Conservation Areas

Though the *National Marine Conservation Areas Act, 2002*, Parks Canada has been mandated to establish a network of NMCAs within each of Canada's 29 marine regions (Parks Canada 2019). No NMCAs or candidate NMCAs have yet to be established or identified in the Marine LAA/RAA.

16.2.4 AoCC Intersecting or Adjacent to the Project Area

Among the terrestrial and marine AoCC identified in the RAAs, three directly intersect the Project Area and two are adjacent:

- Bras Mort Bog Proposed Reserve
- Cape John Proposed Reserve (adjacent)
- Cape St. George Transitional Reserve (adjacent)
- Newfoundland marten proposed critical habitat
- Newfoundland T'Railway



Bras Mort Bog Proposed Reserve

The Bras Mort Bog Proposed Reserve contains some of the largest, relatively undisturbed plateau bogs found on the Island. The Bras Mort Proposed Reserve contains undulating terrain, dominated by black spruce and moss species that provide important habitat and forage for overwintering woodland caribou. Approximately (36.2 km² of Bras Mort Bog Proposed Reserve is intersected by the Terrestrial LAA/RAA (Figure 16.2) (WERAC 2020). The Bras Mort Bog Proposed Reserve also directly intersects with Project transmission line RoWs in sections near Stephenville Crossing over approximately 0.9 km² or 2.5% of the overall Reserve.

Cape John Proposed Reserve

The Cape John Proposed Reserve is one of 24 new proposed areas in the Protected Areas Plan for the Island. It was nominated as a representative forested habitat in western Newfoundland (WERAC 2020). The proposed ecological reserve is in southwestern NL, north of the Codroy Valley. Approximately 213 km² of Cape John Proposed Reserve is within the Terrestrial LAA / RAA. Initially, sections of the Cape John Proposed Reserve were directly intersected by the Project near the Codroy Wind Farm. WEGH2 applied an avoidance mitigation measure to this AoCC by adjusting the Codroy Wind Farm boundaries in this area to exclude direct Project intersection with this proposed reserve (Figure 16.2). This AoCC is now adjacent to the Project Area. The reserve is situated along a remote coastline encompassing the western portion of the Anguille Mountains. The reserve is known for rugged coastal valleys containing windswept forests dominated by balsam fir, with ferns and mosses along the forest floor. Deciduous forests of yellow birch and trembling aspen also occur within the reserve. Although the use of off-road vehicles has affected the barrens in the upper regions of the watersheds, Cape John remains largely undeveloped and intact. This forested area serves as an accurate depiction of the Western Newfoundland Forest natural region (WERAC 2020).

Cape St George Transitional Reserve

The Cape St. George Transitional Reserve is a proposed protected area (Figure 16.2) and was identified in the Protected Areas Plan for the Island of Newfoundland (WERAC 2020). The Cape St. George Transitional Reserve was selected as a proposed protected area based on its unique qualities, including its very important limestone barren sites that are the most southerly occurring on the Island. Numerous rare plant species, including three species listed under the NL ESA, are found in these limestone barrens. Protection of the Cape St. George Transitional Reserve has been identified as a high-priority action in the Limestone Barrens SAR Recovery Plan. The proposed protected area also provides habitat for three black-legged kittiwake colonies. The Cape St. George Transitional Reserve is the only area proposed for protection in the Port au Port subregion and as such, is considered integral to the overall Protected Areas Plan (PAP 2020).

The Cape St George Transitional Reserve is located within the southwestern tip of the Port au Port Peninsula. Approximately 18.1 km² of Cape St George Transitional Reserve is within the Terrestrial LAA / RAA. Initially, there were sections of the Cape St George Transitional Reserve, approximately 1.0 km² or 6%, which was directly intersected by the Project near the Port au Port Wind Farm (As with the Cape



John AoCC, WEGH2 applied an avoidance mitigation measure to this AoCC by adjusting the Project boundary to avoid encroaching on this reserve (Figure 16.2). Three NL ESA-listed plant species, Mackenzie's sweetvetch, rock-dwelling sedge, and wooly arnica, are found within the reserve. Rare limestone barren habitat and rocky cliffs also support a wide variety of uncommon, though not provincially endangered plant species (WERAC 2020).

Newfoundland Marten Proposed Critical Habitat

Large-scale areas of critical habitat for the marten in Newfoundland were identified by the Newfoundland Marten Recovery Team (2010) and this habitat from the provincial plan was adopted by the federal government to assist with identification of critical habitat under SARA (Environment Canada 2013). Turbines and access roads do not overlap critical habitat currently identified by the province or under SARA; however, a portion of the transmission line intersects the periphery of critical habitat along the Trans-Canada Highway near Barachois Pond Provincial Park. Approximately 4.0 km² or 0.36% of proposed Newfoundland marten habitat within the LAA/RAA is intersected by the Project Area near Stephenville Crossing.

Salmon Rivers and Riparian Sensitive Wildlife Areas

Section 16.2.2.8 lists the 11 salmon rivers that occur within the AoCC LAA/RAA. All of these briefly cross the transmission line RoW. Chapter 10, Freshwater Fish and Fish Habitat, proposes extensive mitigation measures for riparian habitat where they are intersected by Project components.

Newfoundland T'Railway

Approximately 205 km of the Newfoundland T'Railway is intersected by the Terrestrial LAA / RAA, with sections totaling 2.9 km directly intersecting with the Project Area near the Codroy Wind Farm, as well as proposed transmission line RoW near Stephenville Crossing (Figure 16.2).

16.3 Assessment Criteria and Methods

The approach to identifying AoCC as a VEC considers their value as identified by provincial regulators, WEGH2, resource managers, scientists, and/or the general public. Residual environmental effects (Section 16.5) are assessed and characterized using criteria defined in Section 16.3.1, including direction, magnitude, geographic extent, timing, duration, frequency, reversibility, and ecological or socio-economic context.

The assessment also evaluates the significance of residual effects using threshold criteria or standards beyond which a residual environmental effect is considered significant. The definition of a significant effect for AoCC is provided in Section 16.3.2. Section 16.3.3 identifies the environmental effects to be assessed for AoCC, including effect pathways and measurable parameters. This is followed by the identification of potential Project interactions with this VEC (Section 16.3.4). Analytical assessment techniques employed for the assessment of potential Project-related environmental effects on AoCC are provided in Section 16.3.5. The assumptions that were made to support a conservative approach to the assessment of residual effects on AoCC are described in Section 16.3.5.1.



16.3.1 Residual Effects Characterization

Table 16.6 presents definitions for the predicted environmental effects characterization of the Project on AoCC. The criteria are used to describe the potential residual effects that remain after mitigation measures have been implemented. Quantitative measures have been developed, where possible, to characterize residual effects. Qualitative considerations are used where quantitative measurement is not possible.

Table 16.6 Characterization of Predicted Environmental Effects of the Undertaking on Areas of Conservation Concern

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Nature	The long-term trend of the residual effect	• Neutral – No net change in the measurable parameter(s) for AoCC relative to baseline • Positive – A residual effect that moves the measurable parameter(s) in a direction beneficial to AoCC relative to baseline • Adverse – A residual effect that moves the measurable parameter(s) in a direction detrimental to AoCC relative to baseline
Magnitude	The amount of change in measurable parameter(s) or the VEC relative to existing conditions	• Negligible – No measurable change • Low – a measurable change in AoCC but residual effects cannot be distinguished from existing conditions within normal range of variability • Moderate – a measurable change potentially exceeding normal variability but not likely to pose a serious risk or benefit to AoCC • High – Measurable change that is likely to pose a serious risk or benefit to AoCC
Geographic Extent	The geographic area in which a residual effect of a defined magnitude occurs	• Project Area – Residual effect is restricted to the Project Area • LAA – Residual effect extends into the LAA • RAA – Residual effect extends into the RAA
Timing	Considers when the residual environmental effect is expected to occur, where applicable or relevant to the VEC	• No Sensitivity – Residual effect does not occur during critical life stages for SAR or SOCC using AoCC as habitat or timing does not affect AoCC • Moderate Sensitivity – Residual effect may occur during a lower sensitive period of a critical life stage for SAR or SOCC using AoCC as habitat • High Sensitivity – Residual effect occurs during a critical life stage for SAR or SOCC using the AoCC as habitat, or during culturally important activities



Table 16.6 Characterization of Predicted Environmental Effects of the Undertaking on Areas of Conservation Concern

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Duration	The period of time required until the measurable parameter(s) or the VEC returns to its existing (baseline) condition, or the residual effect can no longer be measured or otherwise perceived	• Short-term – Residual effect is restricted to no more than the duration of the construction phase (4 years) • Medium-term – Residual effect extends through the operation phase (30 years) • Long-term – Residual effect extends beyond the operation phase (greater than 30years) • Permanent – recovery to baseline conditions unlikely
Frequency	Identifies how often the residual effect occurs during the Project, during a specific phase of the Project, or during another specified time period	• Single event • Multiple irregular event – Occurs at no set schedule • Multiple regular event – Occurs at regular intervals • Continuous – Occurs continuously
Reversibility	Describes whether a measurable parameter(s) or the VEC can return to its existing condition after the Project activity ceases, including through active management techniques	• Reversible – Residual effect is likely to be reversed after activity completion and rehabilitation • Irreversible – Residual effect is unlikely to be reversed
Ecological / Socio-economic Context	Existing conditions and trends in the area where the residual effect occurs	• Undisturbed – Area is relatively undisturbed or not adversely affected by human activity • Disturbed – Area has been substantially previously disturbed by human development or human development is still present

16.3.2 Significance Definition

A significant adverse residual environmental effect on AoCC is defined as a Project-related environmental effect that:

- Results in changes to the habitat or species community structure or viability of a designated AoCC to an extent that the conservation objectives are not maintained.
- Results in permanent / irreversible loss of critical habitat as defined in a recovery plan or action strategy



16.3.3 Potential Environmental Effects, Project Pathways, and Measurable Parameters

Table 16.7 lists the potential Project effects on AoCC and provides a summary of the Project effect pathways and measurable parameters, where available, and units of measurement to assess potential effects. Potential environmental effects and measurable parameters were selected based on review of recent EAs for large development projects in NL, renewable energy projects in other parts of Canada, comments provided during engagement, and professional judgment. If measurable parameters are not applicable, a qualitative discussion is provided.

Table 16.7 Environmental Effects, Effect Pathways, and Measurable Parameters for AoCC

Environmental Effect(s)	Effect Pathway(s)	Measurable Parameter(s) and Units of Measurement
Change in Habitat in AoCC	- Direct loss or alteration of habitat arising from vegetation clearing and ground disturbance - Project activities and components may create disturbance effects to nearby habitat in intersected areas (i.e., noise, dust, visual)	Area (km²) of AoCC intersected by Project components

Project Interactions with AoCC

Table 16.8 uses checkmarks to indicate the routine Project activities that could interact with the VEC and result in the identified environmental effect(s) to be assessed. Immediately following Table 16.8, environmental effects pathways are briefly described for potential routine Project-related environmental effects and justification is provided in cases where no Project interaction with the VEC (and therefore no potential environmental effect on the VEC) is predicted.

Table 16.8 Project Interactions, Environmental Effects, and Environmental Effect Pathways

Project Activities	Environmental Effect to be Assessed
	Change in Habitat in AoCC
Construction	
Site Preparation and Civil Works (including turbine foundations, road construction, quarries, clearing, grubbing, blasting, cement production, and watercourse crossings)	✓
Transportation of Resources and Equipment (includes trucking, shipping and barging of materials)	✓
Construction / Installation, Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure	-
Installation and Commissioning of Wind Turbines	-
Installation and Commissioning of Collector Systems	✓



Table 16.8 Project Interactions, Environmental Effects, and Environmental Effect Pathways

Project Activities	Environmental Effect to be Assessed
	Change in Habitat in AoCC
Installation and Commissioning of Transmission Lines and Substations (including marine cable crossing)	✓
Installation and Commissioning of Hydrogen / Ammonia Production, and Storage Facilities and Associated Infrastructure (including Industrial water supply infrastructure)	-
Restoration of Existing Port Facilities (including pile driving and dredging)	-
Emissions, Discharges, and Wastes ¹	✓
Employment and Expenditures ²	-
Operation and Maintenance	
Presence, Operation, and Maintenance of Wind Farms (including wind turbines, access roads, and collector systems)	✓
Presence, Operation, and Maintenance of Transmission Lines and Substations	✓
Presence, Operation, and Maintenance of Hydrogen / Ammonia Production, and Storage, Facilities and Associated Infrastructure (includes marine discharge from treatment plant)	-
Presence, Operation, and Maintenance of Port Facilities (includes loading of ammonia and vessel maneuvering within Port)	-
Emissions, Discharges, and Wastes ¹	✓
Employment and Expenditures ²	-
Decommissioning and Rehabilitation	
Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure	-
Decommissioning and Rehabilitation of Wind Farms (including wind turbines, access roads, and collector systems)	✓
Decommissioning and Rehabilitation of Transmission Lines and Substations	✓
Decommissioning and Rehabilitation of Hydrogen / Ammonia Production, and Storage, Facilities and Associated Infrastructure	-
Decommissioning and Rehabilitation of Port Facilities	-
Emissions, Discharges, and Wastes ¹	✓
Employment and Expenditures ²	-



Avoidance measures will reduce potential direct interactions between Project components or activities and intersected AoCC or sensitive features by physically relocating these components and activities away from AoCC, where practicable. If avoidance is not possible, appropriate mitigation will be applied. In addition, some AoCC only intersect with associated transmission line RoWs, where smaller disturbance effects are anticipated.

In the absence of mitigation, the Project may interact with AoCC in the following ways:

- Site preparation and civil works including clearing vegetation, stripping soils, and grading for access road and turbine pad construction may alter habitats within AoCC
- Transportation of resources and equipment along the access road could result in decreased air quality, noise and vibration in AoCC, thereby affecting habitat and water quality of proximal salmon rivers. This interaction could also occur during operation and maintenance, and decommissioning and rehabilitation
- Installation and commissioning of collector systems, transmission lines and substations including clearing riparian vegetation may directly affect AoCC habitat, as well as salmon habitat quality related to run-off
- Emissions, discharges, and wastes that will occur as a result of construction, operation and maintenance, and decommissioning and rehabilitation may interact with AoCC that intersect or are adjacent to the Project Area

The following Project activities are not expected to result in a change to AoCC

- Construction / installation, presence, operation and maintenance, and decommissioning of temporary workforce accommodations and associated infrastructure, and presence, operation, and maintenance of temporary workforce accommodations and associated infrastructure will occur away from known AoCC
- Restoration of existing port facilities during construction, presence, operation, and maintenance of port facilities, and decommissioning and rehabilitation of port facilities will occur in the marine environment; however, no marine AoCC intersect the Project Area
- Restoration of existing port facilities (including pile driving and dredging)

16.3.4 Analytical Assessment Techniques and Level of Knowledge

Potential effects of the Project on AoCC were assessed quantitatively if information was available, and qualitatively when information was not available. Quantitative assessments included:

- GIS analysis of the Project footprint overlain on maps of AoCC to delineate potential habitat loss, supplemented with field measurements where available

Qualitative assessments were conducted that entailed the use of the best available imagery, professional judgement based on an understanding of the Project and potential effects in the AoCC, and the likely effectiveness of mitigation measures, supported by experience working on similar projects, scientific literature, industry best management practices, and regulatory guidelines, as available.



Assumptions and Conservative Approach

Several assumptions were employed in the assessment of Project effects on AoCC, resulting in conservative predictions of residual effects:

- A number of biophysical VECs are closely associated with, and are dependent on, the maintenance of ecological integrity within AoCC intersected and adjacent to Project components.
- The conservative assumptions and approaches used in the effects assessments of the Project on other VECs, listed in Section 16.4, contribute to the objectives and integrity of AOCC.

16.4 Mitigation Measures

A series of environmental management plans will be developed by WEGH2 to mitigate the effects of Project development on the environment. A list of mitigation measures to be applied throughout Project construction, operation and maintenance, and decommissioning and rehabilitation is provided in Section 26.2 and in the various biophysical chapters related to AoCC:

- Chapter 10 – Freshwater Fish and Fish Habitat
- Chapter 11 – Marine Environment and Use
- Chapter 12 – Wetlands and Vegetation, including Rare Plants
- Chapter 13 – Avifauna
- Chapter 14 – Bats
- Chapter 15 – Other Wildlife
- Chapter 20 – Land and Resource Use

16.4.1 Application of the Precautionary Principle to Project Mitigation Measures

The mitigation measures referenced in Section 16.4 and listed in Section 26.2 have been selected in consideration of the environmental effects pathways and include standard proven mitigation measures for the terrestrial and marine environments. The precautionary principle was used in determining mitigation measures for the Project; that is the absence of scientific certainty was not used as justification for omission of mitigation.

As a result of using the precautionary principle, it is expected that the mitigation measures presented are more than adequate for reducing effects to acceptable levels that are below thresholds for what would be considered an unacceptable effect.



16.5 Residual Environmental Effects

For each potential effect identified in Section 16.3.3, specific Project activities that may interact with the VEC and result in an environmental effect (i.e., a measurable change that may affect the VEC) are identified and described. The following sections describe the pathways by which a potential Project effect could result from Project activities in the absence of mitigation during each Project phase (i.e., construction, operation and maintenance, and decommissioning and rehabilitation). Mitigation and management measures (Section 26.2) are applied to avoid or reduce these potential pathways and resulting environmental effects. Residual effects are those remaining following implementation of mitigation, which are then characterized using the criteria defined in Section 16.3.1. A summary of predicted residual effects is provided in Section 16.5.2.

16.5.1 Change in Habitat in AoCC

A number of baseline studies completed for the Project provided comprehensive analyses of SAR and SOCC presence and critical habitat known or likely to occur in the Project Area and/or the LAA / RAA. Comprehensive assessment of effects for SAR / SOCC and their habitats were completed in other chapters of this document and the mitigation measures described are applicable to AoCC, as well as areas outside AoCC that are intersected by the Project Area and/or the LAA / RAA. Details of assessments completed in these other chapters are not repeated here. The relevant chapters include:

- Chapter 10 – Freshwater Fish and Fish Habitat
- Chapter 11 – Marine Environment and Use
- Chapter 12 – Wetlands and Vegetation, including Rare Plants
- Chapter 13 – Avifauna
- Chapter 14 – Bats
- Chapter 15 – Other Wildlife
- Chapter 20 – Land and resource Use

Table 16.9 provides a summary of AoCC intersections with Project components and lists key values of each AoCC. Commentary on adverse effects to the AoCC and the application of mitigation measures is presented as well as other relevant chapter references.



Table 16.9 Summary of Project Residual Effects on AoCCs Intersected by or Adjacent to the Project Area

AoCC	Key Values	Intersection or Adjacency to Project Components	Commentary	Other Relevant Chapters
Bras Mort Bog Proposed Reserve	Contains some of the largest, relatively undisturbed plateau bogs found on the Island. Provides important habitat for overwintering woodland caribou.	Intersection 36.2 km² of Bras Mort Bog is intersected by the Terrestrial LAA/RAA Directly intersects with Project transmission line RoW in section near Stephenville Crossing - 0.9 km² or 2.5% of the overall Reserve.	The area of this AoCC intersected by the transmission line occurs on its southwestern periphery. The Project EPP will be followed and work completed in or near this AoCC, will follow applicable mitigation measures relative to flora and fauna species that may occur there, including SAR and SOCC. The area intersected by the Project is a small part of the overall AoCC, 0.9 km². Standard mitigation such as avoiding breeding bird season and caribou overwintering sites, implementing dust control and noise reduction mitigation measures will reduce adverse interactions. WEGH2 will consult with Policy, Planning, and Natural Areas Division (NL DECC) and DFFA-WD in development of an Environmental Effects Mitigation and Monitoring Plan for this AoCC. WEGH2 predicts that the conservation objectives and integrity of this AoCC will not be substantively affected because of the Project.	Chapter 12 – Wetlands and Vegetation, including Rare Plants Chapter 13 – Avifauna Chapter 14 - Bats Chapter 15 – Other Wildlife
T'Railway Provincial Park	Stretches Island wide (900 km) from St. John's to Port aux Basques along the main line of the abandoned CN railbed. Provides access to many of the Island's representative natural and scenic landscapes. Serves as the Island's portion of the Trans-Canada Trail system. ATVs and snowmobiles are allowed. Hiking, scenic touring, and nature observation is encouraged and promoted.	Intersection 205 km of the T'Railway is intersected by the AoCC LAA / RAA. 2.9 km directly intersect the Project Area near the Codroy Wind Farm and the transmission line RoW near Stephenville Crossing	The area of this AoCC intersected by the transmission line occurs in two locations. WEGH2 will implement mitigation measures to protect public safety, given the publicly accessible nature of the T'Railway, The Project EPP will also be followed and work completed in or near this AoCC, will follow applicable mitigation measures relative to flora and fauna species that may occur there, including SAR and SOCC, as well as recreational values. The area intersected by the Project is a small part of the overall AoCC, 2.9 km. Standard mitigation such as avoiding breeding bird season, limiting public access to the Project site when public safety is an issue (e.g., around active construction), and implementing dust control and noise reduction mitigation measures will reduce adverse interactions. WEGH2 predicts that the conservation objectives and integrity of this AoCC will not be substantively affected because of the Project.	Chapter 20 – Land and Resource Use Chapter 22 - Heritage and Cultural Resources
Proposed pine marten habitat	Areas of critical habitat for the marten were identified by the Newfoundland Marten Recovery Team (2010) and was adopted by the federal government to assist with identification of critical habitat under SARA (Environment Canada 2013). Areas of critical habitat are meant to provide buffers against the effects of human activity that would be harmful to the marten's recovery.	Intersection Turbines and access roads do not overlap critical habitat currently identified by the province or under SARA. A portion of the transmission line intersects the periphery of critical habitat along the Trans-Canada Highway near Barachois Pond Provincial Park. Approximately 4.0 km² or 0.36% of proposed Newfoundland marten habitat within the AoCC LAA/RAA is intersected by the Project RoW near Stephenville Crossing	Area of intersection is small compared to the overall habitat available in the LAA / RAA and the intersection occurs on the periphery of proposed habitat area identified. There is an abundance of suitable habitat present in the LAA / RAA beyond this area of intersection. The Project EPP will be followed and work completed in or near this AoCC, will follow applicable mitigation measures relative to flora and fauna species that may occur there, including SAR and SOCC (e.g., martin). Standard mitigation such as implementing dust control and noise reduction mitigation measures will reduce adverse interactions. WEGH2 predicts that the conservation objectives and integrity of this AoCC will not be substantively affected because of the Project. WEGH2 will include marten in a SAR IMMP to be developed for the Project.	Chapter 15 – Other Wildlife



Table 16.9 Summary of Project Residual Effects on AoCCs Intersected by or Adjacent to the Project Area

AoCC	Key Values	Intersection or Adjacency to Project Components	Commentary	Other Relevant Chapters
Salmon Rivers	Cultural and economic importance in NL. High level of public concern with respect to maintaining healthy stocks and habitat. Riparian zones around rivers are often important habitat for rare plants. Robinson's River and Barachois River are scheduled salmon river and also SWA for listed rare plants. Robinson's River extends from approximately 1 km east of the Trans-Canada Highway west to the coast and intersects with the Project Area. Small yellow water-crowfoot (<i>Ranunculus gmelinii</i>) is an aquatic forb listed as endangered under the NL ESA (Chapter 12). One of only two known locations for this species is along the Robinsons River, where other vascular plant SOCC are also known to occur (BSA 4).	Intersection Brief intersections between 11 scheduled salmon rivers and SWAs for listed plants, and the transmission line RoW.	Mitigation measures, including identification and avoidance of sensitive areas prior to construction where feasible, will reduce the risk of adverse effects to salmon and their habitat, and rare flora. VEC specific mitigation measures as described in Chapters 10 and 12 will be implemented to reduce the risk of adverse effects. The Project EPP will be followed and work completed in or near this AoCC, will follow applicable mitigation measures relative to flora and fauna species that may occur there, including SAR and SOCC. The areas intersected by the Project are small compared to overall AoCC. Standard and VEC-specific mitigation such as implementing dust control and noise reduction mitigation measures will reduce adverse interactions. Fishing and the harvesting of fish resources will be strictly prohibited on Project work sites. Project personnel will not be permitted to fish while staying at the workforce accommodation camp(s) and will not be permitted to bring angling gear to the workforce accommodation camp(s). WEGH2 predicts that the conservation objectives and integrity of this AoCC will not be substantively affected because of the Project.	Chapter 10 – Freshwater Fish and Fish Habitat Chapter 12 – Wetlands and Vegetation, including Rare Plants Chapter 22 - Heritage and Cultural Resources
Sensitive Wildlife Areas	Sections of the riparian zones around the Barachois and Robinson's Rivers are considered SWAs for rare plants. As noted above, small yellow water-crowfoot (<i>Ranunculus gmelinii</i>) is an aquatic forb listed as endangered under the NL ESA (Chapter 12). One of only two known locations for this species is along the Robinsons River, where other vascular plant SOCC are also known to occur(BSA 4) Two small SWAs containing limestone barrens located on Table Mountain	Intersection Brief intersections between sections of riparian zones for two salmon rivers /SWAs and the transmission line RoW. Intersection Small intersections with the Project Area on Table Mountain.	VEC specific mitigation measures as described in Chapter 12 will be implemented to reduce the risk of adverse effects. The Project EPP will be followed and work completed in or near SWAs for plants will follow applicable mitigation measures relative to flora and fauna species that may occur there, including SAR and SOCC. A rare plant mitigation plan is anticipated to be created as well as a SARIMMP. In addition, standard and VEC- specific mitigation such as implementing dust control and noise reduction mitigation measures will reduce adverse interactions. The SWA areas on Table Mountain that are intersected by the Project are small compared to overall limestone barren habitat identified in the Limestone Barrens Species at Risk Recovery Plan (Limestone Barrens Species at Risk Recovery Team 2021). WEGH2 predicts that the conservation objectives and integrity of these SWAs will not be substantively affected because of the Project.	Chapter 12 – Wetlands and Vegetation, including Rare Plants
Cape St. George Transitional Reserve	An important limestone barrens site that is the most southerly occurring on the Island. Identified as a high-priority site in the Limestone Barrens SAR Recovery Plan. Home to several provincially endangered plant species (Mackenzie's sweetvetch, rock-dwelling sedge and wooly arnica and several rare plant species. Provides habitat for three black-legged kittiwake colonies. Certain areas on the proposed reserve are designated as sensitive plant areas (BSA-3 Terrestrial Environment Baseline Study).	Adjacent Approximately 18.1 km² is within the AoCC LAA / RAA. After avoidance mitigation measure applied, no direct intersection with Project components.	Because of adjacency there is potential for effects to the Reserve due to emissions, discharges and wastes, and from access created for Project components. These effects are possible during all Project phases. Standard and VEC specific mitigation such as avoiding breeding bird season, limiting vegetation clearing to only that required by the Project, implementing dust control and noise reduction mitigation measures will reduce adverse interactions. WEGH2 predicts that the conservation objectives and integrity of this AoCC will not be substantively affected because of the Project.	Chapter 12 – Wetlands and Vegetation, including Rare Plants Chapter 13 – Avifauna Chapter 14 - Bats Chapter 15 – Other Wildlife Chapter 22 - Heritage and Cultural Resources
Cape John Ecological Reserve	Nominated as a representative Western Newfoundland Forest natural region. Situated along a remote coastline encompassing the western portion of the Anguille Mountains. Remains largely undeveloped and intact.	Adjacent Approximately 213 km² is within the AoCC LAA / RAA. After avoidance mitigation measure applied, no direct intersection with Project components.	Because of adjacency there is potential for effects to the Reserve due to emissions, discharges and wastes, and from access created for Project components. These effects are possible during all Project phases. Standard and VEC specific mitigation such as avoiding breeding bird season, limiting vegetation clearing to only that required by the Project, and implementing dust control and noise reduction mitigation measures will reduce adverse interactions. WEGH2 predicts that the conservation objectives and integrity of this AoCC will not be substantively affected because of the Project.	Chapter 12 – Wetlands and Vegetation, including Rare Plants Chapter 13 – Avifauna Chapter 14 - Bats Chapter 15 – Other Wildlife Chapter 22 - Heritage and Cultural Resources



Construction Summary of Residual Effects

Based on Table 16.9, a summary of residual effects on change in Change in Habitat in AoCC during the construction phase is provided in Table 16.10.

Table 16.10 Summary of Effects by Project Component on Change in Habitat in AoCC During Construction

Project Site	Summary of Effect during Construction
Temporary Workforce Accommodations	As there are no intersections anticipated between the temporary workforce accommodations and AoCC (Table 16.8), no residual effects are anticipated.
Port au Port Wind Farm and Associated Infrastructure	- The Cape St. George Transitional Reserve is immediately adjacent to the Port au Port Wind Farm boundary. - Two small SWA containing limestone barrens intersect the Project Area on Table Mountain (Chapter 12). - Potential effects from emissions, discharges and wastes may occur. - Potential effects in AoCC (access) from the creation of access within the Project Area. - Potential effects will be managed through the application of standard and VEC specific mitigation measures which are described in Section 26.2 and the Project EPP, e.g., buffers, avoiding bird breeding season, dust control mitigation measures.
Codroy Wind Farm and Associated Infrastructure	- No intersections with AoCC, however the Cape John Ecological Reserve is immediately adjacent to the Codroy Wind Farm boundary. - Potential effects from emissions, discharges and wastes may occur. - Potential effects in AoCC (access) from the creation of access within the Project Area. - Potential effects will be managed through the application of standard and VEC specific mitigation measures which are described in Section 26.2 and the Project EPP, e.g., buffers, avoiding bird breeding season, dust control mitigation measures.
230 kV Transmission Lines and Substations	- RoW intersects 11 scheduled salmon rivers, including the Robinson River, along which a SWA occurs for SAR/SOCC flora. - RoW intersects approximately 4 km² of proposed marten critical habitat - RoW intersects a section of the NL T'Railway (2.9 km) - RoW intersects the Bras Mort Bog by 0.9 km² or 2.5% of its area. - Effects will be managed through the application of standard and VEC specific mitigation measures which are described in Section 26.2 and the Project EPP, e.g., buffers, avoiding bird breeding season, dust control mitigation measures.
Hydrogen / Ammonia Production and Storage Facilities	As there are no interactions anticipated between the hydrogen / ammonia plant and AoCC (Table 16.8), no residual effects are anticipated.
Port Facilities	As there are no interactions anticipated between the port facilities and AoCC (Table 16.8), no residual effects are anticipated.



Operation and Maintenance Summary of Residual Effects

During operation and maintenance, the primary source of interaction between the Project and habitat within AoCC will be because of physical intersections with the RoW. There is a potential for indirect effects in adjacent AoCC because of emissions and discharges; however mitigation measures will be applied. There is no evidence that bird or bat SAR/SOCC or their critical habitat is present in intersected or adjacent AoCC. VEC specific mitigation measures for birds and bats will be implemented however and appropriate monitoring and mitigation plans will be developed.

Based on the information in Table 16.9, a summary of residual effects on Change in Habitat during the operation and maintenance phase is provided in Table 16.11.

Table 16.11 Summary of Effects by Project Component on Change in Habitat in AoCC During Operation and Maintenance

Project Site	Summary of Effect during Operation and Maintenance
Port au Port Wind Farm and Associated Infrastructure	• The Cape St. George Transitional Reserve is immediately adjacent to the Port au Port Wind Farm boundary. • Two small SWA containing limestone barrens intersect the Project Area on Table Mountain (Chapter 12). • Potential effects from emissions, discharges and wastes may occur during operation of the wind farm. • Potential effects in AoCC (access) from the existence of access created for Project components. • VEC specific mitigation measures for birds and bats will be applied during operation of wind turbines. The SAR IMMP will include mitigation, monitoring, and adaptive management frameworks for possible effects on SAR / SOCC including bats and provincially managed bird species such as raptors. • Potential effects will be managed through the application of standard and VEC specific mitigation measures which are described in Section 26.2 and the Project EPP (e.g., buffers, avoiding bird breeding season, dust control mitigation measures).
Codroy Wind Farm and Associated Infrastructure	• No intersections with AoCC, however the Cape John Ecological Reserve is immediately adjacent to the Codroy Wind Farm boundary. • Potential effects from emissions, discharges and wastes may occur during operation of the wind farm • Potential effects in AoCC (access) from the existence of access created for Project components. • VEC specific mitigation measures for birds and bats will be applied during operation of wind turbines. The SAR IMMP will include mitigation, monitoring, and adaptive management frameworks for possible effects on SAR / SOCC including bats and provincially managed bird species. • Potential effects will be managed through the application of standard and VEC specific mitigation measures which are described in Section 26.2 and the Project EPP (e.g., buffers, avoiding bird breeding season, dust control mitigation measures).



Table 16.11 Summary of Effects by Project Component on Change in Habitat in AoCC During Operation and Maintenance

Project Site	Summary of Effect during Operation and Maintenance
230 kV Transmission Lines and Substations	• RoW intersects 11 scheduled salmon rivers, including the Robinson River, along which a SWA occurs for SAR/SOCC flora. • RoW intersects approximately 4 km² of proposed marten critical habitat • RoW intersects a 2.9 km section of the NL T'Railway • RoW intersects the Bras Mort Bog by 0.9 km² or 2.5% of its area. • Potential effects will be managed through the application of standard mitigation and VEC specific measures which are described in Section 26.2 and the Project EPP (e.g., buffers, avoiding bird breeding season, dust control mitigation measures).
Hydrogen / Ammonia Production and Storage Facilities	• As there are no interactions anticipated between the hydrogen / ammonia plant and AoCC (Table 16.8), no residual effects are anticipated.
Port Facilities	• As there are no interactions anticipated between the port facilities and AoCC (Table 16.8), no residual effects are anticipated.

Decommissioning and Rehabilitation Summary of Residual Effects

The effects of decommissioning and rehabilitation activities on habitat within AoCC are anticipated to be similar to construction. For the purposes of assessment, it is assumed that physical infrastructure will be removed from the site (i.e., turbines, transmission poles). It is assumed that roads will not be decommissioned and associated culverts / bridges will be left in place. Based on the information in Table 16.9, a summary of residual effects on Change in Habitat in AoCC during the decommissioning and rehabilitation phase is provided in Table 16.12.

Table 16.12 Summary of Effects by Project Component on Change in Habitat in AoCC During Decommissioning and Rehabilitation

Project Site	Summary of Effect during Decommissioning and Rehabilitation
Temporary Workforce Accommodations	• As there are no interactions anticipated between the temporary workforce accommodations and AoCC (Table 16.8), no residual effects are anticipated.
Port au Port Wind Farm and Associated Infrastructure	• The Cape St. George Transitional Reserve is immediately adjacent to the Port au Port Wind Farm boundary. • Two small SWA containing limestone barrens intersect the Project Area on Table Mountain (Chapter 12). • Potential effects from emissions, discharges and wastes during decommissioning may occur. • Potential effects in AoCC (access) during decommissioning of roads located adjacent to AoCC, if undertaken. • If required, habitat restoration will be undertaken in adjacent AoCC during decommissioning phase. • Potential effects will be managed through the application of standard and VEC specific mitigation measures which are described in Section 26.2 and the Project EPP (e.g., buffers, avoiding bird breeding season, dust control mitigation measures).



Table 16.12 Summary of Effects by Project Component on Change in Habitat in AoCC During Decommissioning and Rehabilitation

Project Site	Summary of Effect during Decommissioning and Rehabilitation
Codroy Wind Farm and Associated Infrastructure	• No intersections with AoCC, however the Cape John Ecological Reserve is immediately adjacent to the Codroy Wind Farm boundary. • Potential effects from emissions, discharges and wastes during decommissioning may occur. • Potential effects in AoCC (access) during decommissioning of roads located adjacent to AoCC, if undertaken. • If required, habitat restoration will be undertaken in adjacent AoCC during decommissioning phase. • Potential effects will be managed through the application of standard and VEC specific mitigation measures which are described in Section 26.2 and the Project EPP (e.g., buffers, avoiding bird breeding season, dust control mitigation measures).
230 kV Transmission Lines and Substations	• RoW sections intersecting AoCC (scheduled salmon rivers marten critical habitat, the NL T'Railway and the Brad Mort Bog) will be decommissioned • If required, habitat restoration will be undertaken in adjacent AoCC during decommissioning phase. Potential Effects will be managed through the application of standard and VEC specific mitigation measures which are described in Section 26.2 and the Project EPP (e.g., buffers, avoiding bird breeding season, dust control mitigation measures).
Hydrogen / Ammonia Production and Storage Facilities	• As there are no interactions anticipated between the hydrogen / ammonia plant and AoCC (Table 16.8), no residual effects are anticipated.
Port Facilities	• As there are no interactions anticipated between the port facilities and AoCC (Table 16.8), no residual effects are anticipated.

16.5.2 Residual Environmental Effects Summary

Summary of Predicted Environmental Effects

The Project will avoid AoCC where possible, and buffers will be maintained between sensitive features (e.g., salmon rivers, protected areas, transitional reserves, SWAs) and Project activities in areas where work in, or in proximity to, AoCC must be carried out. With the implementation of applicable VEC specific mitigation measures described in Section 22.6 and Chapter 12, and adherence the EPP, the residual adverse environmental effects are considered to be low in magnitude for all Project components and activities, within the Project Area, short to long-term in duration, moderate sensitivity to timing, occurring continuously, and reversible. Project activities will occur within undisturbed ecological and socioeconomic settings in AoCC (except for the hydrogen/ammonia plant area at the port). The residual environmental effects of a change in habitat within AoCC are considered reversible because post-decommissioning it is expected that decommissioned areas will be returned to AoCC.

A rare plant mitigation plan and a SAR IMMP will be developed for SAR that may occur in the Project Area and LAA / RAA, and mitigations identified for these species will be applicable to AoCC where SAR may occur.



Residual Environmental Effects Characterization

Table 16.13 summarizes the predicted environmental effects (residual effects) of the undertaking on AoCC.

Table 16.13 Summary of Predicted Environmental Effects of the Undertaking on AoCC

Residual Effect	Residual Effects Characterization							
	Nature	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological and Socio-economic Context
Construction								
Change in Habitat	A	L	PA	MS	ST	C	R	D/U
Operation and Maintenance								
Change in Habitat	A	L	PA	MS	LT	C	R	D/U
Decommissioning and Rehabilitation								
Change in Habitat	A	L	PA	MS	ST	C	R	D/U
KEY: Nature: <i>P: Positive</i> <i>A: Adverse</i> <i>N: Neutral</i> Geographic Extent: <i>PA: Project Area</i> <i>LAA: Local Assessment Area</i> <i>RAA: Regional Assessment Area</i> Timing: <i>NS: No Sensitivity</i> <i>MS: Moderate Sensitivity</i> <i>HS: High Sensitivity</i> Reversibility: <i>R: Reversible</i> <i>I: Irreversible</i> Magnitude: <i>N: Negligible</i> <i>L: Low</i> <i>M: Moderate</i> <i>H: High</i> Duration: <i>ST: Short-term</i> <i>MT: Medium-term</i> <i>LT: Long-term</i> Frequency: <i>S: Single Event</i> <i>IR: Irregular Event</i> <i>R: Regular Event</i> <i>C: Continuous</i> Ecological / Socio-Economic Context: <i>D: Disturbed</i> <i>U: Undisturbed</i>								



Determination of Significance

For the purposes of this EA, a significant adverse residual environmental effect on AoCC is defined as a Project-related environmental effect that results in:

- Results in changes to the habitat or species community structure or viability of a designated AoCC to an extent that the conservation objectives are not maintained.
- Results in permanent / irreversible loss of critical habitat as defined in a recovery plan or action strategy

In consideration of the VEC-specific significance criteria defined above, and with application of avoidance (through Project design), and mitigation measures, the residual effects of routine Project activities on AoCC are predicted to be not significant. This conclusion is based primarily on limited intersections with AOCC directly or indirectly, and the effects analyses and mitigation measures presented in the other relevant VEC chapters that indicate no substantial adverse effects on: habitat or species community structure; or viability of a designated AoCC to an extent that the conservation objectives are not maintained. Effects assessment in other VEC chapters do not indicate that the Project will result in permanent or irreversible loss of critical habitat for flora or fauna species as defined in a recovery plan or action strategy.

The Project has been designed to avoid adverse effects to AoCC through careful planning of the placement of infrastructure and shifting locations of activities away from AoCC boundaries. Where avoidance was not feasible, the application of best practices in accordance with the Project construction EPP and other standard mitigation measures will be employed to reduce the potential for effects and thus maintain the integrity of AoCCs.

16.6 Prediction Confidence

The overall determination of significance for effects to change in habitat in AoCC is made with a high level of confidence given that Project effects are well known and documented, and best management practices and standard mitigation measures will be in place when working in and around AoCC. The conservation objectives of the AoCC potentially affected by the Project will not be affected, nor is the overall integrity of these areas expected to change as a result of the Project. Mitigation measures applied will be in accordance with permits, approvals and the Project EPP. The potentially affected SAR and SOCC occurring in AoCC are well studied, and their habitat preferences are well known to allow for prediction of effects. Overall, given the mitigation measures proposed for work in and near AoCCs, the determination of significance for effects to AoCCs is made with a high level of confidence. Avoidance and the use of buffers contribute to low magnitude effects to the physical features of AoCCs as a result of Project activities.



16.7 Follow-Up and Monitoring

Follow-up and monitoring is intended to verify the accuracy of predictions made during the EA, to assess the implementation and effectiveness of mitigation, and to manage Project activities adaptively, if required. Follow-up and monitoring plans may be required for VECs closely associated with AoCC (e.g., Fish and Fish Habitat, Other Wildlife, Wetlands, Vegetation and Rare Plants, Avifauna, and Bats). AoCC will rely on follow-up and monitoring plans for these other VECs to monitor and address potential effects within AoCC boundaries. Compliance monitoring, where required by permitting or regulations, will be conducted to confirm that mitigation measures are properly implemented. Should an unexpected deterioration of the environment be observed as part of follow-up and/or monitoring, intervention mechanisms will include the adaptive management process. This may include identification of existing and/or new mitigation measures to be implemented to address it (e.g., restricted access in certain areas).

16.8 Capacity of Renewable Resources and Effects on Biological Diversity

The potential environmental effects of the Project on AoCC were thoroughly assessed. The assessment concluded that routine Project activities are not likely to result in significant residual adverse effects on AoCC. Potential interactions between the Project and AOCC are not anticipated to adversely affect renewable resources. Adverse Project-related effects on biological diversity that exceed the limits of natural variability or affect the long-term viability of biological diversity in the LAA / RAA are not anticipated with respect to AoCC. Therefore, adverse Project-related effects on biological diversity, are not anticipated with respect to AoCC.

16.9 Predicted Future Environmental Conditions if the Project Does Not Proceed

The Project is located in an area that has been designated for wind farm development, and it is likely that other wind farm projects would occur in this area if this Project were not to proceed. Future projects are anticipated to have similar effects on AoCC. Should the Project Area remain undeveloped, the predicted future condition of AoCC would be relatively unchanged from that discussed in the existing environment portion of this assessment (Section 16.2 and BSA-3).

If the Project does not proceed, it would be expected that protections for AoCC would remain in place and the habitats and species for which they were designated would continue to be protected. If no Project-related effects are experienced in the AoCC, no adverse effects are expected to habitat quality in the AoCC, nor to SAR or SOCC species that may occur there. Unless other development occurs in the LAA / RAA, very little change is expected to future conditions of AoCC in the LAA / RAA.



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17.0 Economy, Employment and Business

17.1 Scope of Assessment

Economy, employment and business have been assessed as a valued environmental component (VEC) because economic conditions may be affected by the construction, operation and maintenance, decommissioning and rehabilitation, and closure of the Project. Employment and business support the economic livelihoods of residents and provide associated social benefits stemming from earned income. Economic effects (e.g., labour, labour income, and contributions to Gross Domestic Product [GDP] and government revenues) are of interest to the public, stakeholders, regulators, Indigenous groups, and governments.

The assessment of economy, employment and business is linked with the assessment of Land and Resource Use (Chapter 20) with respect to effects on outfitters. Other sections that are supported by components of this assessment include:

- Communities (Chapter 18) with respect to changes in demand for community infrastructure and services due to changes in population (stemming from Project employment-related effects), as well as changes in community well-being due to changes in employment and income;
- Land and Resource Use (Chapter 20) with respect to outfitter operators.

17.1.1 Regulatory and Policy Setting

The Project is subject to the Newfoundland and Labrador *Environmental Protection Act* (NL EPA).

The provincial Environmental Impact Statement (EIS) Guidelines issued for the Project require that descriptions of labour force requirements and economic benefits to Newfoundland and Labrador (NL) are provided. The EIS Guidelines also require that effects on outfitters be considered.

17.1.2 Boundaries

17.1.2.1 Spatial Boundaries

The following spatial boundaries were used to assess Project effects, including residual environmental effects, on economy, employment and business in areas surrounding the Project components (Figure 17.1):

- Project Area: The Project Area encompasses the immediate area in which Project activities and components occur, and is comprised of the following distinct areas: the Port au Port Wind Farm, the Codroy Wind Farm, the Hydrogen/Ammonia Production and Storage Facility (hydrogen / ammonia plant), Port Facilities, and the 230 kV Transmission Lines, as well as associated infrastructure, including roads, substations, and water supply infrastructure. The Project Area is the anticipated area of direct physical disturbance associated with the construction, operation, decommissioning,



rehabilitation and closure of the Project. In addition to encompassing the immediate area in which Project components and activities will occur, the Project Area also includes a buffer of up to 300 m for access roads and turbines and a 350 m corridor to accommodate the 70 to 75 m wide RoW for the transmission line. These buffers allow flexibility for the micro-siting of Project components during detailed design, based on technical considerations as well as the avoidance of environmentally sensitive areas, where practicable.

- **Local Assessment Area (LAA):** The LAA for this VEC is Statistics Canada Census Division (CD) No. 4., unorganized Statistics Canada Census Subdivisions No. 3., H and J, as well as the Town of Channel-Port aux Basques and the City of Corner Brook.
- **Regional Assessment Area (RAA):** The RAA is an area that establishes the context for determining the significance of Project-specific effects and is the area that informs the assessment of cumulative effects. The RAA for this VEC is Newfoundland and Labrador. This provincial scale was selected due to the way Project impacts are measured (i.e., GDP, which is measured at a provincial level, the location of regional businesses (i.e., eastern Newfoundland), and the availability of granular data in NL.

17.1.2.2 Temporal Boundaries

The temporal boundaries for the assessment of potential effects on economy, employment and business include:

- **Construction:** Overall, the construction phase of the Project will be from Q4 2023 through Q2 2027, pending EA approval and receipt of other required permits and approvals. Early civil works are planned to start Q4 2023 through Q3 2024. Construction of the Port au Port Wind Farm and associated infrastructure is expected to start in Q3 2024 with completion of the construction in Q4 2026. Construction of the Codroy Wind Farm and associated infrastructure is expected to start in Q4 2025 with completion in Q1 2027. The hydrogen / ammonia plant will be constructed in phases from Q2 2024 to Q1 2026. Grid power sources are planned for hydrogen production in 2025 until March 2026, when the electrolyzer is commissioned.
- **Operation and maintenance:** Wind farm commissioning is anticipated to start in Q1 2026 at the Port au Port Wind Farm and in Q2 2027 at the Codroy Wind Farm. The 600 MW electrolyzer is expected to be commissioned in Q1 2026. The operational life of the Project is 30 years at each site.
- **Decommissioning and rehabilitation:** After a 30-year operational life, the decommissioning phase is anticipated to occur during 2057 and 2058. Decommissioning is anticipated to begin in Q1 2057 at the Port au Port Wind Farm, with completion in Q3 2058 at the Codroy Wind Farm.





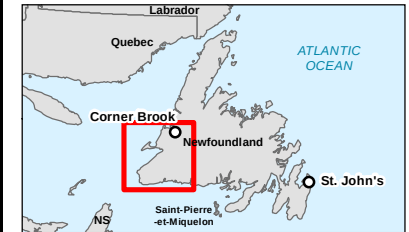
- Local Service District
- Municipality
- Census Subdivision
- Census Division
- Proposed Project Features
 - Project Area
 - Local Assessment Area
- Other Features
 - Transmission Line, Existing
 - Trans-Canada Highway
 - Road
 - Contour (100 m)
 - Watercourse
 - Waterbody
 - Forested Area



0 10 20 km
(At original document size of 8.5x11)
1:1,100,000

Notes

- Coordinate System: NAD 1983 CSRS UTM Zone 21N
- Data Sources: Client, Statistics Canada, GovNL
- Background: NRCan, CanVec



Project Location
Stephenville
NL

Prepared by MB on 2023-07-25
QR by AW on 2023-07-20

Client/Project
World Energy GH2
Project Nujio'qonik

121417233_027b

Figure No.

17.1

Title

Local Assessment Area

17.2 Existing Environmental Conditions

A characterization of the existing conditions within the spatial boundaries defined in Section 17.1.2.1 is provided in the following sections. This includes a discussion of the influences of past and present physical activities on the VEC, leading to the current conditions. An understanding of the existing conditions for the VEC within the spatial area being assessed is a key requirement in the prediction of potential Project effects provided in Section 17.5.

17.2.1 Methods

Secondary sources of information were used to describe existing conditions in the LAA and RAA. Secondary information included government sources (e.g., Statistics Canada, Government of NL), publicly available data and literature, as well as previously prepared information (e.g., reports, studies) submitted to World Energy GH2 from Indigenous groups and local communities.

Much of this chapter relies on government databases, including Census data from Statistics Canada. Available data that was used includes population, education, occupational and industry information, wages, and labour. Statistics Canada regularly suppresses (i.e., selectively does not disclose) survey information to protect the identity of individuals and to address data quality issues. The 2021 Census of the Population (Census), which is used in this chapter is subject, in part, to data suppression by Statistics Canada. Results of engagement with stakeholders and Indigenous groups have also been integrated into the description of existing conditions, where applicable.

17.2.2 Population

As summarized in Table 17.1, the total population in 2021 of the LAA was 42,733, of which 51.3% were female, a 5.0% decrease since 2016 (Statistics Canada 2017, 2022). Total population decreases in the LAA were greater than the RAA average of 2.0%. Corner Brook, the largest community in the LAA, accounted for 45.2% (19,333 persons) of the total population. 30.6% or 13,095 persons (51.7% female) within the LAA identified as Indigenous, compared to the RAA average of 9.1%.



Table 17.1 Population Change – 2016 to 2021

Location	Total Population			2016 – 2021 % Change		
	Total	Men+ ¹	Women+ ²	% Change (Total)	% Change (Men+)	% Change (Women+)
Census Division No. 3, Subdivision H	562	280	280	-25.8%	-28.6%	-23.2%
Census Division No. 3, Subdivision J	38	X	X	-34.2%	X	X
Census Division No. 4	19,253	9,545	9,710	-5.9%	-4.4%	-7.4%
<i>Census Division No. 4, Subdivision A</i>	1,530	780	750	-11.1%	-10.9%	-11.3%
<i>Census Division No. 4, Subdivision B</i>	1,140	580	555	-3.0%	-0.9%	-6.3%
<i>Census Division No. 4, Subdivision C</i>	591	310	275	-26.4%	-24.2%	-30.9%
<i>Census Division No. 4, Subdivision D</i>	1,212	625	590	29.0%	28.8%	30.5%
<i>Stephenville</i>	6,540	3,150	3,390	-1.3%	1.4%	-3.8%
<i>Census Division No. 4, Subdivision E</i>	1,467	750	715	-33.4%	-33.3%	-33.6%
Corner Brook	19,333	9,255	10,080	-2.5%	-1.8%	-2.9%
Channel-Port aux Basques	3,547	1,690	1,855	-14.7%	-12.1%	-17.0%
Total LAA	42,733	20,770	21,925	-5.4%	-4.2%	-6.3%
Newfoundland and Labrador (RAA)	510,550	250,075	260,475	-1.8%	-1.5%	-2.0%
Indigenous Population ³						
Census Division No. 3, Subdivision H	50	25	25	0.0%	20.0%	-20.0%
Census Division No. 3, Subdivision J	X	X	X	X	X	X
Census Division No. 4	8,290	4,105	4,190	3.8%	4.3%	3.6%
<i>Census Division No. 4, Subdivision A</i>	75	30	45	-133.3%	-233.3%	-66.7%
<i>Census Division No. 4, Subdivision B</i>	360	200	155	23.6%	25.0%	19.4%
<i>Census Division No. 4, Subdivision C</i>	425	230	195	-17.7%	-15.2%	-23.1%
<i>Census Division No. 4, Subdivision D</i>	625	315	310	48.0%	46.0%	50.0%
<i>Stephenville</i>	2,435	1,105	1,330	11.5%	14.5%	9.0%



Table 17.1 Population Change – 2016 to 2021

Location	Total Population			2016 – 2021 % Change		
	Total	Men+ ¹	Women+ ²	% Change (Total)	% Change (Men+)	% Change (Women+)
<i>Census Division No. 4, Subdivision E</i>	780	420	360	-26.3%	-20.2%	-33.3%
Corner Brook	4,620	2,125	2,495	-0.2%	-10.6%	8.6%
Channel-Port aux Basques	135	75	60	-18.5%	26.7%	-75.0%
Total Indigenous LAA	13,095	6,330	6,770	2.1%	-0.4%	4.7%
Newfoundland and Labrador (RAA)	46,545	22,520	24,030	1.8%	1.8%	1.7%
Notes: ¹ This category includes men (and/or boys), as well as non-binary persons. ² This category includes women (and/or girls), as well as non-binary persons. ³ Indigenous and non-Indigenous totals may not sum to equal total population counts because they are based on a 25% population sample size. X – no information available. 2021 'Total Population' and 'Indigenous Population' data from 2021 Census of the Population – Census Profile. Values shown in "Total" columns are the sum of male and female Census Subdivision (CSD) subsets taken from Statistics Canada's 2021 Census Profile (Census of the Population). Due to Statistics Canada rounding (Statistics Canada 2022) totals may not exactly align with those shown on CSD Census Profiles and may not sum across tables. Source: Statistics Canada 2022						

17.2.3 Education Attainment

Educational attainment levels for residents of the LAA and RAA in 2021 are summarized in Table 17.2. Overall, within the LAA, 49.3% of the total population had completed post-secondary education compared to the RAA average of 51.8% (Statistics Canada 2022). Women+¹ within the LAA accounted for a greater proportion of the total population with a college or university certificate, diploma or degree at bachelor level or above, while men+² accounted for a greater proportion of the population with an apprenticeship or trades certificate or diploma.

¹ This category includes women (and/or girls), as well as some non-binary persons.

² This category includes men (and/or boys), as well as some non-binary persons.



Table 17.2 Education Attainment in LAA and RAA – 2021

Educational Attainment	LAA				RAA			
	Total		Men+ ¹ (%)	Women+ ² (%)	Total		Men+ (%)	Women+ (%)
	Total	Percent			Total	Percent		
No certificate, diploma, or degree	8,350	22.8%	49.8%	50.2%	88,710	20.4%	50.9%	49.1%
High school diploma or equivalency certificate	10,215	27.9%	46.3%	53.7%	119,855	27.6%	47.1%	52.9%
Apprenticeship or trades certificate or diploma	3,725	10.2%	73.8%	26.2%	42,715	9.8%	73.6%	26.4%
College, CEGEP or other non-university certificate or diploma	8,880	24.2%	41.3%	58.7%	101,680	23.4%	43.3%	56.7%
University certificate or diploma below bachelor level	680	1.9%	44.1%	53.7%	8,810	2.0%	41.9%	58.2%
Bachelor's degree or higher	4,775	13.0%	41.8%	58.1%	72,190	16.6%	42.0%	58.0%
Notes: ¹ This category includes men (and/or boys), as well as some non-binary persons. ² This category includes women (and/or girls), as well as some non-binary persons. Source: Statistics Canada 2022								



17.2.4 Employment by Occupation

Table 17.3 provides a summary of LAA employment (by gender) by occupations. Generally, men+ make up a larger proportion of workers within the LAA. Sales and service occupations make up the highest number of total LAA labour force works (4,815, 57.8% women+), followed by trades, transport and equipment operators (and related) (3,380, 8.4% women+), and occupations in education, law, social, community and government services (2,965, 69.8% women+).

Table 17.3 LAA Employment by Occupation – 2021

Employment by Occupation	Total	Men+¹ (%)	Women +² (%)
Legislative and senior management occupations	95	57.9%	42.1%
Business, finance and administration occupations	1970	26.9%	73.1%
Natural and applied sciences and related occupations	715	82.5%	17.5%
Health occupations	1945	19.3%	80.7%
Occupations in education, law and social, community and government services	2965	30.2%	69.8%
Occupations in art, culture, recreation and sport	275	34.5%	65.5%
Sales and service occupations	4815	42.2%	57.8%
Trades, transport and equipment operators and related occupations	3380	91.6%	8.4%
Natural resources, agriculture and related production occupations	660	84.1%	15.9%
Occupations in manufacturing and utilities	525	82.9%	17.1%
Notes: ¹ This category includes men (and/or boys), as well as some non-binary persons. ² This category includes women (and/or girls), as well as some non-binary persons. Source: Statistics Canada 2022			

Approximately 95% of the RAA trade workforce is employed within Canada (JC 2023b). While a breakdown of the percentages of workers located in the RAA and LAA is not available, current NL projects that are substantial contributors to the RAA trade workforce include the White Rose project in Argentia, Voisey's Bay and Iron Ore Company of Canada (IOC) expansion in Labrador, Come by Chance refinery refurbishment, and the building of the Holyrood Marine Base. Equinor's decision to postpone Bay du Nord for up to three years will assist in labour capacity for the Project, as more workers will be available, and the conclusion of the West White Rose project, which is scheduled to end by late 2024, will provide an additional 1,200 construction workers in the RAA (JC 2023b).



17.2.5 Individual Income

This section presents information on 2021 total income and employment income (annual, before-tax) for individuals within the LAA and RAA. Total income represents the sum of regular and recurring monetary receipts from part-time and full-time employment income, income from investment sources, income from employer and personal pension sources, other regular cash income (e.g., child support payments and spousal support payments), and income from government sources (e.g., income support) (Statistics Canada 2022). Employment income is the sum of wages, salaries, tips, commissions, and net income from self-employment (Statistics Canada 2022).

Total incomes (mean and median) and employment incomes (mean and median) of the LAA were lower than RAA (provincial) incomes (Table 17.4) in 2020. In each case (i.e., LAA and RAA [provincial] averages), total incomes and employment incomes (mean and median) were higher among men+ than women+.

Table 17.4 2021 Individual Income (Annual – Before Tax)

Topic	LAA			RAA		
	Total	Men+	Women+	Total	Men+	Women+
Weighted median total income (\$ (2020)	33,300	36,800	30,200	36,800	42,000	32,400
Weighted median employment income (\$ (2020)	27,700	29,800	25,700	31,600	37,600	27,400
Mean total income (2020)	41,260	46,180	36,780	48,440	56,000	41,280
Mean employment income (\$ (2020)	37,620	41,880	33,380	45,520	52,900	37,840
Source: Statistics Canada 2022						

17.2.6 Labour and Business Capacity

Location quotients (LQ) provide a measure of the intensity of employment in a given sector in a region (i.e., the LAA) relative to the level of employment in that sector to a reference region (i.e., the RAA), and are commonly used to assess the labour capacity and concentration of economic activities in a smaller area relative to an overarching region. Critical values for the LQ analysis are as follows:

- LQ > 1.0 – the LAA has a higher intensity of employment in the given sector relative to the RAA.
- LQ = 1.0 – the LAA has the same intensity of employment in the given sector relative to the RAA.
- LQ < 1.0 – the LAA has a lower intensity of employment in the given sector relative to the RAA.



Where the LQ is greater than 1.25, the LAA can be considered to have a concentration of economic activity in the specific sector relative to the RAA and may be an indication that the local economy is specialized in this sector and/or has capacity to support development in this sector. Conversely, an LQ of less than 1.0 may suggest that the LAA does not have the capacity to support development in this sector³.

Table 17.5 provides the LQ for the LAA relative to the RAA in sectors areas related to the Project (using information provided by Statistics Canada). In nearly every category, the LAA has a lower specialization and capacity to enhance the respective sectors compared to the RAA. The exception is in transportation and warehousing, which has a LQ value of 1.28. This suggests that the LAA has a specialization in transportation and warehousing and may have capacity to address additional demand that will result from the Project. Section 17.4 provides mitigation and enhancement measures that indicates WEGH2 will provide training for operational staff to assist in developing the required labour to fulfill the demands of the Project.

Table 17.5 Labour Force Population Aged 15 Years and Over by Sector, Location Quotients, 2021

Industry / Sector	Location Quotient (LAA)
Mining, quarrying, oil and gas	0.53
Construction	0.86
Utilities	0.60
Manufacturing	0.73
Transportation and warehousing	1.28
Professional, scientific and technical services	0.60
Source: Labour information from Statistics Canada 2022	

Similarly, the LQ values can demonstrate the level of business capacity in the LAA to meet the demands of the Project and can indicate that certain goods or services in specific sectors may need to be imported. There are over 600 businesses in the LAA, however, the top two types of businesses are retail firms (17% of businesses in the LAA) and personal services (14%) (JC 2023b). This suggests that the LAA may not have the required level of businesses to locally supply the demands of the Project, and that imports will likely be required.

³ Employment statistics in these sectors may not be fully correlated with a complete labour skillsets and it is expected that local expertise within each of these industry/sectors are transferrable to other industry/sectors.



17.3 Assessment Criteria and Methods

This section describes the criteria and methods used to assess environmental effects on Economy, Employment and Business. Residual environmental effects (Section 17.5) are assessed and characterized using criteria defined in Section 17.3.1, including direction, magnitude, geographic extent, timing, duration, frequency, reversibility, and ecological or socio-economic context. The assessment also evaluates the significance of residual effects using threshold criteria or standards beyond which a residual environmental effect is considered significant. The definition of a significant effect on Economy, Employment and Business is provided in Section 17.3.2. Section 17.3.3 identifies the environmental effects to be assessed, including effect pathways and measurable parameters. This is followed by the identification of potential Project interactions with this VEC (Section 17.3.4). Analytical assessment techniques employed for the assessment of potential Project-related environmental effects on economy, employment and business are provided in Section 17.3.5. The assumptions that were made to support a conservative approach to the assessment of residual effects on economy, employment and business are described in Section 17.3.5.1.

17.3.1 Residual Effects Characterization

Table 17.6 presents definitions for the predicted environmental effects characterization of the undertaking on economy, employment and business. The criteria are used to describe the potential residual effects that remain after mitigation and enhancement measures have been implemented. Quantitative measures have been developed, where possible, to characterize residual effects. Qualitative considerations are used where quantitative measurement is not possible.

Table 17.6 Characterization of Predicted Environmental Effects of the Undertaking on Economy, Employment and Business

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Nature	The long-term trend of the residual effect	• Neutral – No net change in the measurable parameter(s) for economy, employment and business relative to baseline • Positive – A residual effect that moves the measurable parameter(s) in a direction beneficial to economy, employment and business relative to baseline • Adverse – A residual effect that moves the measurable parameter(s) in a direction detrimental to Economy, Employment and Business relative to baseline
Magnitude	The amount of change in measurable parameter(s) of the VEC relative to existing conditions	• Negligible – No measurable change • Low – A measurable change in employment and economy but residual effects cannot be distinguished from existing conditions within normal range of variability • Moderate – A measurable change but not likely to pose a serious risk or benefit to employment and economy • High – Measurable change that is likely to pose a serious risk or benefit to employment and economy



Table 17.6 Characterization of Predicted Environmental Effects of the Undertaking on Economy, Employment and Business

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Geographic Extent	The geographic area in which a residual effect of a defined magnitude occurs	• Project Area – Residual effect is restricted to the Project Area • LAA – Residual effect extends into the LAA • RAA – Residual effect extends into the RAA
Timing	Considers when the residual environmental effect is expected to occur, where applicable or relevant to the VEC.	• No Sensitivity – Residual effect does not occur during critical life stage or timing does not affect Economy, Employment and Business • Moderate Sensitivity – Residual effect may occur during a lower sensitive period of a critical life stage • High Sensitivity – Residual effect occurs during a critical life stage or culturally important activities
Duration	The period of time required until the measurable parameter(s) or the VEC returns to its existing (baseline) condition, or the residual effect can no longer be measured or otherwise perceived	• Short term – Residual effect restricted to construction • Medium term – Residual effect extends through the operation and maintenance phase (30 years) • Long term – Residual effect extends beyond the operation and maintenance phase (greater than 30 years) • Permanent – Recovery to baseline conditions unlikely
Frequency	Identifies how often the residual effect occurs during the Project, during a specific phase of the Project, or during another specified time period	• Single event – Occurs only once • Multiple irregular event – Occurs at no set schedule • Multiple regular event – Occurs at regular intervals • Continuous – Occurs continuously
Reversibility	Describes whether a measurable parameter(s) or the VEC can return to its existing condition after the Project activity ceases, including through active management techniques	• Reversible – Residual effect is likely to be reversed after activity completion and rehabilitation • Irreversible – Residual effect is unlikely to be reversed
Ecological / Socio-economic Context	Existing conditions and trends in the area where the residual effect occurs	• Resilient – VC is able to assimilate the additional change • Not Resilient – VC is not able to assimilate the additional change because of having little tolerance to imposed stresses due to fragility or near a threshold



17.3.2 Significance Definition

A significant residual adverse effect on Economy, Employment and Business is defined as a residual Project-related change to the environment that results in any of the following:

- Distinguishable⁴ from current conditions and trends; and cannot be managed or mitigated through adjustments to programs, policies, plans, or through other mitigation or enhancement. A significant adverse effect occurs if there are residual adverse effects disproportionately experienced by one or more identified sub-populations.

The residual effects assessment considers both positive and adverse effects after mitigation and enhancement measures are implemented. However, the significance determination is made for adverse effects only.

17.3.3 Potential Environmental Effects, Project Pathways, and Measurable Parameters

Table 17.7 lists the potential Project effects on economy, employment and business, and provides a summary of the Project effect pathways, and measurable parameters and units of measurement, to assess potential effects. Potential environmental effects and measurable parameters were selected based on review of recent environmental assessments for large development projects in NL, renewable energy projects in other parts of Canada, comments provided during engagement, and professional judgment.

⁴ "Distinguishable" means that the adverse effect is measurable, predictable, and attributable to one or more Project or cumulative interactions (i.e., it is not within the boundaries of normal variation of the measurable parameter under baseline conditions).



Table 17.7 Environmental Effects, Effect Pathways, and Measurable Parameters for Employment, Economy and Business

Environmental Effect(s)	Effect Pathway(s)	Measurable Parameter(s) and Units of Measurement
Change in regional labour force	• The Project's demand for labour will affect the regional labour supply • Loss of Project employment following completion of decommissioning and closure will affect the regional labour supply	• Qualified labour supply (persons) and existing wage levels • Project employment (jobs and FTEs)
Change in regional business	• Project spending will affect regional businesses • Loss of Project spending following completion of decommissioning, rehabilitation and closure will affect regional business	• Value of local and regional spending and related employment • Project contribution to increased competition for labour and wage inflation
Change in regional economy	• Project employment and spending will affect the economy • Loss of Project employment and spending following completion of decommissioning, rehabilitation and closure will affect the economy	• GDP (\$) • Tax revenue (\$)

17.3.4 Project Interactions with Economy, Employment and Business

Table 17.8 uses checkmarks to indicate the routine Project activities that could interact with the VEC and result in the identified environmental effect(s) to be assessed. Immediately following Table 17.8, environmental effects pathways are briefly described for potential routine Project-related environmental effects and justification is provided in cases where no Project interaction with the VEC (and therefore no potential environmental effect on the VEC) is predicted.

Project demand and expenditures on services, labour, materials and equipment are the primary pathways through which changes in regional labour force, regional business, and economy occur. All pathways are captured through the identified interaction with Employment and Expenditure. All remaining Project activities and components are identified as having no interaction. The assessment of change in regional labour force, business, and economy is considered in the overall context of each Project phase (i.e., construction, operation, and decommissioning, rehabilitation and closure).



Table 17.8 Project Interactions with Employment, Economy, and Business, Environmental Effects, and Environmental Effect Pathways

Project Activities	Environmental Effect(s) to be Assessed		
	Change in regional labour force	Change in regional business	Change in regional economy
Construction			
Site Preparation and Civil Works (including turbine foundations, road construction, quarries, clearing, grubbing, blasting, cement production, and watercourse crossings)	-	-	-
Transportation of Resources and Equipment (includes trucking, shipping and barging of materials)	-	-	-
Construction / Installation, Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure	-	-	-
Installation and Commissioning of Wind Turbines	-	-	-
Installation and Commissioning of Collector Systems	-	-	-
Installation and Commissioning of Transmission Lines and Substations (including marine cable crossing)	-	-	-
Installation and Commissioning of Hydrogen / Ammonia Production, and Storage Facilities and Associated Infrastructure (including Industrial water supply infrastructure)	-	-	-
Restoration of Existing Port Facilities (including pile driving and dredging)	-	-	-
Emissions, Discharges, and Wastes ¹	-	-	-
Employment and Expenditures ²	✓	✓	✓
Operation and Maintenance			
Presence, Operation, and Maintenance of Wind Farms (including wind turbines, access roads, and collector systems)	-	-	-
Presence, Operation, and Maintenance of Transmission Lines and Substations			
Presence, Operation, and Maintenance of Hydrogen / Ammonia Production, and Storage, Facilities and Associated Infrastructure (includes marine discharge from treatment plant)	-	-	-



Table 17.8 Project Interactions with Employment, Economy, and Business, Environmental Effects, and Environmental Effect Pathways

Project Activities	Environmental Effect(s) to be Assessed		
	Change in regional labour force	Change in regional business	Change in regional economy
Presence, Operation, and Maintenance of Port Facilities (includes loading of ammonia and vessel maneuvering within Port)	-	-	-
Emissions, Discharges, and Wastes ¹	-	-	-
Employment and Expenditures ²	✓	✓	✓
Decommissioning and Rehabilitation			
Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure	-	-	-
Decommissioning and Rehabilitation of Wind Farms (including wind turbines, access roads, and collector systems)	-	-	-
Decommissioning and Rehabilitation of Transmission Lines and Substations	-	-	-
Decommissioning and Rehabilitation of Hydrogen / Ammonia Production, and Storage, Facilities and Associated Infrastructure	-	-	-
Decommissioning and Rehabilitation of Port Facilities	-	-	-
Emissions, Discharges, and Wastes ¹	-	-	-
Employment and Expenditures ²	✓	✓	✓
Notes: ✓ = Potential interaction – = No interaction ¹ Emissions (e.g., light, noise, vibration, air contaminants and GHGs), discharges (e.g., wastewater and other liquid effluents), and hazardous and non-hazardous wastes are generated by many Project activities. Rather than acknowledging this by placing a checkmark against each of these activities, "Emissions, Discharges, and Wastes" is listed as a separate item under each phase of the Project. ² Project employment and expenditures are generated by most Project activities and are the main drivers of many potential socio-economic effects. Rather than acknowledging this by placing a checkmark against each of these activities, "Employment and Expenditures" is listed as a separate item under each phase of the Project.			



17.3.5 Analytical Assessment Techniques and Level of Knowledge

17.3.5.1 Economic Modelling

Economic impacts of the Project were estimated by Jupia Consultants Inc. (JC 2023a included as Appendix 1-C, and JC2023b, included as Appendix 1-D) using a customized model to estimate direct, indirect, and induced impacts⁵ on employment, incomes, GDP, and taxation associated with the Project. Economic impacts were estimated for the economies of the RAA (NL) and the rest of Canada, with assumptions made about the LAA, where feasible. Given the minimal GDP and other economic impacts to the LAA, RAA and Canada from international imports, the effect of imports were not included in the model⁶. Parameters used in Jupia's economic impact analysis were based on data obtained from Statistics Canada, the Canada Revenue Agency, the provincial government, and were developed based on the best available information from other wind energy projects across Canada (JC 2023a). Annual capital expenditure profiles, operating costs, and estimates of expenditure types and expected sources of supply provided by WEGH2 formed the basis of Jupia's economic impact analysis (JC 2023a). In many cases, the direct and indirect economic impacts were calculated together in the model given the uncertainty of the level of capital expenditures that will be incurred directly by the company compared to the level incurred by third parties (D. Campbell, pers. comms, 2023). The results of Jupia's economic impact assessment and labour capacity study are integrated into the assessment of 'change in regional labour force,' 'change in regional business,' and 'change in economy.' Residual Project effects within the LAA were quantified using estimates of local employment, and in consideration of effect pathways, mitigation and enhancement measures, and existing conditions.

Direct Project Costs

The Project expenditures are broken out by construction, operation and maintenance, and decommissioning. The Project's total capital expenditures (CAPEX) are currently estimated to be \$5.98 billion CDN (\$2023), which includes development costs, the building of the wind energy infrastructure as well as the hydrogen and ammonia plant. The economic model estimates that 42% (\$2.5 billion) of total CAPEX is related to international imports and thus, is not modelled for economic impact, with the remaining 58% of CAPEX spending assumed to boost output in both the RAA and Canada. The exact amount of construction costs will ultimately be determined at financial close. Operational expenditures (OPEX) are currently projected at \$180 M per year, of which 23% (\$41 M) is related to international imports. Decommissioning costs are expected to amount to \$99 M with no foreign expenses anticipated at this time. The economic model estimates these expenditures will be divided between the RAA and Canada. WEGH2 plans to work towards the highest local content that is reasonably possible and use the most local labour that is reasonably possible, during equipment procurement and contract agreements.

⁵ Economic impacts are described on a direct, indirect, and induced basis. Direct impact measures the value-added to the economy attributed directly from the wages earned, and the revenues generated from the workforce spending in Newfoundland and Labrador and Canada. Indirect impact measures the value-added generated within the regional economy through firm and organizational demand for intermediate inputs or other support services (e.g. the supply chain). Induced impacts are derived when workers in the aforementioned industries spend their earnings. These purchases lead to more employment, higher wages and increased income and tax revenues, and can be felt across a wide range of industries (JC2023a).

⁶ Wholesale margin and the cost of transportation and installation is included in the model.



While it will not be possible to procure complex technologies locally, such as wind turbines and electrolyzers, WEGH2 is currently assessing the local supply chain and is committed to sourcing components and raw materials locally, where possible. For those products and services not procured locally, other Canadian suppliers will be provided the opportunity to respond to procurement requests. Only after evaluating the possibility of procuring both locally and domestically, will the Project explore international alternatives.

Although the Project continues to engage in discussions and the negotiation of agreement terms and conditions with respect to the procurement of goods and services, the precise expenditure breakdown by location will not be determined until financial close. Nonetheless, a current estimation of the expenditure breakdown is provided in Table 17.9, which represents the Project's estimates at present. These expenditures and associated percentage breakouts are subject to change as the Project progresses and vendors are identified and terms finalized.

Table 17.9 Direct Project Costs (\$2023) by Phase

Expenditures	Construction	Operation / Maintenance (Annual)	Decommissioning
Project	\$5,980 M	\$180 M ¹	\$99 M
NL	44%	62%	90%
Other Canadian	14%	15%	10%
Foreign	42%	23%	0%
Note: ¹ Lifetime average, per year (nominal) Source: WEGH2; JC 2023a			

17.3.5.2 Assumptions and Conservative Approach

Labour Force

With respect to the size of the labour force, estimates have been provided by Jupia Consultants for Project components during each phase in Table 17.10 (JC 2023a).

Table 17.10 Assumptions of Direct Labour Required for the Project, FTE

Project Component	Construction	Operations and Maintenance (Annual)	Decommissioning	Total
Wind (including balance of plant)	599	146	100	845
Plant	2,258	132	250	2,640
Other (overhead, management, port)	242	113	25	380
Total	3,099	391	375	3,865



Construction of the Port au Port and Codroy wind farms as well as the hydrogen / ammonia plant will provide 3,099 full-time equivalents (FTEs) of construction labour. Construction of the wind farms will occur sequentially over a planned three-year period.

Because not every construction worker will be actively working across the construction phase, it is estimated the total number of person hours would be approximately 400,000 person-hours per year for the wind farm. Across a three-year construction period, this amounts to 1.2 million person-hours. Similar to the construction of the wind farms, the buildout of the hydrogen / ammonia plant will be a phased approach. As the wind farms come online, further capacity will be added to the hydrogen / ammonia plant. As such, the hydrogen / ammonia plant construction positions will likewise be long-term. At a projected 2,258 plant construction workers, a total of 4.5 million person-hours per year, or 13.5 million person-hours are estimated during construction of the Project. Labour requirements other than construction-related activities, including port construction and construction management, are estimated at a total 383,000 person-hours across the three-year construction period.

The operation and maintenance of Project facilities will be a constant undertaking, with workers employed full-time through the life of the Project. It is estimated that 391 workers total will be required throughout the 30-year operations and maintenance phase, of which 272 of these workers will be based in NL. Assuming each employee works 250 eight-hour shifts per year, the 146-person operation and maintenance staff employed in the wind component will work 292,000 person-hours per year. WEGH2 will also employ additional workers throughout the operation of the Project related to the plant, port, overhead, and as management personnel. It is anticipated that an additional 490,000 person-hours per year for the hydrogen / ammonia plant and other parts of the Project will be required. In total, it is estimated that the operation and maintenance phase of the Project will entail 391 workers, totaling 782,000 person-hours annually.

Decommissioning and rehabilitation is anticipated to last for less than two years and will require a labour force of 375 which is expected to last approximately two years.



17.4 Mitigation and Enhancement Measures

Key measures to mitigate and enhance the potential effects of the Project on economy, employment and business are listed in Table 17.11, by category and Project phase.

Table 17.11 Mitigation and Enhancement Measures: Employment, Economy, and Business

ID #	Mitigation Type	Mitigation and Enhancement Measure	Project Phase*		
			C	O	D
205	Mitigation	Outfitter Effects Monitoring Program will be implemented to address effects on outfitter operators and their clients.	X	X	X
272	Engagement	A Gender Equity and Diversity Plan will be implemented that meets the approval of the Minister of Industry, Energy and Technology and the Minister responsible for the Office of Women and Gender Equality. WEGH2 will engage with Indigenous groups during the development of the Plan. A business access strategy for members of underrepresented populations will be included in the plan.	X	X	X
273	Mitigation	A Benefits Agreement will be implemented that meets the approval of the Minister of Industry, Energy and Technology, and Minister Responsible for the Office of Women and Gender Equality.	X	X	X
274	Engagement	WEGH2 will communicate employment information to local communities and Indigenous groups in a timely manner so that local and Indigenous residents have an opportunity to acquire the necessary skills to qualify for potential Project-related employment.	X	X	X
275	Engagement	WEGH2 will work with the Province, educational and training institutions, Indigenous groups, and stakeholders to identify skilled trade shortages relative to the Project, and to identify training needs and opportunities to contribute to a sustainable Project workforce.	X	X	X
276	Engagement	On-the-job training programs and apprenticeship opportunities will be made available.	X	X	X
277	Engagement	Summary reports will be provided to the provincial regulator that include information on the number of persons employed by 4-digit National Occupational Classification (NOC), the number of full- and part-time employed, the number of apprentices (by level) and journey persons for each applicable 4-digit NOC code, gender and source of the workforce.	X	X	X
278	Mitigation	Procurement packages will be developed with consideration for capacity and capabilities of local and regional Indigenous and non-Indigenous businesses.	X	X	X
279	Mitigation	Project purchasing requirements will be posted in a timely manner so that local and regional businesses can position themselves to compete to supply goods and services needed for Project construction, operations and decommissioning.	X	X	X



Table 17.11 Mitigation and Enhancement Measures: Employment, Economy, and Business

ID #	Mitigation Type	Mitigation and Enhancement Measure	Project Phase*		
			C	O	D
320	Mitigation	WEGH2 will establish sufficient setback of wind turbines to mitigate risk to surrounding residences.	X	X	-
* Note: "ID #" denotes the master identification number for mitigation in Appendix 26-A. "C" denotes the construction phase of the Project. "O" denotes the operation and maintenance phase of the Project. "D" denotes the decommissioning and rehabilitation phase of the Project. "X" denotes the relevant Project phase for the mitigation measure.					

17.4.1 Application of the Precautionary Principle to Project Mitigation and Enhancement Measures

There is a moderate to high likelihood that the mitigation and enhancement measures presented will succeed. Consistent with other large-scale industrial projects in NL, Gender Equity and Diversity and Benefits Plans assist in distributing project benefits to underrepresented groups as well as smaller communities. Ongoing updates from proponents have facilitated training and onboarding and have provided local and Indigenous individuals with increased access to project benefits. Communicating project updates to local and regional businesses allows for advanced preparation for the procurement processes.

17.5 Residual Environmental Effects

17.5.1 Change in Regional Labour Force

17.5.1.1 Project Pathways

Project demand for labour has the potential to have both beneficial and adverse effects on the regional labour force. Beneficial effects stem from increased local employment during construction and operation phases, while adverse effects stem from losses in local employment due to decreased labour demand as the Project transitions from the operation phase through the decommissioning, rehabilitation and closure phase. Based on direct labour costs, a total of 11,730 person-years of direct employment for operations are estimated over the life of the Project (Table 17.10.) Over the life of the Project, total direct and indirect labour costs are estimated at \$2.8 billion and support 27,480 full-time equivalents (FTE) person-years of employment.

Table 17.12 provides a summary of average gross hourly wages (2023) for NL workers in sectors likely to supply direct labour to the Project. Average annual wages were applied to three scenarios to estimate average annual employment (Table 2.8). As calculated, estimated annual wages under Scenario 1 are based on full-time employment and 2,100 person hours per year (no overtime); scenario 2 is based on



12-hour workdays and a two-week on / two-week off work schedule (overtime after 40 hours per week); and scenario 3 is based on 10-hour workdays and a three-week on / one-week off work schedule (overtime after 40 hours per week).

Table 17.12 Provincial Wages in Select Sectors, Average – 2022

Industry	Average Hourly Wage	Scenario 1 - Annual Wage (based on 2,100 hrs/year)	Scenario 2 - Annual Wage (based on 12-hour 2x2 work schedule) ¹	Scenario 3 - Annual Wage (based on 10-hour 3x1 work schedule) ¹
Forestry, fishing, mining, quarrying, oil and gas	\$42.65	\$89,565	\$117,866	\$152,893
Construction	\$30.71	\$64,491	\$84,869	\$110,090
Utilities	\$47.87	\$100,527	\$132,292	\$171,606
Manufacturing	\$28.55	\$59,955	\$78,900	\$102,347
Transportation and Warehousing	\$27.82	\$58,422	\$76,883	\$99,730
Professional, scientific and technical services	\$28.52	\$59,892	\$78,817	\$102,239
Note: ¹ Assumes overtime payments beyond 40 hours per week by 1.5X the hourly rate; rounded down to nearest thousand Source: Statistics Canada 2023				

17.5.1.2 Construction

Total pre-production direct employment is estimated at approximately 3,099 FTE, while peak employment is estimated at 1,976 FTEs (occurring in April 2025). Average annual direct employment during pre-production is estimated at 1,129 FTEs. Table 17.13 provides the annual estimates of the cost of labour during Project phases.

Table 17.13 Total Direct Employment and Labour Income

Project Phase	Direct Employment (FTEs)	Direct Labour Income (\$ million)	Average Labour Income (\$) / FTE
Construction	3,099	186.8	\$110,090 ¹
Operation	391	1,349	\$115,000
Decommissioning ²	375	N/A	N/A
Total Direct	3,865		
Notes: ¹ Based on average annual salaries from a 3 week on 1 week off work rotation as identified in Table 17.12. ² Labour income for decommissioning was outside the scope of the Jupia Consultants model. Source: WEGH2 Project information and JC 2023a			



Table 17.14 provides a breakdown of direct employment and labour income by estimated geographic residency of workers. In consideration of existing levels of educational attainment, baseline labour force conditions within the LAA and RAA (province) (Section 17.2), approximately 16% of direct employment effects are anticipated to occur in the LAA, with the rest of the direct employment effects occurring in the remainder of NL. Strategies to increase local and provincial recruitment are summarized in Section 17.4, Table 17.11.

Table 17.14 Estimate of Direct Employment by Estimated Geographic Residency of Workers Over the Life of Project

Project Phase	Employment (Person-Years)			
	LAA	Rest of RAA (NL)	RAA (NL) Total	Rest of Canada
Construction	1,521	7,776	9,297	0
Operations ¹	5,940	2,220	8,160	3,570
Notes:				
The nature of the decommissioning workforce is unavailable.				
¹ Based on information provided by JC 2023b, capacity of labour in the LAA/RAA and trends from similar industrial projects in NL.				

While estimates of local and regional employment are provided, the degree to which residents of the LAA and RAA (province) secure employment with the Project depends on numerous considerations, including existing levels of educational attainment, labour force conditions, and the extent to which local workers wish to participate in the Project. The extent to which contractors draw on labour from outside the LAA and RAA to complete Project work also affects levels of Project-related local and regional employment.

Recognizing that the Indigenous population represents 30.6% of the LAA total population, it is conservatively assumed that the Project will likely employ more non-Indigenous than Indigenous persons. It is also likely that the Project will employ more males than females as most jobs associated with the Project will be in trades and construction-related occupations and industries that employ disproportionately high numbers of males (Table 17.3). To enhance diversity and inclusion within the workforce, WEGH2 will implement the mitigation and enhancement measures identified in Section 17.4. WEGH2 is providing training, in collaboration with Qalipu First Nation, to support the Project's need for a skilled workforce and to enhance Project-related employment opportunities for local residents. Training programs will be targeted to develop the skill sets required by the renewable energy industry, thereby supporting the provincial workforce in the transition to low-carbon renewable energy. As part of this effort, WEGH2 is facilitating a Wind Industry Training partnership with DOB Academy (Netherlands) and Qalipu First Nation.

Based on the information above, a summary of residual effects on change in regional labour force during the construction phase is provided in Table 17.15.



Table 17.15 Summary of Effects by Project Component During Construction

Project Site	Summary of Effect during Construction
Temporary Workforce Accommodations	Given that it is estimated 84% of the construction workforce will need to be sourced outside the LAA, and the lack of available temporary housing within the LAA to meet this demand, it is estimated that temporary workforce accommodations will be required to accommodate up to 1,976 workers (peak workforce). The construction of the Project will have a positive effect on the change in regional labour force.
Port au Port Wind Farm and Associated Infrastructure	The construction of the Project will have a positive effect on the change in regional labour force, which include provisions of labour, a reduction of unemployment, and increased wages for the area.
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

17.5.1.3 Operation and Maintenance

Over the 30-year operation phase, total direct employment is estimated at 11,730 person-years with 8,160 person-years based in the RAA (peak and average annual employment is not available). As highlighted in Table 17.14, there is approximately 51% of labour within the LAA that could potentially fulfill the operational needs of the Project. The rest of the RAA could employ approximately 19% of remaining operations labour, with 30% of employment expected to come from the rest of Canada. WEGH2 is committed to hiring locally, where possible, and Section 17.4 notes mitigation and enhancement measures to provide training and educational opportunities for individuals within the LAA interested in operations employment. Table 17.16 breaks down the occupational category of these workers.

Table 17.16 Employment Occupational Category Breakdown

Project Function	Percent of Workforce
Company (Project management, legal, health and safety, administration, environment, stakeholder management, and planning)	30%
Development, procurement and contracting (engineering and interfaces, commissioning, general site management, electrical, civil, wind, hydrogen, and ammonia, operation and maintenance, and procurement)	64%
Offtake and logistics	3%
Risk management and financing	3%

Based on the information above, a summary of residual effects on change in regional labour force during the operation and maintenance phase is provided in Table 17.17.



Table 17.17 Summary of Effects by Project Component During Operation and Maintenance

Project Site	Summary of Effect during Operation and Maintenance
Temporary Workforce Accommodations	It is not anticipated there will be temporary workforce accommodations during operations.
Port au Port Wind Farm and Associated Infrastructure	The construction of the Project will have a positive effect on the change in regional labour force, which includes provisions of labour, a reduction of unemployment, and increased wages for the area.
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

17.5.1.4 Decommissioning and Rehabilitation

Total direct employment is estimated at approximately 750 person-years over the decommissioning, rehabilitation and closure phase (a peak workforce estimate has not been prepared for decommissioning, rehabilitation and closure).

As the Project transitions into decommissioning, rehabilitation and closure, a decrease in workforce that ultimately results in the loss of employment will occur. This loss will be known and anticipated by Project workers as the operational life of the Project will be communicated at early stages and updated throughout the life of the Project. Mitigating the magnitude of this loss of employment is the gained labour income, skills and experience workers realize while employed with the Project. In the case of gained skills and experience, these improved qualifications will aid with securing employment on other and future projects within the LAA, RAA (province), or elsewhere. Loss of direct employment following closure of the Project is assessed as moderate in magnitude but is expected to be short-term in duration.

Based on the information above, a summary of residual effects on change in regional labour force during the decommissioning and rehabilitation phase is provided in Table 17.18.



Table 17.18 Summary of Effects by Project Component During Decommissioning and Rehabilitation

Project Site	Summary of Effect during Decommissioning and Rehabilitation
Temporary Workforce Accommodations	Temporary workforce accommodations may be required during decommissioning, depending on the availability of local labour at the time. As such, the provision of temporary workforce accommodations would have a positive effect for the change in regional labour force.
Port au Port Wind Farm and Associated Infrastructure	The decommissioning of the Project will have an adverse effect on the change in regional labour force as there will be a reduction in employment and a reduction in higher-paying employment. However, this effect is predicted to be short-term since it is likely that the skills gained from the Project will assist in securing related employment in the LAA, RAA, or elsewhere.
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

17.5.1.5 Summary

With the implementation of mitigation and enhancement measures, Project residual effects on the LAA labour force are expected to be positive in direction and high in magnitude during construction and operation. Moderate magnitude adverse effects are anticipated as the Project transitions from operation through decommissioning, rehabilitation and closure (i.e., loss of direct employment). Positive and adverse effects are expected to extend to the RAA, although it is recognized that employment extends beyond NL. Effects are short term in duration during construction, and decommissioning, rehabilitation and closure, and medium-term during operation. Effects occur continuously throughout each Project phase and are reversible following the completion of construction and operation; however, these are irreversible following the completion of decommissioning, rehabilitation and closure (due to potential permanent loss of Project-related employment). Based on existing conditions, effects occur within a resilient socio-economic context.

17.5.2 Change in Regional Business

17.5.2.1 Project Pathways

Project expenditures on services, materials and equipment has the potential to result in both positive and adverse effects on regional business. Positive effects include increased business revenue, which can support capital investment and hiring (indirect employment), thereby increasing capabilities and capacity among local businesses. Spending of income by direct and indirect workers further contributes to beneficial effects on local businesses, primarily within the service sector, resulting in induced employment effects. Adverse effects relate to Project contributions to labour drawdown (i.e., workers leave current employers to secure employment with the Project due to wage differentials or a desire to work on the Project), wage inflation (i.e., to attract and retain workers, local employers may have to increase compensation paid to workers), and the potential for the Project to adversely impact outfitter operators.



17.5.2.2 Construction

Indirect Employment

As identified in Section 17.3.5.1, given the nature of the Project, the economic model could not disassociate the direct and indirect employment income over the life of the Project. As such, estimates on direct and indirect employment income are grouped together.

Table 17.19 identified direct and indirect employment income as a result of the construction phase. Annual direct and indirect employment income in the RAA is estimated at \$536.5M, totaling \$1.6 billion over the three-year construction phase. Annual direct and indirect employment income impacts across Canada (including NL) is estimated at \$685.2M annually, totaling over \$2 billion during the three-year construction phase.

Table 17.19 Estimated Employment Income Impacts – Annual and Total (\$2023)

	RAA (Newfoundland and Labrador)				Canada			
	Direct & Indirect Impacts		Total Impacts ¹		Direct & Indirect Impacts		Total Impacts ¹	
	Annual	Total	Annual	Total	Annual	Total	Annual	Total
Employment income (\$M)	\$536.5	\$1,609.4	\$602.5	\$1,807.4	\$685.2	\$2,055.7	\$826.7	\$2,480.2
Person-years (FTE) employment	5,433	16,300	6,444	19,332	7,203	21,609	9,256	27,768
Note: ¹ Includes induced impacts Source: JC 2023a								

The degree to which LAA businesses benefit from Project contracting and supply opportunities, and therefore result in indirect employment, depends on several factors, including their size, capability and capacity to accommodate Project requirements. Specifically, indirect employment resulting from Project spending on goods and services would only be expected to result in 'net new' (i.e., creation of) indirect employment if businesses become established or expand (by increasing workforces) to meet Project demands. In consideration of the LAA's industrial composition, existing labour force (Section 17.2.4) conditions, and using employment as a measure of capacity, businesses within the LAA are likely well positioned to compete for small- to medium-sized service and supply contracts, particularly those related to construction, transportation, and warehousing (Section 17.2.4).

Given the length of construction, operation, and decommissioning, rehabilitation and closure, it is possible that local businesses could expand (workforce size) or new businesses could be established (especially those seeking to fulfill operational service and supply contracts) to meet Project demands. It is possible that new and expanded businesses may be established in the LAA, particularly as the Project has the potential to stimulate a new and specialized industry for the province and the country, which would stimulate further indirect impacts and induced spending. Given the potential for increases for indirect spending in the LAA, paired with the low likelihood that all indirect NL-based employment effects will



occur in the LAA, resulting in 'net-new' employment, residual effects within the LAA are considered moderate in magnitude.

As the Project transitions from operation through decommissioning, rehabilitation and closure, a loss of Project expenditures within the LAA could result (depending on economic conditions at the time) in adverse effects (i.e., a reduction) on indirect employment. The magnitude of this effect would align with gains in indirect employment during construction and operation (i.e., low magnitude).

Induced Employment

Induced impacts result from spending by direct and indirect workers on consumer goods and services (e.g., employment in restaurants, hotels, and the retail sector supported by the Project) (JC 2023a). Construction of the Project is estimated to generate 2,053 FTEs of induced employment annually in Canada, of which 1,011 FTEs (49.2%) is anticipated to be realized by residents of NL (JC 2023a). When considering the entire construction phase, the Project is estimated to generate 6,159 FTEs of induced employment in Canada, of which 3,032 FTEs (50.0%) will be in NL. Induced employment income is estimated at \$142M in Canada during construction annually, with \$66M occurring in NL (46.5% of domestic induced employment income). Over the entire construction phase, induced employment income is estimated at \$425M in Canada with \$198M occurring in NL (46.6% of domestic induced employment income). A summary of induced employment and labour income by estimated geographic residency of workers is provided in Table 17.20.

Table 17.20 Total Estimated Induced Employment and Income by Region

Category	RAA (NL)		Rest of Canada		Canada	
	Annual	Total	Annual	Total	Annual	Total
Induced Employment (FTEs)	1,011	3,032	1,042	3,027	2,053	6,059
Induced Income (\$M)	\$66	\$198	\$76	\$227	\$142	\$425
Source: JC 2023a						

Because induced employment depends on consumer purchasing on the part of direct and indirect workers, the magnitude of effect largely depends on the magnitude of Project-related direct and indirect employment. Based on induced employment estimates for NL, and assuming all induced employment estimated for NL were to occur in the LAA and result in 'net-new' employment, the Project would result in a 5.6% average annual increase in the number of employed persons within the LAA (over baseline conditions) during pre-development and operation. While there is a low likelihood that all NL-based induced employment effects will occur in the LAA and result in 'net-new' employment, it is estimated that approximately 70-80% of induced employment will directly impact the LAA and as such residual effects within the LAA are considered high in magnitude.

As with indirect employment, as the Project transitions from operation into decommissioning, rehabilitation and closure, a loss of direct and indirect Project-related employment within the LAA could result (depending on economic conditions at the time) in adverse effects on (i.e., a reduction in) induced employment. This reduction in induced employment is predicted to have a low magnitude impact on regional businesses.



Induced Spending

In addition to the indirect and induced employment created by the Project, there will also be an increase of indirect and induced spending in NL and the rest of Canada. Table 17.21 breaks down the spending patterns during the construction phase. It is projected that the Project construction phase will result in \$642.7M in NL and nearly \$1.5 billion Canada-wide of indirect and induced spending. Of note, wholesale will see \$119.2M of spending in NL, with \$230.6M in the rest of Canada. Areas mostly likely to impact the LAA and RAA include retail (\$78.9M in NL ; \$28.8M in the rest of Canada), accommodation and food services (\$23.7M in NL; \$19.0 M in the rest of Canada), electrical power generation, transmission and distribution (\$22.8M in NL; \$10.6M in the rest of Canada) and cement and concrete product manufacturing (\$28.8M in NL; \$3.3M in the rest of Canada).

Table 17.21 Indirect and Induced Spending in Select Industries, Construction Phase (\$Million)

Category	NL	ROC	Canada
Wholesale	119.2	230.6	349.8
Retail	78.9	28.8	107.7
Fabricated metal product manufacturing	16.9	41.5	58.3
Other finance, insurance, and real estate services	17.1	36.2	53.4
Truck transportation	14.7	31.9	46.5
Information services	23.3	23.0	46.4
Banking services	17.7	28.1	45.8
Accommodation and food services	23.7	19.0	42.7
Legal, accounting and architectural, engineering and relation services	21.1	19.7	40.9
Electric power generation, transmission and distribution	22.8	10.6	33.4
Petroleum and coal product manufacturing	8.9	24.2	33.2
Insurance carriers	7.6	24.8	32.3
Cement and concrete product manufacturing	28.8	3.3	32.1
Administrative and support services	7.5	21.8	29.3
IT Services and other professional, scientific and technical services	5.3	23.4	28.7
Other transportation	9.4	15.5	25.0
Electrical equipment and component manufacturing	0.0	20.4	20.4
Total	\$642.7	\$853.7	\$1,496.5
Note: does not include international imports Source: JC 2023a			



Similar to indirect and induced spending, the Project has an impact on household spending. Approximately 72% of all employment income in NL becomes current consumption⁷, with the remainder going to income taxes, savings, and non-current consumption. Table 17.22 indicates the amount of household spending in various areas expected as a result of the construction phase of the Project based on typical housing spending in NL (JC 2023a). Approximately \$1.7 billion is expected to be spent on current consumption as a result of the Project, including \$270M in food expenditures, \$412M in shelter, \$356M in transportation, and \$83M in recreation. The level of which this is reflected in the LAA will depend on the amount of local labour involved in the project, the number of migrant and mobile workers purchasing in the area, among other factors.

Table 17.22 Household spending in NL included from the Project, Construction Phase

Category	\$Million
Shelter	412.3
Transportation	356.4
Food expenditures	269.8
Household operations	143.9
Clothing and accessories	84.3
Recreation	82.6
Retirement and pension fund payments	75.2
Health care	48.3
Gifts of money and charitable donations	33.8
Personal care	21.5
Private health and dental premiums	18.0
Financial services	11.6
Total current consumption in NL	1,680.5
Source: JC 2023a	

Outfitting Operators

As identified in the Socio-economic Baseline Study (Appendix BSA-4), there are 22 outfitter operations on Crown Land within the LAA. Of these 22, it was identified that five outfitter lodges / facilities are in proximity to the Project Area that have potential to be directly impacted by the Project.

As part of the community and stakeholder engagement process, WEGH2 developed a questionnaire to solicit feedback from outfitter operators about the Project, as well as to identify issues, concerns, or inquiries related to the Project. The questionnaire included a Project Map identifying the wind farm locations and asked respondents a series of questions divided into four parts.

⁷ Areas such as food, shelter, transportation, recreation.



Part A of the questionnaire consisted of 20 questions asking respondents to provide general information about their outfitting operation. Part B of the questionnaire, consisting of three questions, asked respondents to identify the hunting activities that clients engage in through their outfitting operation. Part C of the questionnaire, consisting of six questions, asked respondents to identify what fishing activities their clients engage in through their outfitting operation. Part D of the questionnaire, with three questions, sought to ascertain the respondent's opinion on the potential effects, both positive and adverse, of resource development and industrial projects in general and the proposed Project specifically on their outfitting operation. The final part of the questionnaire recorded identifying information of the respondents and asked for any other comments the respondents wished to share.

The questionnaire was administered by Newfoundland and Labrador Outfitters Association via email. WEGH2 representatives expressed their desire to continue with dialogue and discussions with the affected outfitters to better understand areas of importance to individual outfitters and to address their concerns. Information sharing with the outfitters will continue in a process that is transparent. A summary of input received from outfitters on key issues and concerns is provided in Appendix 4-D of the EIS.

Two outfitter lodges / facilities in the vicinity of the Codroy wind farm are overlapped by the Project Area and two additional outfitter lodges / facilities in the vicinity of the Codroy wind farm are overlapped by the LAA. One outfitter lodge / facility in the vicinity of the transmission line RoW is overlapped by the LAA. There are no known outfitter lodges / facilities in the vicinity of the Port au Port wind farm, or in the vicinity of the hydrogen / ammonia plant or port facilities. It is expected that recreational / subsistence activities conducted by outfitter operators and clients within the Project Area and/or LAA would be adversely affected by the direct alteration / disturbance or loss of recreational / subsistence areas in the Project Area and/or by construction-related sensory disturbance and nuisance impacts in the LAA. However, alternative recreational / subsistence areas are available for use by outfitter operators and clients outside of the Project Area and LAA. Residual effects on outfitter operators and their clients will be confirmed through implementation of the Outfitter Effects Monitoring Program for the Project (refer to Section 17.8).

Based on the information above, a summary of residual effects on change in regional business during the construction phase is provided in Table 17.23.

Table 17.23 Summary of Effects by Project Component During Construction

Project Site	Summary of Effect during Construction
Temporary Workforce Accommodations	Given that it is estimated 84% of the construction workforce will need to be sourced from outside the LAA, and the lack of available temporary housing within the LAA to meet this demand, it is estimated that temporary workforce accommodations will be required to accommodate up to 1,976 workers (peak workforce). The construction of the Project will have a positive effect on the change in regional business.
Port au Port Wind Farm and Associated Infrastructure	The construction of the Project will have a predominantly positive effect on the change in regional business which may include increased indirect employment, indirect impacts, and induced spending.
Codroy Wind Farm and Associated Infrastructure	The construction of the Project will have a predominantly positive effect on the change in regional business which may include increased indirect employment, indirect impacts, and induced spending. The Project may result in adverse effects on outfitter operators, which may include economic loss.



Table 17.23 Summary of Effects by Project Component During Construction

Project Site	Summary of Effect during Construction
230 kV Transmission Lines and Substations	The construction of the Project will have a predominantly positive effect on the change in regional business which may include increased indirect employment, indirect impacts, and induced spending. The Project may result in adverse effects on outfitter operators, which may include economic loss.
Hydrogen / Ammonia Production and Storage Facilities	The construction of the Project will have a predominantly positive effect on the change in regional business which may include increased indirect employment, indirect impacts, and induced spending.
Port Facilities	The construction of the Project will have a predominantly positive effect on the change in regional business which may include increased indirect employment, indirect impacts, and induced spending.

17.5.2.3 Operation and Maintenance

Labour Scarcity and Increased Labour Costs

Potential adverse effects of Project spending and increased economic activity during all Project phases include labour scarcity and increased labour costs. Table 17.24 provides a comparison between existing employment income in the LAA and RAA and projected Project-case wages and salaries.

Table 17.24 Baseline Employment Income and Projected Project-related Wages and Salaries (undiscounted), LAA and RAA

Category	Mean Annual Employment Income (2022) ¹		Range of Mean Annual Wages (Estimates) for Reference Industries / Sectors, NL	Projected Project Direct Wages, Mean (\$)
	LAA	RAA		
Construction	\$37,620	\$45,520	- Forestry, fishing, mining, quarrying, oil and gas: \$89,565 to \$152,893 - Utilities: \$100,527 to \$171,606 - Construction: \$64,491 to \$110,090 - Manufacturing: \$59,955 to \$102,347 - Transportation and Warehousing: \$58,422 to \$99,730 - Professional, scientific and technical services: \$59,892 to \$102,239	\$110,090
Operation				\$115,000
Decommissioning, Rehabilitation and Closure				N/A

Note:

¹ Mean employment income is presented for the total population (aggregate of Indigenous and non-Indigenous labour force)

Source: Estimates of economic impacts are taken from JC 2023a and assuming a 3 week on 1 week off construction rotation. Baseline wage information is taken from Tables 17.12.

Wages paid to the Project's direct workforce are predicted to be substantially higher than the average wage rates paid within the LAA and RAA. Depending on Project phase wages and geography (LAA or RAA), projected wages are between 241% and 305% greater than existing mean annual employment incomes from local employment. However, when compared to the range of mean annual wages paid to



NL workers employed in other provinces, and in reference industries and sectors, projected wages fall within existing levels of compensation.

While Project wages are likely to fall within the existing range of compensation paid to NL workers of industries and sectors most applicable to Project-related work, due to differentials between existing LAA and RAA conditions, the Project has the potential to contribute to upward pressure on wages through increased competition for labour among local employers. Combined with the potential for Project-related employment to be perceived as being more desirable than other forms of employment within the LAA and RAA, the Project could result in increased difficulty for local businesses to recruit or retain qualified workers.

To manage the Project's contribution to upward pressure on wages, WEGH2 will pay its direct workforce wages that are consistent with NL's energy industry. Combined with the anticipated size of the Project's local direct workforce, adverse effects on local and regional businesses (in terms of upward pressure on wages and associated increased difficulty to recruit or retain workers) is expected to be low in magnitude.

Induced Spending

Annual operations of the Project will also increase household spending in the RAA and the LAA based on typical household spending in NL. In total, the Project is expected to boost current consumption by \$17.3M annually, of which at least 63% will be spent within the LAA and will boost the average annual household spending on current consumption between 5% and 8% (JC 2023a). The total annual current consumption will include nearly \$2.8M on food, \$4.2M on shelter, \$3.7M on transportation, \$1M on health and personal care, and \$1.2M on recreation (Table 17.25) (JC 2023a).

Table 17.25 Household Spending in NL Induced from the Project, Operations, Annual

Category	\$000s
Shelter	4,241.2
Transportation	3,666.3
Food expenditures	2,775.6
Household operations	1,480.3
Recreation	1,235.5
Retirement and pension fund payments	1,124.6
Clothing and accessories	867.5
Health care	721.9
Gifts of money and charitable donations	506.3
Personal care	321.5
Private health and dental premiums	321.5
Financial services	173.9
Total current consumption in NL	17,288.2
Source: JC 2023a	



Based on the information above, a summary of residual effects on change in regional business during the operation and maintenance phase is provided in Table 17.26.

Table 17.26 Summary of Effects by Project Component During Operation and Maintenance

Project Site	Summary of Effect during Operation and Maintenance
Temporary Workforce Accommodations	The temporary workforce accommodations will not be provided during operation and maintenance, so there is no interaction.
Port au Port Wind Farm and Associated Infrastructure	The operation and maintenance phase of the Project will have a predominantly positive effect on the change in regional business which may include increased indirect employment, indirect impacts, and induced spending.
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

17.5.2.4 Decommissioning and Rehabilitation

There was no economic modelling done for the decommissioning phase given the probability that the economics will continue to change during the life of the Project. Induced employment estimates were not calculated for the decommissioning, rehabilitation and closure phase. However, the closure of the WEGH2 facility may result in an adverse effect on regional businesses. The potential for benefits associated with indirect and induced employment and direct, indirect, and induced spending will be realized during Project construction and operations and the conclusion of the Project will present an irreversible residual effect. It is worth noting that the establishment of this Project may stimulate further developments of similar projects in the LAA of which regional businesses will have the potential to avail.

Based on the information above, a summary of residual effects on change in regional business during the decommissioning and rehabilitation phase is provided in Table 17.27.



Table 17.27 Summary of Effects by Project Component During Decommissioning and Rehabilitation

Project Site	Summary of Effect during Decommissioning and Rehabilitation
Temporary Workforce Accommodations	Temporary workforce accommodations may be required during decommissioning depending on the availability of local labour at the time. As such, the provision of temporary workforce accommodations would have a positive effect for the change in regional business.
Port au Port Wind Farm and Associated Infrastructure	The decommissioning of the Project will have an adverse effect on the change in regional business as the benefits of the Project will be realized.
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

17.5.2.5 Summary

With the implementation of mitigation and enhancement measures, Project residual effects on local and regional businesses are expected to be mixed in direction (positive and adverse) and predominantly low in magnitude, and moderate to high in magnitude for outfitter operators. Positive effects relate to Project spending on goods and service contracts, and direct, indirect and induced employment effects alongside the prospect of improved financial positions of LAA constituents. Adverse effects may result from anticipated upward pressure on wages, increased difficulty of local employers to recruit or retain workers who may be qualified for employment with the Project, and potential economic loss for outfitter operators.

Positive and adverse effects on regional businesses are expected to extend to the RAA, although it is recognized that employment also extends beyond NL. Effects are short term in duration during construction, and during decommissioning and rehabilitation, and medium-term during operation. Effects are expected to occur continuously throughout each Project phase and are reversible following the completion of construction and operation; however, these are irreversible following the completion of decommissioning, rehabilitation and closure (due to the potential for permanent loss of Project-related expenditures and employment). Based on existing conditions, effects occur within a resilient socio-economic context within the LAA and RAA.



17.5.3 Change in Economy

17.5.3.1 Project Pathways

Project spending will result in overall increased economic activity in the LAA and RAA and will also contribute to provincial and federal government revenues through royalty payments and taxation on production, labour, goods, and services.

17.5.3.2 Construction

Summary of Economic Impact, Project Construction

The Project will generate GDP through the value of production at the hydrogen facility, and direct, indirect, and induced employment and income. A summary of estimated GDP CAPEX is outlined in Table 17.28. Project construction is estimated to generate \$2.5 billion in GDP in NL, and \$3.6 billion Canada-wide (JC 2023a). Estimates of employment income from direct and indirect impacts are estimated to be \$536.5M in NL, and \$685.2M in Canada, with the total direct and indirect impacts over the construction phase estimated at \$1.8 billion in NL, and nearly \$2.5 billion across Canada (JC 2023a). Direct and indirect impacts from household spending in NL are expected to be \$387M annually, and \$1.1 billion over the construction phase, however, once induced impacts are considered, it brings the total household spending to \$434.8M annually, or \$1.3 billion during construction (JC 2023a). Total taxation revenues in direct, indirect and induced impacts from CAPEX are expected to reach \$798M in NL, and just over \$1.0 billion in Canada.

Table 17.28 Estimated Construction Economic Impact – Annual and Total (\$2023)

	RAA (Newfoundland and Labrador)				Canada			
	Direct & Indirect Impacts		Total Impacts ¹		Direct & Indirect Impacts		Total Impacts ¹	
	Annual	Total	Annual	Total	Annual	Total	Annual	Total
GDP contribution (\$M)	\$654.9	\$1,964.7	\$836.6	\$2,509.8	\$874.7	\$2,624.0	\$1,213.1	\$3,639.2
Employment income (\$M)	\$536.5	\$1,609.4	\$602.5	\$1,807.4	\$685.2	\$2,055.7	\$826.7	\$2,480.2
Person-years (FTE) employment	5,433	16,300	6,444	19,332	7,203	21,609	9,256	27,768
Household spending (\$M)	\$387.0	\$1,160.9	\$434.8	\$1,304.5	\$496.6	\$1,489.7	\$599.5	\$1,798.6
Taxes – municipal (\$M)	\$15.5	\$46.6	\$23.2	\$69.6	\$25.4	\$76.3	\$39.1	\$117.4
Taxes – provincial (\$M)	\$95.2	\$285.5	\$142.8	\$428.4	\$112.9	\$338.8	\$182.4	\$547.2
Taxes – federal (\$M)	\$77.2	\$231.7	\$99.4	\$298.3	\$98.5	\$295.4	\$136.7	\$410.2
Total taxes (\$M)	\$188.2	\$564.7	\$266.0	\$798.1	\$236.8	\$710.5	\$358.0	\$1,074.1
Note: ¹ Includes induced impacts Source: JC 2023a								



Based on the information above, a summary of residual effects on the change in economy during the construction phase is provided in Table 17.29.

Table 17.29 Summary of Effects by Project Component During Construction

Project Site	Summary of Effect during Construction
Temporary Workforce Accommodations	Project construction is expected to result in positive impacts on the economy via direct, indirect, and induced impacts.
Port au Port Wind Farm and Associated Infrastructure	
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

17.5.3.3 Operation and Maintenance

Summary of Economic Impact, Operation and Maintenance

Estimates for GDP are also provided during the operation and maintenance phase. Annually, it is estimated that the Project will generate \$78M in GDP in NL, and \$98M across Canada, with employment income expected to reach \$33M annually in NL, and \$43M nationwide. Household spending resulting from the Project is expected to be approximately \$24M annually in NL, and \$31M in Canada (Table 17.30).

Table 17.30 Estimated Operation and Maintenance Economic Impact – Annual (\$2023)

Impact ¹	RAA (Newfoundland and Labrador)	Canada
GDP contribution (\$000s)	\$78,649	\$98,444
Employment income (\$000s)	\$33,203	\$43,280
Person-years (FTE) employment	272	391
Household spending (\$000s)	\$23,959	\$31,377
Note: ¹ Expected start of operations at full capacity Source: JC 2023a		



While estimates of GDP contributions to the LAA have not been prepared, the Project is inherently beneficial to the local and regional economy. Because GDP is a measure of overall economic activity, the magnitude of effect is represented through the additive effect of Project-related changes in the local and regional labour force and businesses. The Project is expected to have a moderate magnitude positive effect on the GDP of the LAA and RAA during construction and operation. As the Project transitions from operation, and into and through decommissioning, rehabilitation and closure, Project contributions to the GDP of the LAA and RAA will cease; however, contributions made during the decommissioning, rehabilitation and closure phase are estimated to be positive in direction and low in magnitude.

Federal and Provincial Taxes on Wind Energy Operations

In NL, government taxes on hydrogen operations come from local, provincial, and federal governments during both the construction and operations phase. A summary of direct, indirect and induced taxes for Canada and NL is provided in Table 17.31, with corporate income tax excluded. Due to the provincial and national scope of Project tax contributions, effects are not characterized at the LAA level. Municipalities in NL are expected to receive \$1.24M per year, or \$37.2 million over the 30-year period. Taxes to the provincial and federal government (crown land and wind electricity fees) are valued at \$15.9M annually for NL and \$6.77M annually for Canada.

Table 17.31 Annual Taxes from Operations Beginning in 2027 (\$2023)

Taxation	RAA (Newfoundland and Labrador)	Canada
Taxes – municipal (\$000s)	\$1,239	\$2,198
Taxes – provincial (\$000s) ¹	\$15,641	\$17,719
Taxes – federal (\$000s) ¹	\$6,766	\$8,758
Total taxes (\$000s)	\$23,645	\$28,676
Note: ¹ Excluding corporate income tax. Source: JC 2023a		

During initial operations of the Project, corporate income tax will be limited due to investment tax credits. Corporate income tax is expected to begin in 2041 and is projected to generate \$2.97 billion between 2041 and 2057 for the provincial and federal governments (Figure 17.2). Accounting for an annual discount rate of 3.5%, this is valued at \$1.5 billion (\$2023), and equates to an annual average of \$50.4M per year from 2027 to 2057, which is divided equally between the provincial and federal governments (JC 2023a).



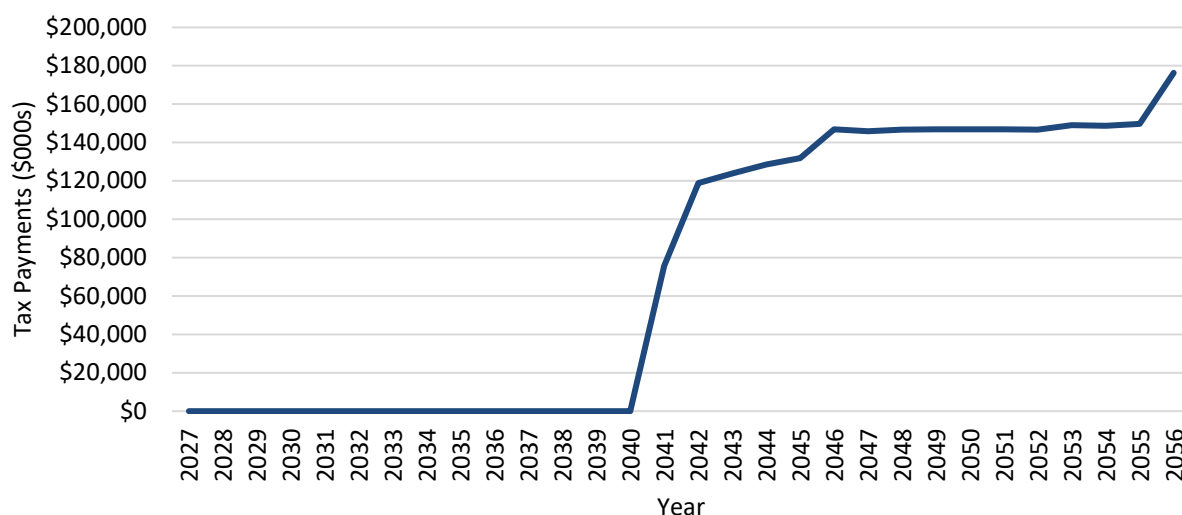


Figure 17.2 Corporate income tax payments by year, in nominal dollars, federal/provincial combined, \$000s (JC 2023a)

Table 17.32 indicates the combined tax revenue that is expected to be induced by both Project operations and corporate income taxes. Cumulatively, it is estimated that the province will receive over \$1.23 billion from taxes during the operation and maintenance phase, with the federal government generating approximately \$958M in NL, and just over \$1.01 billion nationwide. The total taxes during operations paid by WEGH2 is expected to be \$2.22 billion in NL, and \$2.37 billion in Canada (JC 2023a).

Table 17.32 Cumulative Taxes During Operations (\$2023)

Cumulative taxes (2027-2057)	RAA (Newfoundland and Labrador)	Canada
Municipal (\$M)	\$37	\$66
Provincial (\$M)	\$1,225	\$1,288
Federal (\$M)	\$959	\$1,019
Total (\$M)	\$2,221	\$2,372
Source: Jupia Consultants (JC 2023a)		

Based on the information above, a summary of residual effects on change in economy during the operation and maintenance phase is provided in Table 17.33.



Table 17.33 Summary of Effects by Project Component During Operation and Maintenance

Project Site	Summary of Effect during Operation and Maintenance
Temporary Workforce Accommodations	During the operation and maintenance phase, the Project is expected to have positive impacts on the economy via direct, indirect, and induced impacts.
Port au Port Wind Farm and Associated Infrastructure	
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

17.5.3.4 Decommissioning and Rehabilitation

As noted in Table 17.9 (direct project costs) WEGH2 is expected to spend \$99M decommissioning the Project. Approximately 90% of these expenses are expected to occur in NL (predominantly consisting of labour costs), and the remaining 10% are expected to be spent in other areas across Canada. These expenses are projected to occur for approximately two years between 2057 and 2058.

Once decommissioning of the Project is complete, the economic benefits for the LAA and the RAA will have been realized. The Project will no longer contribute towards GDP growth, presenting an irreversible residual effect. However, it is possible that the Project may create a specialization of hydrogen / ammonia activity in the LAA, which may provide labour market benefits once the decommissioning of the Project is complete.

Based on the information above, a summary of residual effects on change in economy during the decommissioning and rehabilitation phase is provided in Table 17.34.

Table 17.34 Summary of Effects by Project Component During Decommissioning and Rehabilitation

Project Site	Summary of Effect during Decommissioning and Rehabilitation
Temporary Workforce Accommodations	The Project is predicted to result in an adverse effect on economy once decommissioning is complete.
Port au Port Wind Farm and Associated Infrastructure	
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	



17.5.3.5 Summary

With the implementation of mitigation and enhancement measures, Project residual effects on the economy are predicted to be positive in direction and moderate in magnitude during construction and operation. Adverse effects are anticipated during decommissioning, rehabilitation and closure. Effects are expected to primarily extend to the RAA, although it is recognized that Project expenditures and, therefore, contributions to GDP will extend beyond NL. Effects are expected to be short term in duration during construction and decommissioning, rehabilitation and closure, and medium term in duration during operation. Effects are expected to occur continuously throughout each Project phase and are reversible following the completion of construction and operations, and irreversible for decommissioning, rehabilitation and closure. Because Project effects are inherently beneficial, the socio-economic context in which effects occur is characterized as being resilient.

17.5.4 Residual Environmental Effects Summary

17.5.4.1 Residual Environmental Effects Characterization

Table 17.35 summarizes the predicted environmental effects (residual effects) of the undertaking on economy, employment and business.

Table 17.35 Summary of Predicted Environmental Effects of the Undertaking on Economy, Employment and Business

Residual Effect	Residual Effects Characterization							
	Nature	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological and Socio-economic Context
Construction								
Change in Regional Labour Force	P	H	LAA/RAA	NS	ST	C	R	R
Change in Regional Business	P / A	M	LAA/RAA	NS	ST	C	R	R/NR
Change in Economy	P	L	LAA/RAA	NS	ST	C	R	R
Operation and Maintenance								
Change in Regional Labour Force	P	H	LAA/RAA	NS	MT	C	R	R
Change in Regional Business	P / A	M	LAA/RAA	NS	MT	C	R	R
Change in Economy	P	M	LAA/RAA	NS	MT	C	R	R



Residual Effect	Residual Effects Characterization							
	Nature	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological and Socio-economic Context
Decommissioning and Rehabilitation								
Change in Regional Labour Force	A	M	LAA/RAA	NS	ST	C	I	R
Change in Regional Business	P / A	L	LAA/RAA	NS	ST	C	I	R
Change in Economy	P	L	LAA/RAA	NS	ST	C	I	R
KEY: Nature: P: Positive A: Adverse N: Neutral Magnitude: N: Negligible L: Low M: Moderate H: High Geographic Extent: PA: Project Area LAA: Local Assessment Area RAA: Regional Assessment Area Duration: ST: Short-term MT: Medium-term LT: Long-term Timing: NS: No Sensitivity MS: Moderate Sensitivity HS: High Sensitivity Frequency: S: Single Event IR: Irregular Event R: Regular Event C: Continuous Reversibility: R: Reversible I: Irreversible Ecological / Socio-Economic Context: R: Resilient NR: Not Resilient								

17.5.4.2 Summary of Predicted Environmental Effects

Residual environmental effects that are likely to occur as a result of the Project are summarized in Table 17.35. The significance of residual adverse effects is considered in Section 17.6. Overall, with the implementation of mitigation and enhancement measures, residual effects on economy and employment are mixed (positive and adverse) with positive effects ranging from low to high in magnitude, and adverse effects ranging from low to moderate in magnitude. Effects on employment and economy generally extend to the RAA (province), although it is acknowledged that positive effects extend beyond NL. Effects range in duration from short to medium term and occur continuously across Project phases. Both reversible and irreversible effects are anticipated. Given existing conditions, effects occur within a resilient socio-economic context.



17.6 Determination of Significance

In consideration of the VEC-specific significance criteria defined above, the residual effect(s) of routine Project activities on economy, employment and business (i.e., Change in Regional Labour Force, Change in Regional Business, and Change in Economy) are predicted to be not significant.

Since adverse residual adverse effects on employment and economy are anticipated to be low to moderate in magnitude and occur within the boundaries of a normal variation in baseline conditions, Project effects are not assessed as being distinguishable from current conditions such that adverse changes cannot be managed or mitigated through adjustments to programs, policies or plans as per the definition provided in Section 17.3. In terms of the local and regional economy, Project operation and maintenance is not expected to result in economic losses that cause a decline in provincial GDP for four or more quarters. With the implementation of mitigation and enhancement measures, residual adverse effects on employment and economy are predicted to be not significant.

The level of confidence in this prediction is discussed in Section 17.7.

17.7 Prediction Confidence

There is a moderate degree of confidence in the assessment of effects on economy, employment and business. While an economic model and labour capacity study was developed based on available data, there remains uncertainty about future economic conditions in the LAA and RAA (province). The extent of local and regional employment will also depend on finalized Project workforce planning, while the extent to which regional businesses are affected depends on how they choose to respond to the opportunities presented by Project spending.

17.8 Follow-Up and Monitoring

Follow-up and monitoring will be implemented in accordance with the Project's Benefits Agreement, the Workforce and Employment Plan, and Gender Equity and Diversity Plan. As part of these plans, periodic reports for each phase of the Project will be developed. These reports will include information on the number of persons employed by 4-digit NOC, the number of full- and part-time employed, the number of apprentices (by level) and journey persons for each applicable 4-digit NOC code, gender, and source of the workforce. WEGH2 will develop Project-specific Environmental Effects Monitoring Programs, including an Outfitter Effects Monitoring Program, where mitigation and enhancement measures will be stipulated for the construction, operation, and decommissioning and rehabilitation activities. These measures will be subject to regular review as to their effectiveness as part of a process of adaptive management related to Project monitoring and follow-up. No additional follow-up and monitoring programs are proposed.



17.9 Capacity of Renewable Resources and Effects on Biological Diversity

Potential interactions between the Project and economy, employment and business are not anticipated to adversely affect renewable resources or biological diversity. Therefore, adverse Project-related effects on the capacity of renewable resources to meet the needs of the present, and those of the future, and adverse Project-related effects on biological diversity, are not anticipated with respect to economy, employment and business.

17.10 Predicted Future Environmental Conditions if the Project Does Not Proceed

If the Project is not allowed to proceed, the contribution to the economy of the area and the potential employment directly related to the Project will not occur. The economy and employment rates would be predicted to be affected by prevailing and future factors unrelated to the Project. It is possible that future development may occur in the area, including wind energy (given those Project sites are designated for wind farm development), but neither the likelihood nor extent of such development can be reasonably predicted at this time based on currently known information. The Project serves to diversify the economic base of the LAA and RAA and increase local employment that otherwise may not be realized in the absence of an equivalent project or investment in the LAA and RAA with a profile that is similar in scope and scale.

17.11 References

17.11.1 Literature Cited

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17.11.2 Personal Communication

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18.0 Communities

18.1 Scope of Assessment

The Communities Valued Environmental Component (VEC) includes community services and infrastructure, and community well-being. Communities was chosen as a VEC because the presence of the Project workforce could adversely affect the well-being of residents in communities close to the Project by altering demographics and disrupting community life. However, the Project may also contribute to positive effects on community well-being through employment and business opportunities, as well as other economic benefits (e.g., government revenue used, in part, to support social programs).

Community services and infrastructure typically includes permanent housing and temporary accommodations, transportation, local services and infrastructure (i.e., water, sewer, solid waste), education, recreation, safety, and health care facilities and services. These services and infrastructure are used by residents and may be operated and maintained by municipal, provincial and/or federal government authorities. Community services and infrastructure may be affected by additional demands arising from Project activities and the Project labour force.

Community well-being encompasses a variety of factors, including residents' access to health services and infrastructure, ability to conduct daily activities, and participation in employment and business opportunities. Community well-being is integral to population stability; maintaining or improving population health can prevent the need for investments in more costly medical interventions.

The assessment of community infrastructure and services and well-being is closely linked to, and informed by, the conclusions of the effect assessments for the following VECs:

- Employment and Economy (Chapter 17) – demographic data and estimates of Project employment inform the assessment of potential effects on Communities.
- Human Health and Quality of Life (Chapter 19) – given the potential for Project interactions with traditional, cultural and recreational activities, human health, and quality of life.

18.1.1 Regulatory and Policy Setting

As described in Chapter 1, the Project is subject to the *Newfoundland and Labrador Environmental Protection Act* and associated EA Regulations. The Minister of Environment and Climate Change required that an EIS be developed in support of the Project; Final Environmental Impact Statement (EIS) Guidelines were issued for the Project on December 13, 2022, and are found in Table E.1.

The assessment of communities was completed to meet the requirements outlined in the Final EIS Guidelines. The Guidelines require that a description of the existing environment for Communities includes a variety of topics, such as education and training facilities and programs; housing, accommodations, and property values; fire and emergency services; and municipal infrastructure or services to be used by the Project, and the capacity of the infrastructure and services to support the



Project. The Final EIS Guidelines also require an assessment of health status, including health care and community services, such as mental health and addiction services, social programs, and food security.

The Final EIS Guidelines issued for the Project require that communities be assessed as a VEC, and that the assessment include the effect of Project-related demand on community services and infrastructure. The provision and management of health services, programs, and infrastructure fall under provincial jurisdiction in NL. Health services, programs, and infrastructure for Indigenous groups in the province are provided by federal, provincial, and municipal agencies, private businesses, Indigenous governments, and service agencies in the communities and regions where they reside.

The Project does not include activities requiring federal assessment as listed in the *Physical Activities Regulations* under the *Impact Assessment Act*.

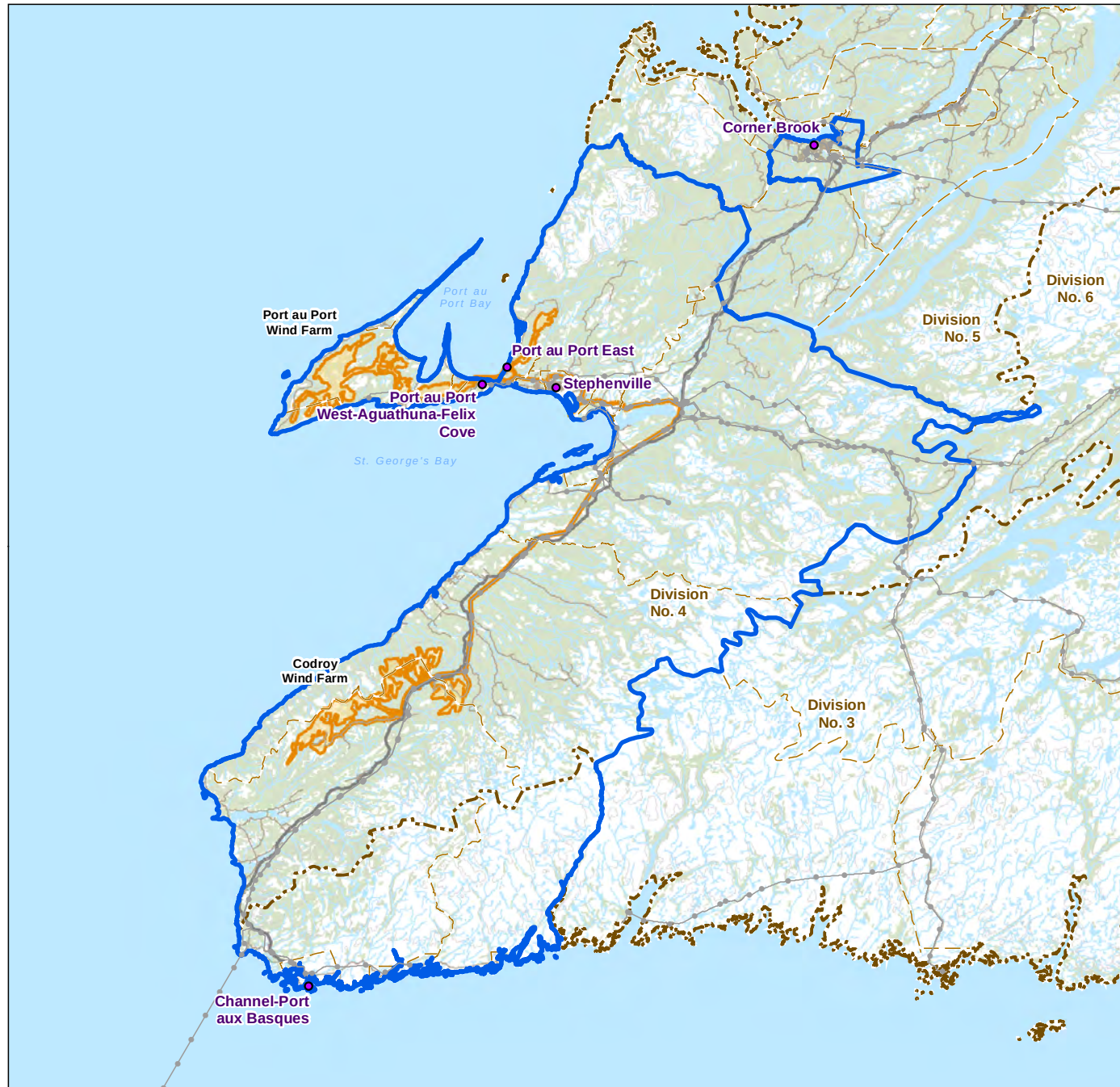
18.1.2 Boundaries

18.1.2.1 Spatial Boundaries

The following spatial boundaries were used to assess Project effects, including residual environmental effects, on Communities in areas surrounding the Project components (Figure 18.1):

- **Project Area:** The Project Area encompasses the immediate area in which the Project activities and components occur and is comprised of following distinct areas: the Port au Port Wind Farm, the Codroy Wind Farm, the Hydrogen/Ammonia Production and Storage Facility (hydrogen / ammonia plant), Port Facilities, and the 230 kilovolt (kV) Transmission Lines, as well as associated infrastructure, including roads, substations, and industrial water supply infrastructure. The Project Area is the anticipated area of direct physical disturbance associated with the construction, operation and decommissioning, rehabilitation and closure of the Project. In addition to encompassing the immediate area in which Project components and activities will occur, the Project Area also includes a buffer of up to 300 m for access roads and turbines and a 350 m corridor to accommodate the 70 to 75 m wide right-of-way (RoW) for the transmission line. These buffers allow flexibility for the micro-siting of Project components during detailed design, based on technical considerations as well as the avoidance of environmentally sensitive areas, where practicable.
- **Local Assessment Area (LAA):** The LAA includes those communities that are most likely to provide services to the Project and see increased demands from Project activities. These are also the communities that are most likely to be affected by the presence of construction and operation workforces (i.e., where Project workers will likely reside). Residents of these communities are also most likely to be affected by Project activities, including Project employment, which may affect their well-being. The LAA includes Stephenville, Port aux Basques, Corner Brook, Port au Port East, and Port au Port West – Aguathuna – Felix Cove.
- **Regional Assessment Area (RAA):** For the assessment of Project effects on communities, the LAA and RAA share the same geographic boundaries because the communities potentially affected by residual effects of the Project, cumulative effects (Chapter 23) and the effects of an accidental event or malfunction (Chapter 24) are the same.





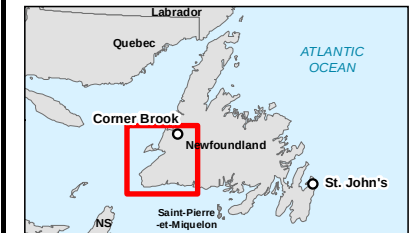
- Main Service Centre
- ▭ Census Subdivision
- ▭ Census Division
- Proposed Project Features**
- ▭ Project Area
- ▭ Local Assessment Area / Regional Assessment Area
- Transmission Line, Existing
- Trans-Canada Highway
- Road
- Contour (100 m)
- Watercourse
- Waterbody
- Forested Area



0 10 20 km
(At original document size of 8.5x11)
1:1,100,000

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: Client, Statistics Canada, GovNL
3. Background: NRCan, CanVec



Project Location
Stephenville
NL
Prepared by MB on: 2023-08-03
QR by AW on: 2023-07-20

Client/Project
World Energy GH2
Project Nujio'qonik
121417233_061

Figure No.

18.1

Title

**Communities Local Assessment
Area and Regional Assessment Area**

18.1.2.2 Temporal Boundaries

The temporal boundaries for the assessment of potential effects on communities include:

- **Construction:** Overall, the construction phase of the Project will be from Q4 2023 through Q2 2027, pending EA approval and receipt of other required permits and approvals. Early civil works are planned to start Q4 2023 through Q3 2024. Construction of the Port au Port Wind Farm and associated infrastructure is expected to start in Q3 2024 with completion of the construction in Q4 2026. Construction of the Codroy Wind Farm and associated infrastructure is expected to start Q4 2025 with completion in Q1 2027. The hydrogen / ammonia plant will be constructed in phases from Q2 2024 to Q1 2026. Grid power sources are planned for hydrogen production in 2025 until March 2026, when the electrolyzer is commissioned.
- **Operation and maintenance:** Wind farm commissioning is anticipated to start Q1 2026 at the Port au Port Wind Farm and Q2 2027 at the Codroy Wind Farm. The 600 MW electrolyzer is expected to be commissioned in Q1 2026. The operational life of the Project is 30 years at each site.
- **Decommissioning and rehabilitation:** After a 30-year operational life, the decommissioning phase is anticipated to, occur during 2057 and 2058. Decommissioning is anticipated to begin Q1 2057 at the Port au Port Wind Farm, with completion in Q3 2058 at the Codroy Wind Farm.

18.2 Existing Environmental Conditions

18.2.1 Methods

Existing sources of information were used primarily to describe the existing conditions in the LAA. This includes government sources (i.e., Statistics Canada, Government of NL, health and school boards, Western Health, NL Statistics Agency), publicly available data and literature, as well as previously prepared information (e.g., reports, studies) submitted to WEGH2 from Indigenous groups and local communities.

Much of this chapter relies on government databases, including census data from Statistics Canada. Statistics Canada regularly suppresses (i.e., selectively does not disclose) survey information to protect the identity of individuals and to address data quality issues. Both the 2016 National Household Survey and 2021 Census of the Population (Census), which are used in this chapter are subject, in part, to data suppression by Statistics Canada. Statistics Canada data have been disaggregated, where possible, and while these are often broken down by sex, most indicators are not available by Indigenous identity.

Results of engagement with stakeholders and Indigenous groups have also been integrated into the description of the existing environment, where applicable.

The following section summarizes the existing conditions of housing and temporary accommodations, utilities, health and emergency services, education, and transportation in the LAA/RAA. More information can be found in Chapter 3.0 of the Socio-Economic Environment and Land and Resource Use Baseline Study (BSA-4).



18.2.2 Existing Conditions

In 2021, the total population of the LAA was 42,733 (51.3% female), a 5.0% decrease since 2016 (Table 2.3) (Statistics Canada 2017, 2022). Total population decreases in the LAA were greater than the NL average of 2.0%. Corner Brook, the largest community in the LAA, accounted for 45.2% (19,333 persons) of the total population. Approximately 30.6% or 13,095 persons (51.7% female) within the LAA identified as Indigenous, compared to the RAA average of 9.1%. Stephenville is the second-largest community in the LAA/RAA with a population of 6,540 in 2021. Corner Brook is the only city located within the LAA/RAA. The Corner Brook municipal government comprises of a Mayor, Deputy Mayor, and five Councilors, and six departments: Capital Works and Engineering, Development and Planning, Finance and Administration, Public Works, Water and Wastewater, Protective Services, and Recreation and Tourism.

Housing stock in most LAA/RAA communities increased between 2016 and 2021 (Statistics Canada 2022), and new subdivisions continue to be developed with lots for new homes. In Stephenville, there are 50 to 75 lots available for residential housing development (C. Maddock, pers. comm.). There are more than 30 temporary accommodations in the LAA/RAA. The vacancy rate of temporary accommodations in Western NL increased between 2016 and 2021 and has not yet recovered to pre-Covid 19 levels. The vacancy rate for rental accommodation is only available for Corner Brook. The vacancy rate for an apartment in Corner Brook decreased from 3.7% in October 2019, to 1.4% in October 2021, and increased to 1.7% in October 2022 (CMHC 2023).

In 2021, core housing need, an indicator which helps identify households living in dwellings considered unsuitable, inadequate, or unaffordable, was highest in Port au Port East (14.6%) and lowest in Port aux Basques (3.9%). Stephenville, Port au Port East, and Port au Port West-Agathuna-Felix Cove have higher percentages of households in core housing need than the provincial average (8.0%). The greatest contributor to core housing need in the LAA/RAA is affordability (Statistics Canada 2023). Between March 2021 and March 2022, Newfoundland and Labrador Housing Corporation (NLHC) provided housing through 5,584 social housing units in NL. Recently, the waitlist for social housing has reached nearly 2,000 applicants, an increase of 30%. Increasingly, provincial and national data speaks to the prevalence of homelessness among vulnerable populations including Indigenous populations and those experiencing complex mental health and addictions issues (NL Housing 2022).

Wastewater system upgrades are required in some LAA/RAA communities, particularly in those communities that do not have wastewater treatment systems, including Corner Brook. Water treatment and capacity is generally good in the LAA/RAA; however, water shortages have occurred on the Port au Port peninsula during months when rainfall was low. Provincial water quality data for the Stephenville area indicate that source water meets the Guidelines for Canadian Drinking water Quality (GCDWQ) except for frequent exceedances of manganese, which is safe to consume, except for children under the age of one year (VOCM News 2023). The Town of Stephenville has confirmed that it has sufficient capacity to supply the anticipated water requirements of the Project accommodation camp and that the Town will install additional wells to meet peak demand (C. Maddock, pers. comm.).



The primary drinking water source for Port au Port East is a protected reservoir that is backed up by a drilled artesian well. Each home in the community has piped drinking water connected to this supply. The water is treated by liquid chlorine, and most of the water system is relatively new. Water quality is generally good but there have been water shortages due to the demand exceeding the available supply. Periods of scarcity occur with the change in weather; during the winter and summer, there can be months with no rainfall. Typically, between December and March, Port au Port East has received low rainfall (amounts below 50mm in a given month). The community has an artesian well to help mitigate some of the reliance on surface water (Barrett and Lightfoot 2014).

Waste management in the LAA/RAA is the responsibility of the Western Regional Waste Management, with six waste disposal locations in Western NL. The regional landfill in Corner Brook that serves the LAA/RAA was built in 2016 and has a planned lifespan of 50 years (T. Rose, pers. comm.). A curbside residential recycling and garbage collection program was launched in 2018 for Western NL, including all communities within the LAA/RAA (Corner Brook 2018).

The LAA/RAA is located in the Western Newfoundland and Labrador English School District (NLESD). There are 18 Kindergarten to Grade 12 schools in the LAA/RAA, which had a total of 4,996 students in 2021-22. Student enrolment within the western NLESD is declining and enrolment at LAA/RAA schools decreased 2.0% between 2020 and 2022. There are five post-secondary institutions in the LAA/RAA, including three College of the North Atlantic (CNA) campuses and the Grenfell Campus of Memorial University.

There are 15 daycares, preschools and after-school programs in the LAA/RAA with capacity for 425 children under the age of 13. There are also unregulated childcare providers, usually providing care in a caregiver's home or the child's home, in the LAA/RAA. There are reports that demand for childcare far exceeds the supply in the LAA/RAA. The NL government is hoping to increase provincial childcare capacity by increasing the pay for Early Childhood Educators and working with training institutions to train 700 additional childcare workers (Dean-Simmons 2023).

As of April 1, 2023, NL's health authorities combined to form one provincial authority, however, due to how recently this change has occurred, community health data for the LAA/RAA have been obtained from, and presented for, Western Health, the entity that formerly managed health care in the western region. There are three main hospitals and several medical clinics in the LAA/RAA. The new Corner Brook Acute Care Hospital will replace the existing Western Memorial Regional Hospital and is expected to be complete in November 2023. The province is experiencing a shortage of primary health care providers, and this is also a problem in the LAA/RAA. Western Health is working to establish a new 'collaborative care team' to help people in the region who do not have family doctors. Six medical clinics with the capacity to serve 19,000 people in the Stephenville-Bay St. George health neighbourhood will be included in the collaborative care team (Rhivu 2022).

The Western Health Region shows higher rates of some conditions, including arthritis, diabetes, asthma, and high blood pressure, than the province. In 2019-2020, 62.3% of Western Health residents perceived their mental health to be very good or excellent, which was lower than 68.9% of the NL population. While rates of smoking were higher in the Western Health Region (21.0%) compared to the province (19.3%) alcohol consumption was slightly higher in the province (22.3%) than in the Western Health Region



(21.7%) in 2019-2020. Just over 20% of the provincial population smoked daily or occasionally versus 16.6% of the Western Health Region. Heavy drinking was common among more than a quarter of NL's population (26.7%) and more than one fifth (22.6%) of Western Health's population.

The social connectivity of the LAA/RAA communities is evidenced by the high percentage (81.2%) of Western Health Region residents who feel a strong sense of community belonging. With respect to the Community Well-Being (CWB) Index, which measures socio-economic well-being for individual communities across Canada, overall well-being scores for LAA/RAA communities ranged from 69 to 79 in 2016, compared to the province's score of 72.

Police services are provided by RCMP detachments in Stephenville and Channel-Port aux Basques, and by the RNC in Corner Brook. The Crime Severity Index (CSI) and total criminal code violations have increased in the LAA/RAA in recent years; the CSI for the Bay St. George detachment in Stephenville, for instance, increased from 83.72 in 2016 to 85.57 in 2019 (Statistics Canada 2022). There are four fire departments in the LAA/RAA. Paramedicine and Medical Transport is a division of Western Health's Medical Services Branch and is responsible for operations of all regional ambulance services. The program is responsible for operational activities relating to emergency ambulance response and inter-facility transport. There are 16 road ambulance providers within Western Health Region and five of these operate within the LAA/RAA.

The Stephenville Regional Airport received funding for upgrades to its instrument landing system in 2018, allowing it to remain an emergency or alternate landing site for transatlantic flights. The Deer Lake Airport serves Western Newfoundland with passenger services to national and international destinations. As of 2021, aircraft movements through local airports had not returned to pre-Covid levels.

There are three ports in the LAA/RAA which service international and national ships, fishing, aggregate, container and special freight. The Marine Atlantic Terminal at Port aux Basques is the terminal for passengers and motor vehicles en route to and from North Sydney, Nova Scotia and other mainland points.

Trans-Canada Highway Route 1 connects the communities between Corner Brook and Channel Port aux Basques, and the Port au Port Peninsula is connected to Stephenville by Highway 460. Some of the roads in the LAA/RAA are reportedly in poor condition but traffic volumes are low relative to design capacity. Upgrades to transportation infrastructure are planned. More detail on roads and highways in the LAA/RAA is available in the Transportation Impact Study (Stantec 2023b).

18.3 Assessment Criteria and Methods

This section describes the criteria and methods used to assess environmental effects on communities. Residual environmental effects (Section 18.5) are assessed and characterized using criteria defined in Section 18.3.1: direction, magnitude, geographic extent, timing, duration, frequency, reversibility, and ecological or socio-economic context. The assessment also evaluates the significance of residual effects using threshold criteria or standards beyond which a residual environmental effect is considered significant. The definition of a significant effect for communities is provided in Section 18.3.2. Section 18.3.3 identifies the environmental effects to be assessed for communities including effect



pathways and measurable parameters. This is followed by the identification of potential Project interactions with this VEC (Section 18.3.4). Analytical assessment techniques employed for the assessment of potential Project-related environmental effects on communities are provided in Section 18.3.5. The assumptions that were made to support a conservative approach to the assessment of residual effects on communities are described in Section 18.3.5.3.

18.3.1 Residual Effects Characterization

Table 18.1 presents definitions for the predicted environmental effects characterization of the undertaking on Communities. The criteria are used to describe the potential residual effects that remain after mitigation and enhancement measures have been implemented. Quantitative measures have been developed, where possible, to characterize residual effects. Qualitative considerations are used where quantitative measurement is not possible.

Table 18.1 Characterization of Predicted Environmental Effects of the Undertaking on Communities

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Nature	The long-term trend of the residual effect	• Neutral – No net change in the measurable parameter(s) for Communities relative to baseline • Positive – A residual effect that moves the measurable parameter(s) in a direction beneficial to Communities relative to baseline • Adverse – A residual effect that moves the measurable parameter(s) in a direction detrimental to Communities relative to baseline
Magnitude	The amount of change in measurable parameter(s) or the VEC relative to existing conditions	• Negligible – No measurable change • Low – the Project will have a measurable effect on Communities (infrastructure and services and well-being) but within the range of normal variation in baseline capacity and/or conditions • Moderate – the Project will have a measurable effect on Communities (infrastructure and services and well-being) that exceeds the normal variation in baseline capacity and/or conditions, but which can be managed using existing resources and will not result in a reduction in standards of service • High – the Project will have a measurable effect on Communities (infrastructure and services and well-being), which will exceed the management capacity of existing resources and will result in a reduction in standards of service



Table 18.1 Characterization of Predicted Environmental Effects of the Undertaking on Communities

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Geographic Extent	The geographic area in which a residual effect of a defined magnitude occurs	• Project Area – Residual effect is restricted to the Project Area • LAA – Residual effect extends into the LAA • RAA – Residual effect extends into the RAA
Timing	Considers when the residual environmental effect is expected to occur, where applicable or relevant to the VEC.	N/A
Duration	The period of time required until the measurable parameter(s) or the VEC returns to its existing (baseline) condition, or the residual effect can no longer be measured or otherwise perceived	• Short-term – Residual effect is restricted to no more than the duration of the construction phase (4 years) • Medium-term – Residual effect extends through the operation and maintenance phase of the Project (30 years) • Long-term – Residual effect extends beyond the operation and maintenance phase of the Project (greater than 30 years)
Frequency	Identifies how often the residual effect occurs during the Project, during a specific phase of the Project, or during another specified time period	• Single event • Multiple irregular event – Occurs at no set schedule • Multiple regular event – Occurs at regular intervals • Continuous – Occurs continuously
Reversibility	Describes whether a measurable parameter(s) or the VEC can return to its existing condition after the Project activity ceases, including through active management techniques	• Reversible – Residual effect is likely to be reversed after activity completion and rehabilitation • Irreversible – Residual effect is unlikely to be reversed
Ecological / Socio-economic Context	Existing conditions and trends in the area where the residual effect occurs	Resilient – community has a moderate to high capacity to accommodate increased demand and recover from a perturbation, with consideration of the existing level of disturbance. Not Resilient – community has a low capacity to accommodate increased demand and recover from a perturbation, with consideration of the existing level of disturbance.



18.3.2 Significance Definition

A significant residual adverse effect on communities is defined as a residual Project-related change to the environment that results in either or both of the following:

- there is an exceedance of available capacity, or a substantial decrease in the quality of infrastructure and/or a service provided, on a persistent and ongoing basis, which cannot be mitigated with current or anticipated programs, policies, or mitigation measures
- deterioration of community health and well-being over an extended period which cannot be managed or mitigated through adjustments to programs, policies, plans, or other mitigation

18.3.3 Potential Environmental Effects, Project Pathways, and Measurable Parameters

Table 18.2 lists the potential Project effects on communities and provides a summary of the Project effect pathways and measurable parameters and units of measurement to assess potential effects. Potential environmental effects and measurable parameters were selected based on review of recent environmental assessments for large development projects in NL, renewable energy projects in other parts of Canada, comments provided during engagement, and professional judgment.

Table 18.2 Environmental Effects, Effect Pathways, and Measurable Parameters for Communities

Environmental Effect(s)	Effect Pathway(s)	Measurable Parameter(s) and Units of Measurement
Change in accommodations	• Demand on housing and temporary accommodations may be affected by Project-related population growth	• Project employment estimates (local and non-local workers) • Availability of accommodations (vacancy rates, inventory levels) • Cost of accommodations (\$) • Shelter-to-income ratio
Change in community infrastructure and services	• Demand on local services and infrastructure may be affected by Project activities and Project-related population growth	• Project employment estimates (local and non-local workers) • Number of hospital beds • Police officers/100,000 population • Physicians/100,000 population • Teacher/student ratio
Change in transportation infrastructure and services	• Demand on transportation infrastructure may be affected by Project activities (e.g., movement of turbines and equipment on local highways) and Project-related population growth	• Project employment estimates (local and non-local workers) • Road volume (vehicles/day) • Capacity of air transportation infrastructure



Table 18.2 Environmental Effects, Effect Pathways, and Measurable Parameters for Communities

Environmental Effect(s)	Effect Pathway(s)	Measurable Parameter(s) and Units of Measurement
Change in community well-being	- Project-related population growth and Project employment have potential to change the demographics and social structure of nearby communities. - Project activities and out-of-region workers could disrupt normal, daily living activities of nearby residents and land users, including access to health infrastructure and services	- Project employment estimates (local and non-local workers) - Provincial health characteristics - Community Well-being (CWB) Index - Crime Severity Index (CSI) - Metrics related to capacity of health services (i.e., number of hospital beds, doctor/patient ratio) - Shift schedule (days on/off)

Potential changes to communities are primarily a result of the change in demographics associated with the Project labour force. The in-migration of non-resident Project workers to the LAA/RAA may increase demand on housing and temporary accommodations, community infrastructure and services, such as health and emergency services, and transportation infrastructure. Project activities, including production of domestic waste from the temporary workforce accommodations and waste from Project construction, as well as the movement of Project workers and Project vehicles and equipment along local roads and highways, may affect the capacity and condition of local infrastructure and services.

Community well-being is affected by a variety of factors, including residents' access to health services and infrastructure, ability to conduct daily activities, and participation in employment and business opportunities. A Project-related increase in the population of the LAA/RAA may affect the availability of health infrastructure and services for existing residents which may disrupt daily activities and lead to changes in well-being. Project employment and income may change levels of disposable income and influence positive and negative health practices, which could, in turn, affect the social structure and social cohesion among residents of the LAA/RAA.

18.3.4 Project Interactions with Communities

Table 18.3 uses checkmarks to indicate the routine Project activities that could interact with communities and result in the identified environmental effect(s) to be assessed. Immediately following Table 18.3, environmental effects pathways are briefly described for potential routine Project-related environmental effects and justification is provided in cases where no Project interaction with communities (and therefore no potential environmental effect on the VEC) is predicted.



Table 18.3 Project Interactions with Communities, Environmental Effects, and Environmental Effect Pathways

Project Activities	Environmental Effect(s) to be Assessed			
	Change in Accommodations	Change in Community Infrastructure and Services	Change in Transportation Infrastructure and Services	Change in Community Well-Being
Construction				
Site Preparation and Civil Works (including turbine foundations, road construction, quarries, clearing, grubbing, blasting, cement production, and watercourse crossings)	-	-	✓	-
Transportation of Resources and Equipment (includes trucking, shipping and barging of materials)	-	-	✓	-
Construction / Installation, Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure	✓	✓	✓	✓
Installation and Commissioning of Wind Turbines	-	-	-	-
Installation and Commissioning of Collector Systems	-	-	-	-
Installation and Commissioning of Transmission Lines and Substations (including marine cable crossing)	-	-	-	-
Installation and Commissioning of Hydrogen / Ammonia Production, and Storage Facilities and Associated Infrastructure (including Industrial water supply infrastructure)	-	✓	-	-
Restoration of Existing Port Facilities (including pile driving and dredging)	-	-	✓	-
Emissions, Discharges, and Wastes ¹	-	✓	-	-
Employment and Expenditures ²	✓	✓	✓	✓
Operation and Maintenance				
Presence, Operation, and Maintenance of Wind Farms (including wind turbines, access roads, and collector systems)	-	-	-	-
Presence, Operation, and Maintenance of Transmission Lines and Substations				



Table 18.3 Project Interactions with Communities, Environmental Effects, and Environmental Effect Pathways

Project Activities	Environmental Effect(s) to be Assessed			
	Change in Accommodations	Change in Community Infrastructure and Services	Change in Transportation Infrastructure and Services	Change in Community Well-Being
Presence, Operation, and Maintenance of Hydrogen / Ammonia Production, and Storage, Facilities and Associated Infrastructure (includes marine discharge from treatment plant)	-	-	-	-
Presence, Operation, and Maintenance of Port Facilities (includes loading of ammonia and vessel maneuvering within Port)	-	-	✓	-
Emissions, Discharges, and Wastes ¹	-	✓	-	-
Employment and Expenditures ²	✓	✓	✓	✓
Decommissioning and Rehabilitation				
Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure	✓	-	-	✓
Decommissioning and Rehabilitation of Wind Farms (including wind turbines, access roads, and collector systems)	-	-	-	-
Decommissioning and Rehabilitation of Transmission Lines and Substations	-	-	-	-
Decommissioning and Rehabilitation of Hydrogen / Ammonia Production, and Storage, Facilities and Associated Infrastructure	-	-	-	-
Decommissioning and Rehabilitation of Port Facilities	-	-	✓	-
Emissions, Discharges, and Wastes ¹	-	✓	-	-
Employment and Expenditures ²	✓	✓	✓	✓
Notes: ✓ = Potential interaction – = No interaction ¹ Emissions (e.g., light, noise, vibration, air contaminants and GHGs), discharges (e.g., wastewater and other liquid effluents), and hazardous and non-hazardous wastes are generated by many Project activities. Rather than acknowledging this by placing a checkmark against each of these activities, “Emissions, Discharges, and Wastes” is listed as a separate item under each phase of the Project. ² Project employment and expenditures are generated by most Project activities and are the main drivers of many potential socio-economic effects. Rather than acknowledging this by placing a checkmark against each of these activities, “Employment and Expenditures” is listed as a separate item under each phase of the Project.				



The potential interactions between Project activities and the socio-economic environment were considered for the construction, operation and maintenance, and decommissioning and rehabilitation phases of the Project. The identification of Project activities and their potential interactions was based on engagement with interested parties, the professional judgment of technical specialists involved in the assessment, and a review of existing conditions. The selection of interactions is also informed by the potential effects and effects pathways for each VEC as described in Section 18.3.3.

Project employment and expenditures are generated by most Project activities and components and are the main drivers of many socio-economic effects. Rather than acknowledging this by placing a check mark against each of these activities, Employment and Expenditures have been consolidated as an integrated activity for efficiency of approach.

In the absence of mitigation, the Project may interact with communities in the following ways:

- While activities for each Project phase will have labour requirements causing an increase in the local population which could affect community services and infrastructure, it is not possible to isolate the effects of individual activities, so these effects are addressed collectively as part of an Employment and Expenditures activity.
- Production of Project waste ('Emissions, Discharges, and Wastes') and domestic waste from the accommodations camp will place additional demands on the local landfill during all Project phases.
- Movement of trucks, equipment, supplies and personnel ('Transportation of Resources and Equipment (includes trucking, shipping and barging of materials)') within the LAA/RAA will place additional demands on local roads and airports.
- Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure will help reduce all Project effects during construction and decommissioning and rehabilitation.
- While Site Preparation and Civil Works (including turbine foundations, road construction, clearing, grubbing, blasting, cement production, and watercourse crossings) may result in additional vehicles on local roads and highways, the construction of a Project-specific road network will reduce demands on existing transportation infrastructure.
- Installation and Commissioning of Hydrogen / Ammonia Production, and Storage Facilities and Associated Infrastructure (including Industrial water supply infrastructure) may place additional demands on local water infrastructure and supply.
- While the Project will create additional demands on the local port facilities, Restoration of Existing Port Facilities (including pile driving and dredging) during construction and Presence, Operation, and Maintenance of Port Facilities (includes loading of ammonia and vessel maneuvering within Port), will create additional capacity with respect to transportation infrastructure.
- Decommissioning and Rehabilitation of Port Facilities



The primary Project-related effects on communities are related to the presence of 'Employment and Expenditures' because the non-resident Project labour force may place additional demands on infrastructure and services in the LAA/RAA and this, along with Project employment by local residents may have positive and adverse effects on community well-being.

Other Project activities, including 'Installation and Commissioning of Wind Turbines', 'Installation and Commissioning of Collector Systems', and 'Installation and Commissioning of Transmission Lines and Substations (including marine cable crossing)' are not expected to interact with communities. Transportation associated with these activities is considered under 'Transportation of Resources and Equipment (includes trucking, shipping and barging of materials)'.

18.3.5 Analytical Assessment Techniques and Level of Knowledge

18.3.5.1 Community Services and Infrastructure

Potential environmental effects on community services and infrastructure (i.e., change in accommodations, change in local services and infrastructure, and change in transportation infrastructure and services) are qualitatively assessed by comparing anticipated Project demand with existing capacity, as established through baseline research. As noted in the previous subsections and in the Socio-Economic Environment and Land and Resource Use Baseline Report (Appendix BSA-4), there is some spare capacity in community services and infrastructure as a result of recent population declines in the LAA/RAA. There may also be potential to expand existing capacity through advance planning and investment to accommodate a new development.

Characterization criteria presented in Section 18.3.1 are applied to residual environmental effects that remain after proposed mitigation and enhancements have been implemented. The significance of these environmental effects is determined by considering thresholds and methods, as outlined in Section 18.3.2. Limitations of information, data analyses and interpretation are compensated for by taking a conservative approach in this assessment (i.e., overstating rather than understating risk).

18.3.5.2 Community Well-Being

The assessment of change in community well-being examines adverse effects on baseline conditions using quantitative and qualitative methods. Quantitative methods are used to estimate Project-related changes in Community Well-Being (CWB) Index scores, to compare Project-related employment and wages to existing conditions, and to quantify changes in population. Qualitative methods are used to explore effect pathways drawing on academic and government literature to establish cause-and-effect reasoning to determine the plausibility of effects, both positive and adverse. Two indicators are used to measure Project-related changes in community well-being: Crown-Indigenous Relations and Northern Affairs Canada's (CIRNAC's) CWB Index (quantitative analysis) and a selection of relevant social determinants of health (SDOH).



As described in the Socio-economic Environment and Land and Resource Use Baseline Study (BSA-4), CIRNAC's CWB Index (Section 3.3), is used to measure changes in community well-being because it is the only published index that provides comparability across all Canadian Census subdivisions (CSDs) for which data are available, and it is comprised of four components that are widely accepted as important to well-being (i.e., education, labour force activity, income, and housing).

Social determinants of health (SDOH) refer to a specific group of social and economic factors within the broader determinants of health. These relate to an individual's place in society, such as income, education or employment. Experiences of discrimination, racism and historical trauma are important social determinants of health for certain groups such as Indigenous Peoples, LGBTQ, and Black Canadians.

Since there is some overlap between the SDOH and CWB Index components, the assessment of community well-being focuses on the shared components of education, labour force activity, income, and housing. In order to fulfill the requirements of the Guidelines, the assessment also considers the SDOHs of healthy behaviours, social supports and coping skills, and access to health services, as well as food security.

Central to the assessment of change in community well-being is the potential for the Project to result in disproportionate or inequitable effects on vulnerable populations. Specifically, for the purpose of this assessment it is understood that the active labour force portion of vulnerable populations (based on existing conditions; Chapter 17, Section 17.2) are less likely to realize benefits of Project-related employment and income. It is also understood that various subpopulation groups may be more vulnerable to adverse changes in housing affordability and availability. As such, for the purpose of this assessment, vulnerable populations are: youth, women, seniors, Indigenous persons; individuals and households below the low-income cut-off; and marginally-housed individuals (includes individuals or households in core housing need as defined by Canadian Mortgage and Housing Corporation).

Where applicable, the assessment of change in community well-being differentiates effects on these populations from the overall population of the LAA/RAA.

18.3.5.3 Assumptions and Conservative Approach

Based on the Project description (Chapter 2) and results of supporting studies, several assumptions have been made with respect to the size of the labour force during each Project phase, plans for accommodating the labour force, and transportation of personnel and materials in order to determine the effects of the Project on communities.

Labour Force

- Construction of the wind farms will occur sequentially over a planned five-year period (Stephenville wind farm starting 2024 and Codroy wind farm starting 2025). Construction of the hydrogen/ammonia plant will occur over two years (2024 to 2026).



- During construction, the peak will see approximately 2,000 workers on site, of which it is estimated that 500 can be sourced from within the LAA/RAA. An estimated 1,500 workers will come from outside the LAA/RAA communities during peak construction.
- It is estimated that approximately 400 workers total will be required throughout the 30-year operation and maintenance phase, for approximately 250 days each year.
- Decommissioning and rehabilitation is anticipated to last for less than two years and will require a labour force of 375.
- WEGH2 will hire locally to the degree possible and will provide training opportunities to LAA/RAA community members to enhance Project-related employment opportunities for local residents.

Accommodations

- Two temporary workforce accommodations facilities will be constructed to accommodate workers during Project construction and decommissioning activities. The accommodations facility in Stephenville will house approximately 1,200 to 1,500 workers and the second camp in the Codroy area is expected to house approximately 300 to 500 workers.
- Purpose-built worker accommodation camps would include:
 - Recreational facilities
 - Canteen services
 - Laundry
 - Transportation to and from site
 - Utility services (e.g., emergency power, water, waste management, telecommunications)

Transportation

- The Port au Port and Codroy wind farms will each require a network of new and upgraded access roads for transportation of Project components and equipment into the Project Area, as well as interconnection of the wind turbine locations within the respective wind farm site.
- The Stephenville accommodations camp will be located near the Port of Stephenville and workers will likely travel to and from Port au Port by bus.
- Based on current understanding, the Port is able to accommodate vessels to transport ammonia without the construction of additional berthage.



18.4 Mitigation and Enhancement Measures

A series of environmental management plans will be developed by WEGH2 to mitigate and/or enhance the effects of Project development on the environment. A full list of mitigation and enhancement measures to be applied throughout Project construction, operation and maintenance, and decommissioning and rehabilitation is provided in Section 26.2. Key measures to mitigate and/or enhance the potential effects of the Project on Communities are listed in Table 18.4, by category and Project phase.

Table 18.4 Mitigation and Enhancement Measures: Communities

ID #*	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
8	Mitigation	Project staff and contractors will adhere to the waste management procedures to be included in the EPP and the Waste Management Plan.	X	X	X
9	Mitigation	Construction areas will be kept clear of rubbish and debris. Rubbish and debris will be appropriately stored and managed.	X	-	-
10	Mitigation	Waste materials and debris will be collected and stored in acceptable containers on-site and disposed of off-site in an environmentally acceptable and approved site. Materials that can be recycled will be sorted and taken to an approved facility.	X	X	X
11	Mitigation	Volatile wastes and materials, such as fuel, mineral spirits, oil, or paint thinner will be stored appropriately and will not be permitted to enter into waterways or storm drains. They will be disposed of at an approved site.	X	X	X
12	Mitigation	Where portable toilets are required, waste will be removed from the site by the supplier in a timely manner for appropriate disposal. These toilets will be located more than 30 m from the boundaries of wetlands or watercourses.	X	X	X
13	Mitigation	Burning of rubbish and waste materials on-site will not be permitted. Rubbish and waste materials will not be buried on-site.	X	X	X
14	Mitigation	Bulk fuel and lubricants will be stored in secure areas (i.e., with bund walls and impervious flooring) that have the capacity to trap more than the volume of petroleum hydrocarbons being stored; this will serve as a secondary containment should the primary containment fail. Other petroleum hydrocarbon products will not be stored in large quantities on-site, and secondary containment (e.g., drip trays) will be used in areas of storage and transfer.	X	X	X
36	Mitigation	In the event that project activities occur in any designated water supply areas, the work will be completed in conjunction with the jurisdiction having authority.	X	X	X



Table 18.4 Mitigation and Enhancement Measures: Communities

ID #*	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
46	Mitigation	If complaints are received from land users regarding perceived Project-related impacts, WEGH2 will work with the affected land users to address their concerns through a grievance redress mechanism and the potential implementation of additional mitigation measures as needed.	X	X	X
47	Mitigation	Workforce training will be provided to address topics such as WEGH2's Equity, Diversity and Inclusion (EDI) Policy and health and safety policies.	X	X	X
48	Mitigation	Management of employees and the temporary accommodations camp will consider measures to reduce impacts on the local community and local infrastructure through provision of services on site, and bussing.	X	X	X
49	Engagement	A Gender Equity and Diversity Plan will be implemented that meets the approval of the Minister of Industry, Energy and Technology and Minister Responsible for the Status of Women, and WEGH2 will engage with Indigenous groups during the development of the Plan. A business access strategy for members of underrepresented populations will be included in the plan.	X	X	X
50	Mitigation	WEGH2 will communicate employment information to local communities and Indigenous groups in a timely manner so that local and Indigenous residents have an opportunity to acquire the necessary skills to qualify for potential Project-related employment.	X	X	X
52	Engagement	WEGH2 will engage with local resource users regarding the overlap of the Project with land use areas in the Project Area. This will include the communication of Project information, updates on ongoing and planned activities, a discussion of issues and concerns, and a potential means of addressing them.	X	X	X
53	Mitigation	Project activities, locations, and timing will continue to be communicated to Indigenous groups, members of the public and government throughout the life of the Project. In particular, and as part of a Traffic Management Plan, WEGH2 will communicate in advance with respect to Project activities that may limit / affect use of access roads (i.e., upgrading activities or transport of large loads or equipment). This information will be communicated through local town councils, local radio stations and social media, as applicable.	X	X	X
54	Mitigation	Project personnel will conduct daily occupational health and safety meetings.	X	-	-
55	Mitigation	Occupational health and safety plans will be developed and approved, detailing appropriate operating procedures and safety provisions based on the type of machinery and materials being used, and contractors will be required to operate in compliance with these plans.	X	X	X



Table 18.4 Mitigation and Enhancement Measures: Communities

ID #*	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
56	Mitigation	The Project will be compliant with the legal, statutory, and regulatory occupational health and safety and labour requirements, to safeguard community and worker safety and health.	X	X	X
57	Mitigation	Personnel will be required to use protective gear to guard against on-the-job injuries.	X	X	X
58	Mitigation	Only trained and/or certified persons will use specialized equipment and handle dangerous chemicals.	X	X	X
59	Mitigation	Hazardous products will be stored according to industrial requirements and standards, and safely secured so that access is limited to authorized personnel.	X	X	X
60	Mitigation	WEGH2's Emergency Response Plan will describe emergency response measures, training requirements, roles and responsibilities, and contact and reporting procedures in the event of a fire at, or near, the Project Area.	X	X	X
61	Mitigation	Traffic management measures will be put in place and consistently implemented to control on-site traffic, as well as the practices of drivers to and from construction sites. Emergency vehicle access will be maintained.	X	-	-
62	Mitigation	There will be adequate safety and security measures to prevent unauthorized entry into restricted Project areas.	X	X	X
63	Mitigation	Adequate safety signage, fencing, guardrails, and/or warning tape will be installed to indicate restricted Project areas to deter members of the public, and sufficient security will be in place to monitor and enforce these restrictions.	X	X	X
64	Mitigation	Safety warning signs will be strategically placed near construction works to inform the public of prohibited activities.	X	-	-
65	Mitigation	Project drivers will be cautioned to obey the speed limit and other traffic laws.	X	-	-
70	Mitigation	Waste generated on-site will be removed on a regular basis and disposed of appropriately at an approved facility.	X	X	X
71	Mitigation	A hazardous waste inventory will be developed to support the management of general and hazardous operational waste streams.	X	X	X
76	Mitigation	When operational, the Project will meet applicable national and provincial standards to protect the health and safety of workers and the surrounding communities. In addition to addressing the potential effects of noise, air quality, worker health and safety, and public health and safety, a grievance redress mechanism will be developed to allow the best interests of relevant stakeholders to be considered during the Project.	-	X	-



Table 18.4 Mitigation and Enhancement Measures: Communities

ID #*	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
78	Mitigation	WEGH2 will liaise with local emergency providers so that roles and responsibilities are understood, and that the necessary resources required to respond to accidents and emergencies are in place.	X	X	X
79	Mitigation	Mandatory safety orientations will be provided for employees.	X	-	-
80	Mitigation	Emergency response plans will be developed, including spill prevention and response, emergency response measures, training, responsibilities, clean-up equipment and materials, and contact and reporting procedures.	X	X	X
81	Mitigation	Appropriate Project personnel will be trained in fuel handling, equipment maintenance, and fire prevention and response measures.	X	X	X
82	Design	Fire prevention and suppression systems will be maintained on site and will consider proper suppression systems for the various potential ignition sources.	X	X	X
83	Mitigation	Spill response kits will be available on-site. Project vehicles will be equipped with appropriately sized spill kits.	X	X	X
140	Mitigation	WEGH2 will actively monitor wildfires that could affect the wind turbines, substations, supporting transmission infrastructure, and/or access roads and coordinate with provincial authorities with respect to response, including the need for potential shutdown and evacuation of employees.	X	X	X
142	Mitigation	Proper fire breaks will be considered and cleared, where necessary, during clearing and site layout.	X	X	X
143	Mitigation	Project-related activities will be adjusted in case of a severe fire and as needed to protect the health and safety of employees.	X	X	X
160	Mitigation	WEGH2 will enter into a Mutual Use and Mutual Access Agreement with local snowmobile trail association to allow continued snowmobile / ATV use of the Port au Port and Codroy area wind farm sites.	X	X	X
280	Mitigation	Will hire locally trained personnel to operate and maintain the wind farms, to the extent possible.	-	X	-
281	Mitigation	Temporary accommodations camps will be constructed to house workers during Project construction, and decommissioning and rehabilitation.	X	-	X
282	Mitigation	A Community Vibrancy Fund of \$10 million for the construction phase of the Project will be distributed equally to the three Project areas (Stephenville, Port au Port and Codroy). The fund will be paid over three years, commencing with the construction start in each area.	X	X	-



Table 18.4 Mitigation and Enhancement Measures: Communities

ID #*	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
286	Engagement	Collaborate with CNA through the application/acceptance process to provide scholarships/bursaries to students in the Wind Turbine Technician and Hydrogen Technician programs. Following regulatory approval and final investment decision (FID), WEGH2 intends to make hiring commitments to some students in these programs.	X	X	-
288	Mitigation	Prioritizing transport on Project access roads versus public roads (e.g., maximizing use of purpose-built Project roads on the Port au Port Peninsula)	X	X	-
290	Mitigation	Potential use of marine landing sites on the Port au Port Peninsula to reduce impacts on local roads.	X	X	X
291	Mitigation	Potential hauling at night, where appropriate.	X	X	X
292	Engagement	Advance public notice and posting of transport schedules, as appropriate.	X	X	X
293	Mitigation	Potential for convoying components for delivery to the Codroy wind farm.	X	X	X
294	Mitigation	Scheduling of daytime deliveries to avoid peak traffic, when possible.	X	X	X
295	Mitigation	Escort vehicles will be used to indicate delivery travel to the traveling public or other motorists. Scheduling of deliveries, in an effort to minimize conflict with ferry traffic between Stephenville and Port aux Basques, will be implemented to the extent practicable.	X	-	-
296	Mitigation	WEGH2 has prepared a Waste Management Plan (WMP) that describes the liquid and solid waste expected to be generated during construction, operation and maintenance, decommissioning, and rehabilitation for all components of the Project. The WMP also includes methods to reduce, reuse, recycle, recover, and/or manage residual wastes through disposal.	X	X	X
297	Mitigation	WEGH2 has prepared a Workforce and Employment Plan, in consultation with the Department of Immigration, Population Growth and Skills, and with the Office of Women and Gender Equality, for the construction, operation and maintenance, decommissioning and rehabilitation phases of the Project. This Plan outlines: positions required (including National Occupation Classification codes); timelines for employment; estimates of apprentices and journeypersons required; qualifications, certifications and other requirements (including training); anticipated source of the workforce; a commitment to provide quarterly summary reports; and a commitment to develop a Benefits Plan.	X	X	X



Table 18.4 Mitigation and Enhancement Measures: Communities

ID #*	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
298	Mitigation	WEGH2 is committed to making a reasonable effort to hire locally, to the extent possible, and is currently undertaking studies on employment availability to analyze local labour capacity for the Project. WEGH2 will be able to better determine how many of these jobs can be filled using local labour from these analyses and studies. WEGH2 intends for jobs created for the Project to be held by locals, except in cases that capacity and available skillsets present limitations. Working closely with industry partners, trade groups, and local post-secondary education institutions will allow the Project to source qualified candidates locally.	X	X	X
183	Mitigation	Project personnel will not be permitted to hunt / fish / harvest while staying at the workforce accommodation camp(s) and/or performing work on the Project and will not be permitted to bring firearms or angling gear to the workforce accommodation camp(s).	X	X	X
320	Mitigation	WEGH2 will establish sufficient setback of wind turbines to mitigate risk to surrounding residences.	X	X	-
345	Engagement	WEGH2 will form community liaison committees and implement a community feedback and response protocol.	X	X	X
* Note: "ID #" denotes the master identification number for mitigation in Appendix 26-A. "C" denotes the construction phase of the Project. "O" denotes the operation and maintenance phase of the Project. "D" denotes the decommissioning and rehabilitation phase of the Project. "X" denotes the relevant Project phase to mitigation measure.					

18.4.1 Application of the Precautionary Principle to Project Mitigation Measures

Proposed mitigation and enhancement measures are considered to have been effective for use in similar applications and environmental conditions. This assessment is based on professional judgment of engineers, scientists, and environmental specialists in consideration of standard design codes and practices and industry standards. Regulations, industry standards, or best practices have been cited where applicable to justify the selection.

Detailed design of the Project and mitigation strategies is currently ongoing. Mitigation and enhancement measures will be refined in consideration of environmental assessment approval conditions and permit stipulations which will be incorporated into final environmental management planning. The effectiveness of these mitigation and enhancement measures will be confirmed by qualified environmental professionals and engineers as part of the development of detailed mitigation and environmental management planning. These detailed mitigation measures and monitoring programs, including adaptive management procedures, will be reviewed by applicable regulatory agencies prior to their implementation.



The primary mitigation and management measure for Communities is the provision of a temporary accommodations camp for Project workers during construction and decommissioning and rehabilitation. WEGH2 has considered the size of the peak workforce, rather than the average workforce, when developing plans for the camp, including the number of beds. Using this conservative approach will reduce the adverse Project-related effects on Communities, particularly change in accommodations and change in community well-being. Mitigation and management measures to enhance benefits to local communities include a Community Vibrancy Fund of \$10 million which will be distributed equally over three years to the three Project areas (Stephenville, Port au Port and Bay St. George South / Codroy), as well as a commitment from WEGH2 to hire locally, where possible.

18.5 Residual Environmental Effects

18.5.1 Change in Accommodations

Changes in accommodations will result from the presence of Project workers in the LAA/RAA who will require housing during construction, operation and maintenance, and decommissioning and rehabilitation. This will increase the demand on permanent and temporary accommodations in the LAA/RAA and decrease the availability of homes and rental units for local residents, as well as the number of hotel, motel, and Airbnb rooms available for tourists and other visitors to the area.

Construction is estimated to require a labour force of approximately 2,000 full-time equivalents (FTEs) (an average of approximately 1,100 FTEs). Peak construction is expected to last approximately three months during April to May 2025. It is estimated that there are approximately 500 persons within the LAA/RAA that have the skills required to work on Project construction; however, the degree to which residents of the LAA/RAA secure employment with the Project depends on numerous considerations, including existing labour force conditions and the extent to which local workers wish to participate in the Project. Therefore, during the peak construction period at least 1,500 individuals may come from outside the LAA/RAA. WEGH2 will construct two temporary accommodations camps; one in the Stephenville area which will house between 1,200 and 1,500 workers, and one in the Codroy area to house 300 to 500 workers. Both camps will be available during the construction and decommissioning and rehabilitation phases. This capacity is sufficient to house the non-local Project workers, even at peak construction.

The operation and maintenance phase will require a much smaller labour force of approximately 400 at peak. During the 30-year operation and maintenance phase, it is expected that 70 individuals will be required intermittently (for approximately 250 days each year) to maintain the wind infrastructure, and 200 people will be required to maintain the hydrogen ammonia plant. While WEGH2 is committed to hiring local residents to the degree possible, the proportion of the operation and maintenance workforce that will be local is uncertain. Therefore, the number of non-local residents who will require housing during this phase is unknown. However, even though the temporary workforce accommodations will not be available during operation and maintenance the workforce is sufficiently small that it will not likely place material demands on the existing accommodations. In addition, the construction workforce will no longer be in the LAA/RAA and any local temporary and permanent accommodations that served non-local employees during the construction phase will have become available.



The two-year decommissioning and rehabilitation phase will require a peak labour force of 375. During this phase, non-local employees will have the option of residing at the one of temporary workforce accommodations facilities. Therefore, additional demands on accommodation during the decommissioning and rehabilitation phase is expected to be minimal.

For the purpose of assessing the effects of the Project on accommodations, the following components have been grouped together and assessed as one component: the Port au Port Wind Farm and Associated Infrastructure, the Codroy Wind Farm and Associated Infrastructure, the 230 kV Transmission Lines and Substations, Hydrogen/Ammonia Production and Storage Facilities, and the Port Facilities. The labour forces associated with the construction of these components are the main impetus for a change in accommodations. Because the labour forces of these components overlap throughout the construction phase, and in line with using a conservative approach, the effects of the combined peak labour forces of these components have been used in this assessment.

18.5.1.1 Construction

It is expected that the majority, if not all, of the non-local peak construction labour force will live in the temporary workforce accommodation. Construction workers will work three weeks on one week off and/or two weeks on and two weeks off. It is assumed that during their week off, workers will return to their home communities. Typically, for short-term construction work, employees who are travelling to the LAA/RAA for work will not bring families with the intention of relocating permanently.

While staying at Project accommodations will be encouraged, some non-local construction workers or management staff may need, or choose, to stay in temporary accommodations in the LAA/RAA instead of the temporary workforce accommodations, which would place limited additional demands on local available housing and accommodations. The LAA/RAA has 33 hotels and motels which have a total of more than 1,200 rooms. There are also approximately 380 Airbnb units in the LAA/RAA. Occupancy rates for the Western region of NL for temporary accommodations, such as hotels and motels, have decreased from 46.3% in 2017 to 24.5% in 2020, likely as a result of the COVID-19 pandemic. The occupancy rate has been increasing post-COVID and reached 34.5% in 2021. Numerically, the number of units (nearly 1,600) of temporary accommodation in the LAA/RAA, in combination with the relatively low occupancy rate, suggest that there will be spare capacity to accommodate non-local employees during the peak construction phase.

If a portion of the construction labour force or Project management personnel choose to purchase homes during the construction phase, there will likely be a surplus of housing in the LAA/RAA due to the decreasing population. In Stephenville, there is a supply of housing remaining from the former military base and available lots for new housing development. It is also anticipated that, due to Stephenville's aging demographic, housing units may become available in the near future as current residents move into senior living facilities.

In Corner Brook, the housing stock has increased between 2016 and 2021, and new housing developments are in progress. The rental vacancy rate in Corner Brook has been decreasing and, as of 2022, it was relatively low at 1.7%. Vacancy rates were not available for the other LAA/RAA, but



assuming that the Corner Brook vacancy rate is a reflection of the availability of rental accommodations on the west coast of NL, the capacity of rental accommodations to serve the Project is likely low.

There is the potential for the Project labour force to diminish the availability of housing for LAA/RAA residents, particularly rentals. For instance, if landlords wish to take advantage of the higher rents that Project employees may be able to afford, they may raise the cost of rental units. In situations such as this, lower-income individuals and families may not be able to afford accommodations and could be forced to rely on social housing in the LAA/RAA. According to NLHC, there are 864 social housing units in the LAA/RAA. As of June 6, 2023, there were 78 applicants on the waitlist for 173 social housing units in Stephenville.

To reduce the adverse effects of the Project on accommodations, WEGH2 will hire locally to the maximum extent possible. WEGH2 is currently undertaking studies on employment availability to analyze local labour capacity for the Project. WEGH2 intends that jobs created for the Project will largely be held by locals, except in cases where capacity and available skillsets present limitations. Working closely with industry partners, trade groups, and local post-secondary education institutions will help the Project source qualified candidates locally.

WEGH2 will also communicate employment information to local communities and Indigenous groups in a timely manner so that they have opportunities to acquire the necessary skills for Project-related employment. WEGH2 will work with the province, educational and training institutions, Indigenous groups, and stakeholders to identify skilled trade shortages relative to the Project, and to identify training needs and opportunities to contribute to a sustainable Project workforce. WEGH2 will also collaborate with College of the North Atlantic through their application/acceptance process, and pre-hire students accepted into the Wind Turbine Technician and Hydrogen Technician programs. WEGH2 will also establish the Wind Industry Training Institute to develop the local wind energy workforce to support the Project.

In consideration of these mitigation and enhancement measures, and with the use of an accommodations camp, the effects of the Port au Port Wind Farm and Associated Infrastructure, the Codroy Wind Farm and Associated Infrastructure, the 230 kV Transmission Lines and Substations, and Hydrogen/Ammonia Production and Storage Facilities will be adverse, low in magnitude, and occur in the LAA/RAA in a resilient socio-economic environment. The effects will be short-term, continuous, and reversible.

Because the temporary workforce accommodations will house up to 2,000 construction workers, it will have a neutral effect on the change in accommodations by adding to the supply of housing and reducing the demand created by the Project labour force on local housing, rentals, and temporary accommodations.

Based on the information above, a summary of residual effects on change in accommodations during the construction phase is provided in Table 18.5.



Table 18.5 Summary of Effects by Project Component During Construction

Project Site	Summary of Effect during Construction
Temporary Workforce Accommodations	The temporary workforce accommodations will house the Project workforce and result in a neutral effect during construction
Port au Port Wind Farm and Associated Infrastructure	While the peak construction workforce will be housed in the Project's temporary workforce accommodations, some workers and Project management personnel may choose to stay in other temporary accommodations (hotels, motels, apartments) and this is expected to have low magnitude adverse effects during construction
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

18.5.1.2 Operation and Maintenance

During the 30-year operation and maintenance phase, it is likely that there will be non-resident workers moving into the LAA/RAA, and that they will bring families, and purchase or rent homes, because the work will be long-term. The same types of effects that are estimated to occur during construction are likely to occur during operation and maintenance but at a smaller scale since the labour force will be much smaller. Of the nearly 400 operation and maintenance workers, it is expected that 70 individuals will be required intermittently and may reside in temporary accommodations, including hotels, motels, and Airbnbs. Considering the number of such units available, and the small size of the labour force, the Project is not likely to create additional demands on temporary accommodations beyond existing capacity.

Approximately 400 individuals will be hired to operate and maintain the hydrogen ammonia plant and fulfil other roles. It is assumed that the majority of this labour force will come from LAA/RAA communities. Once the construction labour force leaves the area, any units they occupied during construction will become available. Therefore, the magnitude of the adverse effects on accommodations in the LAA/RAA during operation and maintenance is anticipated to be low.

The mitigation and enhancement measures provided by WEGH2 during construction will continue to be offered throughout the operation and maintenance phase, except for the accommodations camp. WEGH2 will remain committed to hiring locally to the extent possible and will work closely with industry partners, trade groups, and local post-secondary education institutions to source qualified candidates locally. Employment opportunities will be communicated to local communities and Indigenous groups in a timely manner to maximize local opportunities for Project-related employment.

In consideration of these mitigation and enhancement measures, and with the use of an accommodations camp, the effects of the of the Port au Port Wind Farm and Associated Infrastructure, the Codroy Wind Farm and Associated Infrastructure, 230 kV Transmission Lines and Substations, and Hydrogen/Ammonia Production and Storage Facilities will be adverse, low in magnitude, and occur in the



LAA/RAA in a resilient socio-economic environment with no time sensitivities. The effects will be long-term, continuous, and reversible.

Based on the information above, a summary of residual effects on change in accommodations during the operation and maintenance phase is provided in Table 18.6.

Table 18.6 Summary of Effects by Project Component During Operations and Maintenance

Project Site	Summary of Effect during Decommissioning and Rehabilitation
Temporary Workforce Accommodations	The temporary workforce accommodations will not be provided during operation and maintenance so there is no interaction
Port au Port Wind Farm and Associated Infrastructure	As the operation and maintenance labour force will be substantially smaller than that for construction, residual adverse effects will be low in magnitude
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

18.5.1.3 Decommissioning and Rehabilitation

The two-year decommissioning and rehabilitation phase will require a peak labour force of 375. During this phase, non-local employees will have the option of residing at an accommodations facility that will be sized appropriately to the workforce. While WEGH2 will encourage all Project employees to stay at the accommodations facility, a small number of staff may choose to rent apartments or purchase homes in LAA/RAA communities. As a result, Project effects on change in accommodations during decommissioning and rehabilitation are expected to be adverse, low magnitude and occur in the LAA/RAA in a resilient socio-economic environment with no time sensitivities. It is predicted that effects will occur over the short-term and will be continuous and reversible.

Because the temporary workforce accommodations will house the entire non-local decommissioning and rehabilitation workforce, it will have a neutral effect on the change in accommodations by temporarily adding to the supply of housing and reducing the demand created by the Project labour force on local housing, rentals, and temporary accommodations. The neutral effect will occur in the LAA/RAA. Effects will occur in a resilient socio-economic environment with no time sensitivities and be short-term, continuous, and reversible once construction has ended.

Based on the information above, a summary of residual effects on change in accommodations during the decommissioning and rehabilitation phase is provided in Table 18.7.



Table 18.7 Summary of Effects by Project Component During Decommissioning and Rehabilitation

Project Site	Summary of Effect during Decommissioning and Rehabilitation
Temporary Workforce Accommodations	The temporary workforce accommodations will house the Project workforce and result in a neutral effect during construction
Port au Port Wind Farm and Associated Infrastructure	As the decommissioning and rehabilitation labour force will be substantially smaller than that for construction, residual adverse effects will be low in magnitude
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

18.5.2 Change in Community Infrastructure and Services

Effects on community infrastructure and services can result from a Project-related population increase placing additional demands on existing services and infrastructure, including health, emergency, education, recreation, and utilities. In the LAA/RAA, the population has been decreasing which indicates that there is spare capacity in some community services and infrastructure, including education. However, some infrastructure is aging and in need of repair, upgrading, or replacement. The water systems in some LAA/RAA communities in particular are either unable to meet current demand or are close to reaching their physical capacity (Barrett and Lightfoot 2014).

As described in Section 18.5.1, the majority, if not all, of the Project labour force will live at the temporary workforce accommodations facilities during construction and decommissioning and rehabilitation. A variety of services will be provided at the camps, including catering for Project workers, as well as recreation opportunities, including a fitness centre. Medical services will also be provided through the on-site presence of a paramedic/nurse/ambulatory technician and an ambulance. The provision of these services will reduce additional demands on health, emergency, and recreation services and infrastructure.

During operation and maintenance, the temporary workforce accommodations will not be available. Therefore, the permanent Project labour force may create additional demands on local infrastructure and services. However, at approximately 400 individuals, the operation and maintenance labour force is much smaller than that for construction, and effects on community infrastructure and services are estimated to be of a much lower magnitude. It can also be assumed that the capacities of infrastructure and services in the LAA/RAA may be increased (e.g., new homes will be developed, upgrades will have been made to the water system, new recreation facilities will be built) to accommodate the larger construction labour force, and these enhancements will easily absorb the demands of the operation and maintenance phase.



Likewise, the demands created by the decommissioning and rehabilitation labour force, which will be relatively small and comprised of local and non-local employees, short-term, and housed at the temporary workforce accommodations will be of a lower magnitude than those created by the construction labour force. During decommissioning and rehabilitation, recycling and removal of waste will be managed to mitigate any risk to local capacity.

For the purpose of assessing the effects of the Project on community infrastructure and services, similar to the assessment of change in accommodations, all components, with the exception of the temporary accommodations camp, have been assessed as one component.

18.5.2.1 Construction

The temporary accommodations camp will be connected to the Town of Stephenville's potable water supply and wastewater system. For a facility accommodating approximately 1,200 to 1,500 workers, the increase in potable water demand is expected to be approximately 480 to 500 m³/day. This increased demand will require the Town of Stephenville to install two additional groundwater wells to meet peak demand. Due to the distance and remote nature of the Codroy wind farm, a separate workforce accommodations camp may be required to house workers during construction of the Codroy wind farm. It is anticipated that this camp would house approximately 300 to 500 workers, with a corresponding water demand of approximately 120 to 200 m³/day, which may be provided by a new potable water supply well(s).

While water quality is generally good in LAA/RAA communities, there have been water shortages in Stephenville and Port au Port communities, indicating that, at times, the current demand exceeds the capacity of water systems in those communities (Barrett and Lightfoot 2014; VOCM 2023). However, the project will be adding additional capacity to the municipal water supply to accommodate the increased demand. The Town of Stephenville will install additional wells to meet peak demand and WEGH2 will work with the Town and/or consider alternate water sources for the accommodation facility so as not to burden the Town's water supply. The creation of additional capacity to Stephenville's water system through Project-related upgrades will improve the system and increase its capacity for residents beyond the life of the Project.

During construction, the proposed accommodation facility associated with the Port au Port wind farm will be connected to the Town of Stephenville's wastewater system. A sanitary sewage treatment system is proposed to serve up to 100 employees at the hydrogen/ammonia plant. The domestic sewage treatment system will include a combination of septic tanks, pump station, and leaching beds to allow for subsurface disposal of domestic sewage onsite. While certain communities within the LAA/RAA, including Corner Brook, are lacking wastewater treatment systems, Stephenville has a wastewater treatment that is in good condition and capable of handling additional demand.

The Project will produce construction waste, as well as domestic waste from the temporary accommodations camp. WEGH2 will have a waste management plan in place to reduce Project-related waste. This plan will include recycling and reusing materials where possible. Material not deemed acceptable for re-use or recycling will be disposed of via a local certified contractor for the safe transportation of solid waste to an approved facility. Garbage is transferred from communities in the



LAA/RAA to the Bay St. George and Southwest Coast Waste Disposal Sites and then trucked to the regional landfill in Corner Brook. This landfill was built in 2016 and has a lifespan of 50 years and will have sufficient capacity to accept waste produced by the Project.

Typically, Project workers do not bring families to a new area for short-term construction work. However, if some employees move to the LAA/RAA with families, the declining population in most LAA/RAA communities paired with decreasing enrolment numbers in kindergarten to grade 12 schools suggest that there is spare capacity to accept additional students. Schools in the LAA/RAA experienced an overall decrease in enrolment of 2.0% between 2020-21 and 2021-22 school years, and Stephenville schools saw decreases between 0.8% and 10.7% during that same period. With respect to post-secondary education, WEGH2 will providing training to support the Project's need for a skilled workforce and to enhance Project-related employment opportunities for local residents. As part of this effort, WEGH2 is facilitating a partnership between Qalipu First Nation and DOB Academy, to develop a training institute which will offer green energy programming in Stephenville. This institute will create additional capacity for learning skills required by the renewable energy industry, which will be useful for the Project and future wind and renewable energy projects in the province.

As described in Chapter 3.0 of the Socio-Economic Environment and Land and Resource Use Baseline Report (Stantec 2023a), in the LAA/RAA, there are 15 regulated daycares, preschools and after-school programs with capacity for 425 children under the age of 13. There are also unregulated childcare providers in the LAA/RAA, but this number is unknown. Demand for daycare is exceeding the number of available spaces throughout NL and the situation is no different in LAA/RAA communities. Project construction workers residing in the region with young children requiring daycare may have difficulty securing spaces and may also reduce the number of childcare spaces available for LAA/RAA residents. In anticipation of the Project, it is possible that more childcare facilities will open to create additional capacity for that service. The province also has plans to increase childcare capacity by increasing the pay for Early Childhood Educators and working with training institutions to train 700 additional childcare workers, which may alleviate some pressure on existing childcare facilities.

There are many facilities in the LAA/RAA that offer opportunities for recreation, including the Stephenville Dome which was built to host the Canada Winter Games in 1999, the Corner Brook Civic Centre, and a sports complex that was built in Corner Brook in 2008 to host the NL Summer Games. Research has not revealed capacity issues with respect to recreation in the area, and it is not expected that the Project workforce will place demands on recreation infrastructure beyond its capacity. In addition, recreational facilities will be available for workers at the Project accommodations camp. It is expected that Project workers will use these facilities and that their use of LAA/RAA recreation facilities will be limited.

Health care and emergency services may be required by temporary Project workers, and/or related to accidents or malfunctions at the Project, increasing the potential need for First Responder and fire department services. The LAA/RAA is located within the Western Health service delivery area which, much like the rest of the province, is experiencing a doctor shortage. However, the Corner Brook Acute Care Hospital opened in 2023 and, despite the decline in the number of Western Health doctors (-16.5%) between 2017 and 2021, the number of specialists has increased by approximately 12.0%. In addition, Western Health is working to establish a new collaborative care team to help people in the area who do



not have family doctors. Several medical clinics in the Stephenville-Bay St. George region will be included in the collaborative care team.

To reduce demands on health care and emergency services and infrastructure, Project workers will see health care providers in their hometown during their off time. Medical services will be provided on-site to handle non-emergency health situations. In order to manage on-site accidents, WEGH2 will implement occupational health and safety plans detailing appropriate operating procedures and safety provisions for working with machinery and materials. Contractors will also be required to operate in compliance with these plans. Personnel will be required to use personal protective equipment to guard against on-the-job injuries, and only trained and/or certified persons will use specialized equipment and handle dangerous chemicals. Hazardous products will be stored according to industrial requirements and standards and safely secured so that access is limited to authorized personnel. WEGH2 will also provide workforce training on health and safety policies and mandatory safety orientations will be provided for employees.

The mitigation and enhancement measures for health services described above will also reduce demands on emergency response providers, including police, fire, and ambulance services. In addition, WEGH2 will implement an Emergency Response Plan (ERP) that will describe emergency response measures, training requirements, roles and responsibilities, and contact and reporting procedures in the event of a fire at or near the Project Area. WEGH2 will also liaise with local emergency providers so that roles and responsibilities are understood, and that the necessary resources required to respond to accidents and emergencies are in place.

Policing services may also be affected by interactions between Project workers and residents and by increased disposable income. Demands on local policing and other social service providers may increase if Project-related income is spent on illicit activities, or if it increases income differentials and, hence, tensions among community residents. Based on available data on crime indicators, the crime severity index (CSI) and number of criminal code violations have increased in LAA/RAA communities since 2016. Security services at the Project site will reduce demands on local police services because the presence of on-site security officers will reduce the risk of crimes (e.g., trespassing, vandalism) at the Project site that would require police assistance. There will be adequate security to prevent unauthorized entry into restricted Project areas.

There are four fire departments in the LAA/RAA. There have been past concerns regarding the number of firefighters staffing the Stephenville fire department, however, recruiting has led to an increase in the number of firefighters to 20. The availability of fire prevention and suppression systems at the Project site, as well as the use of a Project ERP describing emergency response measures and training in fire response procedures will reduce demands on local firefighting services.

Summary Characterization

In addition to the mitigation and enhancement measures for community infrastructure and services described above, WEGH2 will implement a Community Vibrancy Fund of \$10 million to be distributed between the three Project areas (Stephenville, Port au Port wind farm project area, and the Codroy wind farm project area). The Fund will be paid over three years, and equally divided across the Project areas, commencing with construction. These communities can choose how they want to use the Fund to



improve their communities, which may result in the creation of additional capacity in some infrastructure and services.

WEGH2 will also continue to communicate with local communities and service providers with respect to scheduling so they may prepare for potential increased demands on local services and infrastructure.

In consideration of these mitigation and enhancement measures, and with plans to add capacity of water and wastewater services, the effects of the of the Port au Port Wind Farm and Associated Infrastructure, the Codroy Wind Farm and Associated Infrastructure, 230 kV Transmission Lines and Substations, and Hydrogen/Ammonia Production and Storage Facilities will be adverse, moderate in magnitude, and occur in the LAA/RAA in a mostly resilient socio-economic environment (not resilient with respect to water supply and daycare availability). The effects will be short-term, continuous, and reversible.

Because the temporary workforce accommodations will provide health and medical, emergency response, and recreation services, it will greatly reduce the effects on the change in infrastructure and services by reducing the demand created by the Project labour force on those services that already exist in LAA/RAA communities. Positive effects will also result from the creation of a training facility which will increase local Project employment and facilitate employment of local residents on future renewable energy projects. The positive effect will be moderate in magnitude and occur in the LAA/RAA. Effects will occur in a resilient socio-economic environment with no time sensitivities and be short-term, continuous, and reversible once construction has ended.

Based on the information above, a summary of residual effects on community infrastructure and services during the construction phase is provided in Table 18.8.

Table 18.8 Summary of Effects by Project Component During Construction

Project Site	Summary of Effect during Construction
Temporary Workforce Accommodations	As the temporary workforce accommodations will provide health and medical, emergency response, and recreation services, they will have positive effects that are moderate in magnitude
Port au Port Wind Farm and Associated Infrastructure	Project activities and labour force during construction will place demands on infrastructure and services that will be mitigated with upgrades to certain infrastructure and services, management plans and the Community Vibrancy Fund so residual adverse effects will be moderate in magnitude
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	



18.5.2.2 Operation and Maintenance

During operation and maintenance, the temporary workforce accommodations camps will not be available. Therefore, the permanent Project labour force may create additional demands on local infrastructure and services. However, at approximately 400 individuals, the operation and maintenance labour force will be much smaller than that for construction and effects on community infrastructure and services are estimated to be of a much lower magnitude. It can also be assumed that the capacities of infrastructure and services in the LAA/RAA may be increased (e.g., new homes will be developed, upgrades will have been made to the water system, new recreation facilities will be built) to accommodate the larger construction labour force and these enhancements will easily absorb the demands of the operation and maintenance phase with ease.

During operation and maintenance, water will be one of the key inputs to the hydrogen/ammonia plant. As described in Chapter 2 (Project Description), Section 2.7.4.3, Gull (Mine) Pond is planned to be the primary source of industrial water for the hydrogen / ammonia plant, and Muddy Pond and Noels Pond will be secondary water sources. In order to access these water sources, WEGH2 plans to refurbish the existing industrial water supply infrastructure that was constructed in the 1970s to supply a liner board mill and, subsequently, the Abitibi mill. Records indicate the previous Abitibi mill site operators used an average of more than 15.9 m³/min of industrial water that was drawn from the Muddy Pond and Noels Pond system. It is estimated that more than 37.9 m³/min of water were being withdrawn from Noels Pond when both the Town of Stephenville and the industrial users were withdrawing water from Noels Pond. The hydrogen / ammonia plant site will not be connected to the municipal water supply and municipal wastewater system onsite. The industrial water requirements for the Project are not expected to exceed the demands of the available water supply.

In consideration of the small size of the operation and maintenance labour force, the capacity of the industrial water supply, and the mitigation and enhancement measures described in Section 18.5.2.1, the effects of the Port au Port Wind Farm and Associated Infrastructure, the Codroy Wind Farm and Associated Infrastructure, 230 kV Transmission Lines and Substations, and Hydrogen/Ammonia Production and Storage Facilities will be adverse, low in magnitude, and occur in the LAA/RAA in a mostly resilient socio-economic environment (not resilient with respect to water supply and daycare availability). The effects will be long-term, continuous, and reversible.

Based on the information above, a summary of residual effects on change in community infrastructure and services during the operation and maintenance phase is provided in Table 18.9.



Table 18.9 Summary of Effects by Project Component During Operation and Maintenance

Project Component	Summary of Effect during operation and maintenance
Temporary Workforce Accommodations	The temporary workforce accommodations will not be provided during operation and maintenance so there is no interaction
Port au Port Wind Farm and Associated Infrastructure	Given the small size of the labour force and reduction in demand on infrastructure and services during operation and maintenance, residual adverse effects will be low in magnitude
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

18.5.2.3 Decommissioning and Rehabilitation

During decommissioning and rehabilitation, there will be a reduction in effects on community services and infrastructure as a result of a reduction in demand from Project activities, and as workers move away from the LAA/RAA due to diminishing employment. Additional demands that have been placed on most community services and infrastructure during operation and maintenance will have been addressed prior to decommissioning. With respect to waste disposal, the removal and disposal of Project infrastructure during the decommissioning, rehabilitation and closure phase may place additional demands on the local landfill. However, while the current capacity of the landfill used by communities in the LAA/RAA is known, there is some uncertainty regarding usage rates over the next 30 years with potential improvements to the landfill and recycling technology and potential for demand to fluctuate. WEGH2 will consult with waste management authorities and develop a plan prior to decommissioning and closure to appropriately handle decommissioning waste. This plan will include consideration of local landfill capacity and measures to reduce unacceptable effects.

In consideration of the small size of the decommissioning and rehabilitation labour force, the capacity of the regional landfill, and implementation of a Waste Management Plan, the effects of the Port au Port Wind Farm and Associated Infrastructure, the Codroy Wind Farm and Associated Infrastructure, 230 kV Transmission Lines and Substations, and Hydrogen/Ammonia Production and Storage Facilities will be adverse, low in magnitude, and occur in the LAA/RAA in a mostly resilient socio-economic environment (not resilient with respect to water supply and daycare availability). The effects will be short-term, continuous, and reversible.

As previously discussed, the temporary workforce accommodations will provide health and medical, emergency response, and recreation services. The temporary accommodations will have a positive effect on the change in infrastructure and services by reducing the demand created by the Project labour force on those services that already exist in LAA/RAA communities. The positive effect will be moderate in magnitude and occur in the LAA/RAA. Effects will occur in a mostly resilient socio-economic environment



(not resilient with respect to water supply and daycare availability) with no time sensitivities and be short-term, continuous, and reversible.

Based on the information above, a summary of residual effects on change in community infrastructure and services during the decommissioning and rehabilitation phase is provided in Table 18.10.

Table 18.10 Summary of Effects by Project Component During Decommissioning and Rehabilitation

Project Component	Summary of Effect during decommissioning and rehabilitation
Temporary Workforce Accommodations	As the temporary workforce accommodations will provide health and medical, emergency response, and recreation services, they will have positive effects that are moderate in magnitude
Port au Port Wind Farm and Associated Infrastructure	Given the small size of the labour force, reduction in demand on infrastructure and services, and use of Waste Management Plan during decommissioning and rehabilitation, residual adverse effects will be low in magnitude
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

18.5.3 Change in Transportation Infrastructure and Services

Effects on transportation infrastructure and services can result from the movement of Project-related vehicles carrying materials and personnel along LAA/RAA roads and highways. The Port of Stephenville will also see increased activity as most materials, equipment, and components for construction and commissioning of the Project will be delivered by ship. The Stephenville Airport may also see increased activity if some of the Project labour force is hired outside of province.

During construction, the current concept for primary Project access involves two temporary marine landing sites on the Port au Port Peninsula. The marine landing sites will be constructed to receive low draft barges for delivery of the wind turbine components and other bulk Project materials. The landing sites at Aguathuna (Figure 2.24) and Western Bay (Figure 2.25) have been chosen to reduce interference with local traffic, with the exception of one public road crossing to get to the turbine access roads (which will have traffic control when trucks cross public roads, approximately 5 minutes per truck). Starting from the marine landing sites, major component deliveries transition to Project-specific roads in the peninsula interior. Construction materials, equipment, and components for the wind farms and supporting infrastructure will be transported to the construction sites using the local road network: Route 1, Route 460, Route 462, Route 463, Route 490, Main Street/Aguathuna Road, and Harbour Drive. These routes will also be used to transport Project personnel to the construction sites. In addition to the existing road infrastructure, a series of internal roads will be constructed to be used throughout the life of the Project including transport the materials, equipment, and components to and around the wind farm sites and on-going maintenance.



The assessment of effects of the Project on transportation infrastructure and services relies heavily on the results of the Transportation Impact Study (Appendix 2-E), which examined the existing road infrastructure and capacity of the existing roads, bridges, culverts, sign structures, traffic, and utility poles to accommodate transportation of oversized and overweight loads during the lifetime of the Project and considered the frequency of travel over proposed routes. The study assumed that all oversized and overweight components will be delivered by ship to Port of Stephenville then distributed to the different sites through the provincial highway network and municipal roads. It acknowledges that measures will be implemented to mitigate any deficiencies in the roads, bridges or other infrastructure, including providing alternative access, acknowledging that any engineering design or investigation costs will be at the Proponent's expense.

For the Transportation Impact Study, the construction phase is considered the worst-case scenario in terms of the Project phases because it is expected that the turbine installation phase of construction will generate the highest traffic volumes. These will mainly include turbine component delivery trips, construction material (e.g., concrete) delivery trips, and trips generated by construction staff and other personnel. The construction phase represents the worst-case scenario for the Project because oversized and overweight Project materials and equipment will be transported to sites.

18.5.3.1 Construction

Roads

During construction, it is assumed that three turbines will be shipped to the construction sites per week, resulting in six round trips per day. It is also assumed that construction of each component will not be conducted simultaneously and that construction crews will finish in one Project area before moving on to the next component. The Transportation Impact Study (Appendix 2-E) estimates that the average number of construction material (not turbine components) delivery round trips will be 30 per day. It is also important to note that components for the construction of hydrogen/ammonia plant will be transported from the laydown areas at the Port of Stephenville to the adjacent construction site using the road network at the port which will not interfere with use of public roads.

The Transportation Impact Study (Appendix 2-E) estimates that 10 shuttles are required to transport the construction workers between Stephenville and Project sites. It is assumed that five personal trips from Stephenville and five personal trips from the nearest ferry (i.e., Port aux Basques) to the Project sites will be made by inspectors, surveyors, and supervisors. As described in the Transportation Impact Study Report (Stantec 2023), the maximum Average Annual Daily Traffic (AADT) recorded in the road network is 8,169. This was recorded on the west side of the Port au Port isthmus. The capacity of a two-lane highway is 1,700 vehicles per hour (veh/h) for each direction of travel (Transportation Research Board 2000). To determine the peak hour volume at each travelling direction, it is assumed that the peak hour volume is 10% of the AADT and traffics are evenly distributed in two directions. The result peak hour volume at each travelling direction is about 410 vehicles/hour, which is well below the default capacity of 1,700 vehicles/hour for a two-lane road.



The Transportation Impact Study (Appendix 2-E) concludes that the delivery of construction material (approximately 30 round trips) will not bring noticeable impact to the road network because it is within its design capacity. In terms of construction-related vehicles during the peak construction season, the impact to current traffic operation is low. When a truck transporting Project materials and equipment is crossing Route 463, crossing Aguathuna Road, or making turns at intersections, it is expected that local traffic will need to be stopped for a maximum of five minutes to allow the truck to pass. These temporary delays are not predicted to substantially interfere with access to adjacent land use sites (Stantec 2023b).

During construction, standard procedures, including traffic management and control, will be implemented to reduce traffic delays. WEGH2 has prepared a Traffic Management Plan as part of the Traffic Impact Study (Appendix 2-D) for Project-related vehicular traffic during transportation of oversized and overweight loads. Informed by the Transportation Impact Study (Appendix 2-D), this Plan addresses municipal requirements and traffic management plans for the transport of oversized and overweight loads on municipal roads and identifies provincial access and right of way permit requirements as expected over the life of the Project. The Traffic Management Plan procedures will be developed during ongoing planning and engineering design and will address traffic staging to reduce delays.

Measures to manage traffic specifically include the scheduling of daytime deliveries to avoid peak traffic, and hauling loads during nighttime hours, when possible. WEGH2 will also have escort vehicles to warn other road users of oversized vehicles travelling between Stephenville and Port aux Basques. WEGH2 will also schedule deliveries to avoid the ferry traffic between Stephenville and Port aux Basques.

As with other community services and infrastructure, WEGH2 will continue to communicate with local communities and service providers with respect to scheduling so they may prepare for potential increased demands related to transportation.

Port

It is assumed that most materials, equipment, and components, including oversized and overweight components, will be brought to the Port of Stephenville by ship, and distributed to the appropriate construction site through highways and internal roads. For each wind farm, approximately 95 vessel trips could be required to deliver the wind turbine components; another 25 to 30 vessel trips could be required for the hydrogen / ammonia plant components. At the height of construction, one to three vessels per week would be expected at the port.

To support Project construction and operations, WEGH2 will complete required upgrades to the existing port facilities. This will include repairs to the underside and topside of the dock and the strengthening or replacement of existing pile supports required by normal tidal erosion.



Airport

While WEGH2 will aim to hire local residents for Project construction to the degree possible, it is likely that a portion of the construction labour force will be hired from other parts of NL, particularly the St. John's area, and will arrive in the LAA/RAA by car. Construction workers hired from outside the province will arrive by airplane through the Stephenville Regional Airport and the Deer Lake Regional Airport. Passenger traffic at NL airports decreased by an average 71% between 2019 and 2020 (TCAR 2021) due to Covid-19 and have not yet seen activity increase to pre-Covid levels. This indicates that there is spare capacity within airports to accommodate flights for Project employees who may be travelling to and from the LAA/RAA from St. John's or outside the province. In addition, the Stephenville Regional Airport received \$1 million in upgrades to its instrument landing system and there are plans to build a new terminal if the sale of the airport is complete.

Planned mitigation measures will reduce the effects of the Project on the capacity of the airport, including scheduling of rotation changes so that the entire workforce does not arrive at or leave the LAA/RAA through the airport on the same day (e.g., split shifts).

Summary Characterization

Because the traffic associated with the movement of materials and personnel will be the same for each component, and because their construction will be sequential, the effects of the construction of the Port au Port Wind Farm and Associated Infrastructure, the Codroy Wind Farm and Associated Infrastructure, the 230 kV Transmission Lines and Substations, and Hydrogen/Ammonia Production and Storage Facilities are expected to be the same. In consideration of the capacity of transportation infrastructure in the LAA/RAA, and the planned mitigation and enhancement measures, the effects of these components are predicted to be adverse, moderate in magnitude, and occur in the LAA/RAA in a resilient socio-economic environment. The effects will be short-term, continuous, and reversible. Positive effects are likely in the event that the Project results in improvements to existing infrastructure, including the port facilities, or the creation of new roads which will increase the capacity of the transportation infrastructure in the LAA/RAA beyond the lifetime of the Project.

The presence of the temporary workforce accommodations will generate some road trips through the transportation of Project personnel between the camps and the Project site. These will also be low-magnitude adverse effects occurring in the LAA/RAA in a resilient socio-economic environment. They will be short-term, continuous and reversible.

Based on the information above, a summary of residual effects on transportation infrastructure during the construction phase is provided in Table 18.11.



Table 18.11 Summary of Effects by Project Component During Construction

Project Site	Summary of Effect during construction
Temporary Workforce Accommodations	Transportation of personnel between the temporary workforce accommodations and Project site will have low magnitude adverse effects
Port au Port Wind Farm and Associated Infrastructure	Movement of equipment and personnel will have moderate adverse effects on transportation infrastructure
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	Upgrades to the port facilities will increase its capacity and create moderate positive effects

18.5.3.2 Operation and Maintenance

During operation and maintenance, it is assumed that Project-related vehicle movements along the local road network will be limited to a few weekly maintenance and site visit trips, and trips made to the Project site by residents of the LAA/RAA who secure Project employment. Airport activity will decrease during the operation and maintenance phase as the labour force will decrease to approximately 400 individuals, some of whom will be from local communities. These positions will largely be permanent during the 30-year operation and maintenance phase, so employees will not be travelling in and out of the LAA/RAA by plane on a rotational basis. With respect to activity at the Port, the first commercial shipments will commence in 2026 and it is estimated that one to two vessels per month will be required. This may increase to four to six vessels per month for future potential development.

Because the operation and maintenance phase will require far fewer vehicle movements along the road network and at the Port, and fewer passenger movements at the airport, effects on transportation infrastructure during this phase are expected to be adverse, low in magnitude and occur in the LAA/RAA in a resilient socio-economic environment with no timing sensitivities. Effects are predicted to occur over the long-term and be continuous and reversible.

Based on the information above, a summary of residual effects on transportation infrastructure during the construction phase is provided in Table 18.12.



Table 18.12 Summary of Effects by Project Component During Operation and Maintenance

Project Site	Summary of Effect during Operation and Maintenance
Temporary Workforce Accommodations	The temporary workforce accommodations will not be provided during operation and maintenance so there is no interaction
Port au Port Wind Farm and Associated Infrastructure	Given the small size of the labour force and reduction in demand on transportation infrastructure and services during operation and maintenance, residual adverse effects will be low in magnitude
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

18.5.3.3 Decommissioning and Rehabilitation

According to the Transportation Impact Study, the construction phase is considered to be the worst-case scenario for the Project with respect to movement of materials and personnel. While the number of trips along roadways during decommissioning has not been provided in the Transportation Impact Study, it is assumed that similar to operation and maintenance, Project-related vehicle movements along the local road network will be greatly reduced from the construction phase. Because the labour force will be much smaller than that required for the construction phase, the number of trips to transport workers between the Project site and the camp will also be greatly reduced. Airport activity will also decrease during the decommissioning and rehabilitation phase and activity at the port will also decrease as operations come to an end.

As a result of these factors, and with the implementation of mitigation and enhancement measures, Project effects on transportation infrastructure and services during decommissioning and rehabilitation are predicted to be low magnitude, adverse, occur in the LAA/RAA in a resilient socio-economic environment and with no timing sensitivities. Effects are expected to be continuous, short-term, and reversible.

Based on the information above, a summary of residual effects on transportation infrastructure during the construction phase is provided in Table 18.13



Table 18.13 Summary of Effects by Project Component During Construction

Project Site	Summary of Effect during construction
Temporary Workforce Accommodations	Given the small size of the labour force and reduction in demand on transportation infrastructure and services during decommissioning and rehabilitation, residual adverse effects will be low in magnitude
Port au Port Wind Farm and Associated Infrastructure	
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

18.5.4 Change in Community Well-Being

As described in Sections 18.3.3 and 18.3.5.2, changes in community well-being are a result of demographic changes that may affect the components of the CWB Index (i.e., education, labour force activity, income, and housing) and SDOH (i.e., healthy behaviours, social supports and coping skills, access to health services, and food security).

During construction, the size of the labour force will peak between March and May 2025, reaching nearly 2,000. Assuming that approximately 500 of these individuals may come from the LAA/RAA communities (Chapter 17), the population of the LAA/RAA may increase by about 1,500 people for a period of at least three months. Considering that the LAA/RAA communities are largely rural, with relatively small populations (total of 42,733 in 2021), this increase may have adverse effects on the well-being of permanent residents. As previously described, an increase in the population of LAA/RAA communities related to Project employment will increase demands on community services and infrastructure, including housing and temporary accommodations, education, and health services and infrastructure. A decrease in access to these services and infrastructure can affect community well-being.

In addition, depending on an individual's pre-employment situation, LAA/RAA residents who secure Project employment may see adverse or positive effects on well-being. Where changes in income result in increased levels of disposable income, Project-related employment could decrease financial barriers to accessing healthy market foods and recreational activities. In other cases, increased disposable income could decrease financial barriers to negative coping mechanisms such as overeating, smoking, heavy drinking, and illicit drug use.

The 30-year operation and maintenance phase will require a much smaller labour force of approximately 400 at peak. It is expected that 70 individuals will be required intermittently (for approximately 250 days each year) to maintain the wind infrastructure and may not choose to reside in LAA/RAA communities. Of the 200 people required to maintain the hydrogen ammonia plant, some will likely be hired from LAA/RAA communities, and these individuals will not affect demographics or access to health infrastructure or services. The two-year decommissioning and rehabilitation phase will require a peak labour force of 375.



During this phase, non-local employees will have the option of residing at temporary accommodations camps and not place demands on housing or other infrastructure and services.

For the purpose of assessing the effects of the Project on community well-being, the following components have been grouped together and assessed as one component: the Port au Port Wind Farm and Associated Infrastructure, the Codroy Wind Farm and Associated Infrastructure, the 230 kV Transmission Lines and Substations, Hydrogen/Ammonia Production and Storage Facilities, and the Port Facilities. The labour forces associated with the construction of these components are the main impetus for a change in accommodations. Because the labour forces for these components overlap throughout the construction phase, and are in line with using a conservative approach, the effects of the combined peak labour forces of these components have been used in this assessment.

18.5.4.1 Construction

Education

The CWB Index education score for the province in 2016 was 49 out of 100. Scores in the LAA/RAA communities, except for Port au Port West-Aguathuna-Felix Cove, were on par or better than the provincial average in 2016 (Stantec 2023a; Table 3.10). The education CWB Index scores could be affected by an increase in the LAA/RAA population which may result in additional demands on schools in the area. Given the declining enrolment in kindergarten to grade 12 schools and results of the assessment of 'change in infrastructure and services' (i.e., residual adverse effects on the education during all Project phases), Project-related adverse effects are predicted to be low (Section 18.5.2).

With respect to post-secondary education, there are five institutions in the LAA/RAA, including three CNA campuses and a Memorial University campus. A new Centre of Excellence for Heavy Equipment and Industrial Trades was opened at CNA's Bay St. George campus in 2019. WEGH2 will work with the province, educational and training institutions, Indigenous groups, and stakeholders to identify skilled trade shortages relative to the Project and to identify training needs and opportunities to contribute to a sustainable Project workforce. This measure will decrease the barriers to employment that are experienced by members of Indigenous groups and other vulnerable subpopulations. New programs that will be established at post-secondary institutions in the LAA/RAA and at the Wind Industry Training Institute to develop the wind energy workforce will likely continue beyond the Project construction, increasing opportunities for education in the region.

The Project is not anticipated to have measurable adverse effects on the capacity of schools in the LAA/RAA and is likely to have positive effects on the proportion of the current LAA/RAA population with a post-secondary education (education variables included in CIRNAC's CWB Index). The Project is, therefore, expected to result in neutral to positive effects related to education and well-being.



Labour Force Activity and Income

Construction is estimated to require a peak labour force of approximately 2,000 full-time equivalents (FTEs). Peak construction is expected to last about three months during April to May 2025. It is estimated that there are about 500 persons within the LAA/RAA that have the skills required to work on Project construction and that a portion of the construction, operation and maintenance, and decommissioning and rehabilitation workforces will be sourced from NL (Chapter 17).

Between 1991 and 2016, income scores increased for all communities in the LAA/RAA (Stantec 2023a, Table 3.7). Scores ranged from a low of 51 in Port au Port West-Agathuna-Felix Cove in 1991 to a high of 76 for Corner Brook in 2016. In 2016, the income score for the province was 75. The labour score for the province in 2016 was 74. For the LAA/RAA communities, labour scores ranged from 60 for Port au Port West-Agathuna-Felix Cove in 1991 to 81 in Stephenville in 2011 and Corner Brook in 2011 and 2016 (Table 3.8). In 2016, the labour scores in Channel-Port aux Basques increased by one point and fell by six points in Stephenville.

As a result of Project-related income, the Project is expected to have a beneficial effect on CWB Index scores of LAA/RAA communities (through changes in individual/household income [income subcomponent]) and result in positive effects on community well-being. Depending on the pre-employment situation of individuals who secure employment with the Project, Project-related income could also result in positive effects on health status due to and improved lifestyle choices (e.g., decreased use of drugs and alcohol) and eating habits. This could also result in beneficial effects on mental and physical health (e.g., decreased blood pressure and other cardiovascular risk factors; Kline and Gonzalez 2003; Kelli et al. 2016), stress and anxiety (Barron et al. 2010)).

Conversely, Project employment-related stressors such as deadlines, workloads and other responsibilities, and time spent away from family during work rotations, could result in increased levels of stress and anxiety, adversely affecting the health status of individuals who secure employment. This increased stress could lead to a reliance on negative coping mechanisms (e.g., drug and alcohol misuse, unhealthy lifestyle choices). Workforce education to encourage healthy lifestyle choices will help reduce these potential adverse health effects. Employee training may include building awareness about the potential effects of drug and alcohol misuse, including social concerns such as effects that workers can have on their community and families.

WEGH2 will hire locally, to the maximum extent possible, and is currently undertaking studies on employment availability to analyze local labour capacity for the Project. WEGH2 will be able to better determine how many of these jobs can be filled using local labour from these analyses and studies. WEGH2 intends for jobs created for the Project to be held by locals, except in cases that capacity and available skillsets present limitations. WEGH2 will implement a number of mitigation and management measures to enhance the local share of the Project labour force. Working closely with industry partners, trade groups, and local post-secondary institutions will allow WEGH2 to identify opportunities for training and source qualified candidates locally. WEGH2 will communicate employment information to local communities and Indigenous groups in a timely manner so that local and Indigenous residents have an opportunity to acquire the necessary skills to qualify for potential Project-related employment.



Due to the demographic profile of the LAA/RAA, positive employment effects will likely be experienced differently by Indigenous and non-Indigenous groups. It is conservatively assumed that the Project will employ more non-Indigenous than Indigenous persons. It is also likely that the Project will employ more males than females, as most jobs associated with the Project will be in trades and construction-related occupations and industries that have disproportionately high employment among males (Chapter 17).

To address issues of diversity and inclusion, WEGH2 will implement the mitigation and management measures identified in Section 18.4, which will include implementation of a Gender Equity and Diversity Plan and a business access strategy for members of underrepresented populations, including Indigenous persons, women, visible minorities and persons with disabilities. WEGH2 and Qalipu have entered into negotiations with a view to concluding a socio-economic agreement that will provide a framework for the Parties' relationship through all phases of the Project. WEGH2 will continue to provide notice of employment and business opportunities to the Indigenous groups.

Given Project employment and income estimates, the Project is expected to have a beneficial effect on CWB Index labour force activity and income scores of LAA/RAA communities (through changes in labour force employment [labour subcomponent] and through changes in individual/household income [income subcomponent]). However, Project-related employment and income may also lead to increased stress and reliance on negative coping mechanisms, which could ultimately adversely affect community well-being. The overall effect on community well-being associated to employment and income is expected to be neutral.

Housing

The housing CWB Index Scores could be affected by an increase in LAA/RAA populations. Housing scores are generally high in LAA/RAA communities, ranging from 93 to 97, consistent with the province's housing score of 95.

As described in Section 18.5.1, the Project labour force will likely diminish the availability of permanent housing, rentals, and temporary accommodations (e.g., hotels, motels, Airbnbs) in LAA/RAA communities. The increased demand placed on rental properties is most likely to affect local residents since the region is already experiencing a low vacancy rate. The increased demand for rentals may lead to an increase in rents, which would adversely affect low-income families who rely on affordable rental accommodations. While there is a supply of social housing units in the LAA/RAA, there are nearly 80 applicants on the waitlist for them. As indicated in the Socio-Economic Environment and Land and Resource Use Baseline Study (Stantec 2023a), the greatest contributor to core housing need in the LAA/RAA is affordability. In the LAA/RAA, only Corner Brook and Port aux Basques have lower rates of core housing need than the provincial average of 8.0%.

As detailed in Table 18.5 and described in Section 18.5.1, WEGH2 will implement several mitigation and enhancement measures to maximize the local labour force and reduce the effects of non-local workers on accommodations and effects on the CWB housing scores. This includes working with the province, educational and training institutions, Indigenous groups, and other stakeholders to identify skilled trade shortages relative to the Project and to identify training needs and opportunities and communicating employment opportunities in a timely manner to local communities.



During construction, it is predicted that Project adverse effects on accommodations will be low in magnitude due to the use of temporary workforce accommodations and occur in the LAA/RAA in a resilient socio-economic environment. The effects will be short-term, continuous, and reversible once construction has ended. While changes in demand for housing are assessed as low, upward pressure on cost of housing and disproportionate effects on subpopulation groups within the LAA/RAA's 'vulnerable population' classification (e.g., persons on fixed incomes and marginally housed persons) may still contribute to a small decrease in the score of the housing subcomponent of CWB Index scores for LAA/RAA communities. The Project is, therefore, expected to result in neutral to low magnitude adverse effects on existing conditions related to housing and community well-being.

Access to Health Services

An increase in the population of the LAA/RAA can place additional demands on existing health services and infrastructure. A decrease in access to health care can lead to adverse effects on the well-being of residents. Health care and emergency services may be required by temporary Project workers, and/or related to accidents or malfunctions at the Project. While the Western Health service delivery area, much like the rest of the province, is experiencing a doctor shortage, the region is seeing an increase in the capacity of health care with the opening of the Corner Brook Acute Care Hospital in 2020 and a new collaborative care team to help people in the area who do not have family doctors.

As described in Section 18.5.2, WEGH2 will implement mitigation and management to reduce demands on health care and emergency services and infrastructure. This will reduce the potential adverse effects of the Project on residents' access to health services. Project workers will be encouraged to see health care providers in their hometown during their off time and medical services will be provided through the on-site presence of a paramedic/ nurse/ambulatory technician and an ambulance. In addition, an ERP will be developed to reduce the potential for Project-related accidents and their demands on health services and infrastructure. As a result, the adverse effects on health care services are expected to be adverse, low in magnitude, occur in the LAA/RAA in a resilient socio-economic environment and be short-term, continuous, and reversible. The Project is therefore expected to result in low magnitude changes in existing conditions related to access to health care and community well-being.

Healthy Behaviours

The presence of a temporary, non-local workforce has the potential to increase the transmission of communicable diseases (e.g., influenza) and sexually transmitted infections within the LAA/RAA. Due to the nature of accommodations camps (i.e., high-density lodging with shared common environments), there is increased potential for communicable disease to spread amongst the Project's workers and to local residents, due to interactions between the Project's workforce and local residents. The current rates of communicable disease in the Central Health Region represent a small portion of the total provincial cases. Because the non-local Project workforce will represent less than one percent of the LAA/RAA population and because the nature of rotational work schedules will limit social interaction between Project workers and residents, it is not likely that rates of communicable disease will increase as a result of the Project.



Given employment and compensation estimates, the Project is expected to have a beneficial effect on CWB Index scores of LAA/RAA communities (through changes in labour force employment [labour subcomponent] and individual / household income [income subcomponent]) and result in positive effects on community well-being. Depending on the pre-employment situation of individuals who secure employment with the Project, Project-related income could also result in positive effects on health status due to decreased use of drugs and alcohol and improved lifestyle choices and eating habits (Barron et al. 2010). This could also result in beneficial effects on mental and physical health (e.g., decreased blood pressure and other cardiovascular risk factors; Kline and Gonzalez 2003; Kelli et al. 2016), stress, and anxiety (Barron et al. 2010).

As described in the section above regarding labour force and income, Project employment may lead to increased stress which could adversely affect the health status of individuals who secure Project employment. WEGH2 will implement mitigation and enhancement measures to encourage healthy lifestyle choices and offer employee training to raise awareness about the potential effects of drug and alcohol misuse.

The overall effect on community well-being associated with healthy behaviours is expected to be neutral.

Social Supports and Coping Skills

Healthy social support networks, in the form of support from families and friends, are linked to improved health status (PHAC 2013). Collective networks of healthy social support networks positively influence social environments and the resultant sense of satisfaction and well-being associated with social support networks seem to buffer individuals from select health problems (PHAC 2013). Changes in population and the demographic profile of the LAA/RAA have the potential to result in adverse changes in sense of community belonging. In the extreme, demographic change associated with non-local workers could lead to adverse interactions between usual residents and workers (e.g., physical altercations) and reliance on negative coping mechanisms (e.g., drug and alcohol use) within LAA/RAA communities.

With respect to social connectivity, LAA/RAA communities have demonstrated a strong sense of social cohesion, as described in Section 3.0 of the Socio-Economic Environment and Land and Resource Use Baseline Study (Stantec 2023a) and reflected in the high percentage (81.2%) of Western Health Region residents who feel a strong sense of community belonging. While the percentage of Western Health residents reporting very good or excellent mental health was lower than that of the province in 2019-20, perceived life stress was relatively low in the Western Health Region and the province and life satisfaction was high (greater than 90%) in both geographies. Rates of engagement in negative coping skills (i.e., smoking and drinking) in the Western Health Region were similar to those of the province (slightly higher with respect to smoking, and slightly lower with respect to heavy drinking).

There are several programs and facilities within the Western Health Region that provide mental health and addictions supports (Western Health 2023). These may see additional demand during Project construction if the temporary increase in the population, along with Project-related employment and income, result in changes in social cohesion and reliance on negative coping strategies. Therefore, the Project is expected to have low magnitude adverse effects on community well-being associated with social supports and coping strategies.



Food Security

Food security may be affected by the Project if labour, goods, and services required for the Project exceed existing capacity, leading to supply issues and cost increases (e.g., wage price inflation) which may change local food security. Due to its island nature (i.e., reliance of ferry shipments of food) and number of rural communities, NL has experienced challenges achieving food security. In NL, 17.9% of households were food insecure in 2021, which refers to insecure access to adequate food due to financial constraints (Tarasuk, Li, & St.-Germain 2022). Just over 5% of the province's population rely on food banks for sustenance (Food Banks Canada 2022). Rates are exacerbated for single-parent families, where one in four experience household food insecurity, and one in nine individuals living alone experience household food insecurity (Food Banks Canada 2022). On average, for a family of four, it costs a minimum of \$1,143 per month to eat a healthy diet, which increases in northern and remote regions (NL Statistics Agency 2018).

Food security in the region has a strong correlation with household income. As described in Chapter 17 (Economy, Employment and Business), the Project will have positive effects on employment and income which may have low magnitude positive effects on food security. WEGH2 will implement measures to reduce the effect of the Project on the availability of market food for local residents. For instance, food provided at the temporary workforce accommodations will be sourced from outside of the LAA/RAA and not from local markets. Also, using appropriately sized temporary workforce accommodations facilities and providing catering on-site will reduce the need for Project personnel to buy food in the community.

Construction of the Project components and transportation of construction equipment and materials may also result in a change in the quantity, quality, accessibility, habitat, or availability of the resources harvested by Indigenous groups. As described in the assessment of Traditional Land and Resource Use (Chapter 21), while species traditionally harvested by the Indigenous groups (e.g., moose, bear, waterfowl) are known to occur in the area, successful implementation of planned mitigation measures will reduce the magnitude and duration of Project effects on mortality risk and change in habitat. After the implementation of these mitigation measures, the number of direct mortalities resulting from the Project is expected to be small relative to existing sources of mortality.

Non-local workers residing in the LAA/RAA communities during construction may wish to engage in recreational land use activities, such as hunting and fishing, that may result in an increase in competition for harvested species. However, Project personnel will not be permitted to bring firearms or angling gear to the accommodations camp(s) and Project work sites, and will be strictly prohibited from engaging in hunting, fishing, and harvesting activities within or near the Project Area and LAA. Direct changes to current use through increased pressure on resource harvested by the Indigenous groups (e.g., wildlife, fish, other country foods and culturally important species) and/or increased competition for use of lands and resources are therefore not expected during the construction phase.

The key recreational / subsistence land and resource use (LRU) (i.e., hunting, trapping, fishing, domestic wood harvesting, and the harvesting of food / medicinal plants for personal consumption or use) areas are identified in Chapter 20 (Land and Resource Use). The overlap of these areas with the Project Area represents a relatively small proportion of the total amount of comparable lands that are available for recreational / subsistence LRU activities outside of the Project Area (e.g., within the surrounding land and



resource use RAA). With the implementation of mitigation measures in Chapter 20 (Land and Resource Use), the Project is anticipated to result in a negligible to moderate residual adverse change in recreational / subsistence LRU that is most likely to occur in the Project Area and the LAA. The low potential for contamination related to the Project (as described in Chapter 19, Human Health and Quality of Life), the potential for air emissions and water discharges to affect recreation / subsistence LRU is predicted to be low to moderate in magnitude (Chapter 20).

Overall, it is expected that all land users will be able to engage in recreational / subsistence land and resource use activities in a manner that is generally consistent with existing conditions within the Communities LAA/RAA. Effects on community well-being associated with food security are expected to be neutral.

Summary Characterization

Overall, a mixture of positive and adverse residual effects on community well-being are anticipated. During construction, positive effects will be low in magnitude (conservatively characterized based on uncertainty with respect to levels of local employment and the extent to which Project wages will be realized by local residents).

In consideration of planned mitigation and enhancement measures, adverse residual effects on community well-being during construction are predicted to be low in magnitude. Mitigation measures include use of temporary workforce accommodations, encouraging healthy lifestyle choices, efforts to hire locally, and provision of training for Project employment.

Based on the information above, a summary of residual effects on change in community well-being during the construction phase is provided in Table 18.14.

Table 18.14 Summary of Effects by Project Component During Construction

Project Site	Summary of Effect during Construction
Temporary Workforce Accommodations	The provision of temporary workforce accommodations will reduce demands on housing and other infrastructure and services in the LAA/RAA which will reduce adverse effects on community well-being
Port au Port Wind Farm and Associated Infrastructure	Project employment and additional demands on infrastructure and services during construction will contribute to adverse effects on community well-being while Project-related income will contribute to positive effects
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	



18.5.4.2 Operation and Maintenance

During operation and maintenance, and decommissioning and rehabilitation, the majority of the non-local workforce that will be in the LAA/RAA for construction will leave the area. This will lead to a substantial decrease in adverse effects that result from Project-related change in population affecting access to infrastructure and services and Project-related employment and income. By the time construction is over and the operation and maintenance phase begins, many of the non-resident Project employees will have become integrated into the LAA/RAA communities and will not be viewed as outsiders who would adversely affect community well-being. As a result of this, and the implementation of mitigation and management measures throughout all Project phases, the operation and maintenance phase is not expected to have residual effects on community well-being (Table 18.15).

Table 18.15 Summary of Effects by Project Component During Operation and Maintenance

Project Site	Summary of Effect during Operation and Maintenance
Temporary Workforce Accommodations	No residual effects are anticipated
Port au Port Wind Farm and Associated Infrastructure	
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	

18.5.4.3 Decommissioning and Rehabilitation

For the same reasons described above in Section 18.5.4.2, the decommissioning and rehabilitation phase is not expected to have residual effects on community well-being (Table 18.16).

Table 18.16 Summary of Effects by Project Component During Decommissioning and Rehabilitation

Project Site	Summary of Effect during Decommissioning and Rehabilitation
Temporary Workforce Accommodations	No residual effects are anticipated
Port au Port Wind Farm and Associated Infrastructure	
Codroy Wind Farm and Associated Infrastructure	
230 kV Transmission Lines and Substations	
Hydrogen / Ammonia Production and Storage Facilities	
Port Facilities	



18.5.5 Residual Environmental Effects Summary

18.5.5.1 Residual Environmental Effects Characterization

Overall, residual effects on Communities are predicted to be adverse and low to moderate in magnitude on change in accommodations, change in community infrastructure and services, and change in transportation infrastructure and services. These are expected to occur in the LAA/RAA over the short-term during construction and decommissioning and rehabilitation and over the long-term during operation and maintenance. In general, effects will be continuous and reversible, with no sensitivity to timing and within a resilient socio-economic environment.

With respect to change in community well-being, effects are predicted to be neutral. Positive effects are likely to occur where there are infrastructure improvements, which will benefit the LAA/RAA communities over the long-term.

Table 18.17 summarizes the predicted environmental effects (residual effects) of the undertaking on Communities.

Table 18.17 Summary of Predicted Environmental Effects of the Undertaking on Communities

Residual Effect	Residual Effects Characterization							
	Nature	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological and Socio-economic Context
Construction								
Change in Accommodations	A/N	L	LAA/RAA	NS	ST	C	R	R
Change in Community Infrastructure and Services	A/P	M	LAA/RAA	NS	ST	C	R	R/NR
Change in Transportation Infrastructure and Services	A/P	L-M	LAA/RAA	NS	ST	C	R	R
Change in Community Well-Being	A/P	L	LAA/RAA	NS	ST	C	R	R
Operation and Maintenance								
Change in Accommodations	A	L	LAA/RAA	NS	LT	C	R	R
Change in Community Infrastructure and Services	A	L	LAA/RAA	NS	LT	C	R	R/NR



Table 18.17 Summary of Predicted Environmental Effects of the Undertaking on Communities

Residual Effect	Residual Effects Characterization							
	Nature	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological and Socio-economic Context
Change in Transportation Infrastructure and Services	A	L	LAA/RAA	NS	LT	C	R	R
Change in Community Well-Being	NA	NA	NA	NA	NA	NA	NA	NA
Decommissioning and Rehabilitation								
Change in Accommodations	A/N	L	LAA/RAA	NS	ST	C	R	R
Change in Community Infrastructure and Services	A/P	L-M	LAA/RAA	NS	ST	C	R	R/NR
Change in Transportation Infrastructure and Services	A	L	LAA/RAA	NS	ST	C	R	R
Change in Community Well-Being	NA	NA	NA	NA	NA	NA	NA	NA
KEY: Nature: P: Positive A: Adverse N: Neutral Magnitude: N: Negligible L: Low M: Moderate H: High Geographic Extent: PA: Project Area LAA: Local Assessment Area RAA: Regional Assessment Area Duration: ST: Short-term MT: Medium-term LT: Long-term Timing: NS: No Sensitivity MS: Moderate Sensitivity HS: High Sensitivity Frequency: S: Single Event IR: Irregular Event R: Regular Event C: Continuous Reversibility: R: Reversible I: Irreversible Ecological / Socio-Economic Context: R: Resilient NR: Not Resilient								



18.5.5.2 Summary of Predicted Environmental Effects

During the five-year Project construction phase, it is expected that a peak labour force of approximately 2,000 will be present in the LAA/RAA for several months. A portion of this labour, up to approximately 500 people, will likely be hired from local communities. The non-local labour force will be housed in the two temporary workforce accommodations which will have the capacity to accommodate the peak workforce. This mitigation measure will reduce the adverse effects on local permanent and temporary housing.

Services, including food, recreation, and medical services and facilities, will be provided at the Project temporary workforce accommodations and this will reduce demands on some local infrastructure and services. Historically, there have been issues with potable water supply and infrastructure in the LAA/RAA and WEGH2 is planning improvements to the water system and will work with the municipalities to meet demand on the water supply.

The Project is expected to place additional demands on roads, airport and port infrastructure during construction, particularly through the movement of wind turbine components and Project personnel. In consideration of current volumes of traffic on local roads and highways, at the port and through the regional airport, as well as implementation of measures to mitigate any deficiencies in the roads, bridges or other infrastructure, development of a Traffic Management Plan, and upgrades to the Port of Stephenville, Project demands are not expected to exceed the capacity of local transportation infrastructure and services.

While Project employment may lead to increased stress and reliance on negative coping strategies, overall, Project employment and associated income will have positive effects on community well-being. Positive effects are also likely to result from Project-related improvements to infrastructure and services, and from the Community Vibrancy Fund.

For Communities, most effects will be experienced during the construction phase because it will see the peak labour force, which will place additional demand on housing and infrastructure and services, and it will generate the highest traffic volumes. Effects on community well-being as a result of Project employment will also be most pronounced during construction. Effects are likely to be reduced during the operation and maintenance, and decommissioning and rehabilitation phases as the labour force decreases and as effects experienced during construction are managed through Project mitigation and enhancement measures.



18.6 Determination of Significance

In consideration of the VEC-specific significance criteria defined in Section 18.3.2, the residual effects of routine Project activities on Communities (i.e., change in accommodations, change in community infrastructure and services, change in transportation infrastructure and services, and change in community well-being) are not expected to result in an exceedance of available capacity, or a substantial decrease in the quality of infrastructure and/or a service provided, on a persistent and ongoing basis, which cannot be mitigated with current or anticipated programs, policies, or mitigation measures. Neither are they expected to result in deterioration of health and well-being over an extended period which cannot be managed or mitigated through adjustments to programs, policies, plans, or other mitigation. Therefore, effects of the Project on Communities are predicted to be not significant.

The level of confidence in this prediction is discussed in Section 18.7.

18.7 Prediction Confidence

The known success of proposed standard mitigation measures and the resilience of the existing socio-economic environment of the LAA/RAA contribute to increased confidence in the prediction of residual effects. However, due to the uncertainty regarding the extent to which Project employment will be realized by local residents and the nature of social interactions and differences in individual actions, behaviours and influences, prediction confidence with respect to Communities is moderate.

18.8 Follow-Up and Monitoring

Government departments, public agencies, and private-sector companies that manage and deliver infrastructure and services will monitor the ongoing demand for such services as part of their normal planning practices. For this reason, no follow-up and monitoring program is proposed for Communities.

Throughout the life of the Project, WEGH2 will continue to engage with stakeholders and communities and liaise with municipalities through the creation of community liaison committees. The goal of the community liaison committees is to have an ongoing, consistent point of contact within communities for disseminating information, and as a channel to receive comments, concerns and issues during the Project stages. In addition, a community feedback and response protocol to receive feedback, comments and complaints from community members and to develop appropriate resolutions.

18.9 Capacity of Renewable Resources and Effects on Biological Diversity

Potential interactions between the Project and Communities are not anticipated to adversely affect renewable resources or biological diversity. Therefore, adverse Project-related effects on the capacity of renewable resources to meet the needs of the present and those of the future, and adverse Project-related effects on biological diversity, are not anticipated with respect to Communities.



18.10 Predicted Future Environmental Conditions if the Project Does Not Proceed

The Project is located in an area that has been designated for wind farm development, and it is likely that other wind farm projects would occur in this area if this Project were not to proceed. Future projects are anticipated to have similar effects on Communities.

In the absence of future development, the population of the LAA/RAA will likely continue to decrease as the population ages and residents move out of LAA/RAA communities. As the population declines, demands on infrastructure and services will decrease and lead to spare capacity. However, as a result of declining populations and a smaller tax base, there will be less investment in local community services and infrastructure.

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PROJECT NUJIO'QONIK
Environmental Impact Statement
18.0 Communities
August 2023

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19.0 Human Health and Quality of Life

19.1 Scope of Assessment

Human Health and Quality of Life was identified as a Valued Environmental Component (VEC) because Section 6.2 (a) of the EIS guidelines specifically indicates that the EIS is required to evaluate “[e]ffects of all phases of the Project on human health and quality of life, including but not limited to:

- i. vibrations, noise emissions and noise levels, including sustained low frequency noise;
- ii. light emissions and shadow flicker and nighttime flicker;
- iii. dust and air emissions;
- iv. ice throw from wind turbines;
- v. weather radar;
- vi. domestic wood cutting areas;
- vii. traditional, cultural and recreational activities;
- viii. developed areas; and
- ix. viewsapes”.

This VEC chapter is specifically focused on the evaluation of the potential for the Project to affect human health and quality of life due to Project-related changes to the health effects associated with items i-iv and ix, above by focusing on the following three environmental effects:

- **Change to human health** due to exposure to air quality contaminants
- **Change to quality of life** due to potential changes in non-chemical parameters (e.g., audible noise and low frequency noise, vibration, shadow flicker, light emissions, and viewscape), and
- **Change to public safety** due to potential ice throw from operating wind turbines.

This evaluation relies heavily on the conclusions of Chapter 6 (Atmospheric Environment) and Chapter 7 (Acoustic Environment). This evaluation is also based on the interpretation of results from the following supporting studies: shadow flicker (Appendix 6-A; Appendix 6-B), visual impact (Appendix 19-A), and ice throw (DNV 2023; Appendix 19-B).

The potential for the Project to interact with item v (weather radar) has been addressed separately as a siting condition for the wind turbines (see Appendix 19-C). The potential for the Project to interact with items vi-viii (domestic wood cutting areas; traditional, cultural and recreational activities; developed areas) has been addressed separately in Chapters 18 – 21 of this EIS.



19.1.1 Regulatory and Policy Setting

The applicable regulatory requirements, policy, and guidance for the evaluation of effects of the Project on human health and quality of life are variable depending on the specific effect and effect pathway being evaluated. For effect pathways, a brief discussion of the applicable regulatory guidance has been provided below. Further information about the applicable guidance is found in Section 19.3.3 and the applicable full VEC chapters: Chapter 6 (Atmospheric Environment); Chapter 7 (Acoustic Environment) and appendices (i.e., Appendix 6-A, Appendix 6-B, Appendix 19-A, Appendix 19-B, and Appendix 19-D).

19.1.1.1 Change to Human Health

With respect to evaluating change to human health due to Project-related emissions of air quality contaminants during Project construction, operation and maintenance, decommissioning and rehabilitation (modelled in Chapter 6 (Atmospheric Environment), the overall approach followed standard human health risk assessment (HHRA) practices and guidance, including (but not limited to) the guidance documents listed below:

- Guidance for Evaluating Human Health Impacts in Environmental Assessment: Human Health Risk Assessment (Health Canada 2019)
- Guidance to Evaluating Human Health Impacts in Environmental Assessments: Air Quality (Health Canada 2016a)
- Federal Contaminated Sites Risk Assessment in Canada, Part I: Guidance on Human Health Risk Preliminary Quantitative Risk Assessment, Version 3.0 (Health Canada 2021a)
- Federal Contaminated Sites Risk Assessment in Canada, Part V: Guidance on Complex Human Health Detailed Quantitative Risk Assessment for Chemicals (Health Canada 2010a)

Additional details about how these guidance documents were applied to evaluate change to human health are provided in Appendix 19-D.

19.1.1.2 Change to Quality of Life

Changes to quality of life due to Project-related changes to non-chemical parameters such as noise, low frequency noise, vibration, shadow flicker, lighting and viewscape are evaluated in the context of applicable regulatory guidance (where available) and qualitative discussion based on peer reviewed literature (where applicable), as listed below.

- Project-related noise (including low frequency noise) was evaluated according to “Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise” (Health Canada 2017), as described in Chapter 7 (Acoustic Environment).



- For vibration, there is no applicable Canadian or provincial regulatory guidance in Newfoundland and Labrador (NL). However, guidelines related to public nuisance from vibration have been developed by the American National Standards Institute (ANSI) and the American Acoustical Society (ASA) through ANSI/ASA S.39-1983. These guidelines have been adopted by regulatory agencies such as the United States Federal Transit Administration (US FTA 2018) and are often used in jurisdictions across Canada for assessing vibration. Project-related vibration will therefore be evaluated by comparison to vibration guideline levels for residential receptors (US FTA 2018), as described in Chapter 7 (Acoustic Environment).
- For shadow flicker, there is no applicable Canadian or provincial regulatory guidance in NL. Predicted Project wind farm shadow flicker was therefore compared to a general industry standard of 30 hours per year (Koppen et al. 2017) as discussed in Appendix 6-A and Appendix 6-B.
- For lighting, there is no applicable Canadian or provincial regulatory guidance in NL. Project related lighting was therefore modeled and compared to guidelines for light trespass and glare for various levels of urbanization developed by the Commission Internationale de L'Éclairage (CIE), also known as the International Commission on Illumination, to limit pollution and associated effects to humans and wildlife (CIE 2017) as discussed in Chapter 6 (Atmospheric Environment)
- There is no Canadian or provincial regulatory guidance in NL that can be applied to assess the potential viewscape to affect quality of life. However, the potential for visual impacts of wind turbines can lead to annoyance for some people, which may indirectly affect quality of life; this interaction has been extensively discussed in scientific literature. Therefore, the potential for changes in viewscape (evaluated in Appendix 19-A) to affect quality of life will be discussed qualitatively in the context of the available scientific literature.

19.1.1.3 Change to Public Safety

There is no Canadian or provincial regulatory guidance in NL specific to evaluating the potential for ice throw from wind turbines to affect public safety. In the absence of a regulatory standard, the ice throw analysis completed in support of this Project (Appendix 19-B) relied on an approach developed by the Finnish Meteorological Institute and Deutsches Windenergie-Institut (DEWI) as part of a research project on the implementation of wind energy in cold climates and summarized in a series of conference papers (Morgan and Bossanyi, 1996; Bossanyi and Morgan, 1996; and Morgan et al., 1997). The resulting guidelines for preparing a safety assessment related to ice throw are broadly consistent with the 2018 International Energy Agency Technology Collaboration Programme (IEA TCP) Wind International Recommendations for Ice Fall and Ice Throw Risk Assessments (IEA TCP 2022).



19.1.2 Boundaries

19.1.2.1 Spatial Boundaries

The following spatial boundaries were used to assess Project effects, including residual environmental effects, on human health and quality of life in areas surrounding the Project components:

- **Project Area:** The Project Area encompasses the immediate area in which Project activities and components occur and is comprised of the following distinct areas: the Port au Port wind farm, the Codroy wind farm, the Hydrogen/Ammonia Production and Storage Facility (hydrogen / ammonia plant), Port Facilities, and the 230 kV transmission lines, as well as associated infrastructure including roads, substations, and water supply infrastructure. The Project Area is the anticipated area of direct physical disturbance associated with the construction, operation and decommissioning, rehabilitation and closure of the Project. In addition to encompassing the immediate area in which Project components and activities will occur, the Project Area also includes a buffer of up to 300 m for access roads and turbines and a 350 m corridor to accommodate the 70 to 75 m wide RoW for the transmission line. These buffers allow flexibility for the micro-siting of Project components during detailed design, based on technical considerations as well as the avoidance of environmentally sensitive areas, where practicable.
- **Local Assessment Area (LAA) / Regional Assessment Area (RAA):** The applicable LAA and RAA for the assessment of effects of the Project on human health and quality of life are variable depending on the specific effect and effect pathway being evaluated (see description of environmental effects and effect pathways specific to human health and quality of life for this Project in Section 19.3.3.). The LAA and RAA applicable to each effect pathway being evaluated in this chapter are summarized below.
 - **Change to human health due to Project-related emissions of air quality contaminants.** LAA and RAA are the same as the LAA and RAA defined in Chapter 6 (Atmospheric Environment) for air quality. Specifically, the LAA and RAA are the same and are defined as a 90 km by 100 km area which encompasses the hydrogen/ ammonia plant and the Codroy and Port au Port wind farm sites. This LAA/RAA represents the modelling domain for air contaminant dispersion modelling and includes sensitive receptors as well as other past, present, or reasonably foreseeable projects/activities that could interact cumulatively with the Project.
 - **Change to quality of life due to audible noise, low frequency noise, and vibration.** LAA and RAA are the same as the LAA and RAA defined in Chapter 7 (Acoustic Environment). Specifically, for the acoustic environment, both the LAA and RAA are the same and are defined as 1.5 kilometres (km) extending beyond the Project area, beyond which Project generated noise and/or vibration would be indistinguishable from background levels.
 - **Change to quality of life due to shadow flicker.** The shadow flicker reports specifically evaluated shadow flicker occurrence for the potentially active dwellings located within 1.5 km of the proposed turbine locations for the Project. These locations represent both the LAA and RAA for this effect pathway.



- **Change to quality of life due to light emissions.** The LAA and RAA for this effect pathway encompass areas where people spend time and it is possible to distinguish light emissions produced by Project components from background levels. In Chapter 6 (Atmospheric Environment), this LAA and RAA is defined as extending 1.5 km from the Project Area.
- **Change to quality of life due to viewscape.** The LAA and RAA for this effect pathway are equal to each other and encompass the visual study area evaluated in the Visual Impact Assessment (Appendix 19-A), which extends 15 km around the proposed wind farms and 5 km around the centreline of the proposed 230 kV transmission line.
- **Change to public safety due to ice throw from turbines.** With respect to the potential for turbines to affect public safety due to ice throw from turbines, the ice throw report (Appendix 19-B) describes a distance-based distribution for frequency of occurrence for ice throw events. Specifically, it was concluded that on flat terrain, 90% of fragments would land between 0 m to 170 m and 99% of fragments would land within 235 m from the turbine. While the modelling indicated that it is theoretically possible that a fragment on flat terrain could land at a maximum distance of 290 m, it is considered improbable that a fragment would reach this distance during the Project life. At some turbine locations, where terrain elevation was accounted for, maximum ice throw distance was calculated to extend to 400 m. Therefore, the LAA and RAA for this pathway encompass the area of 400 m around each turbine.

19.1.2.2 Temporal Boundaries

The temporal boundaries for the assessment of potential effects on the human health and quality of life include:

- **Construction:** Overall the construction phase of the Project will be from Q4 2023 through Q2 2027, pending EA approval and receipt of other required permits and approvals. Early civil works are planned to start Q4 2023 through Q3 2024. Construction of the Port au Port Wind Farm and associated infrastructure is expected to start in Q3 2024 with completion of the construction in Q4 2026. Construction of the Codroy Wind Farm and associated infrastructure is expected to start Q4 2025 with completion in Q1 2027. The hydrogen / ammonia plant will be constructed in phases from Q2 2024 to Q1 2026. Grid power sources are planned for hydrogen production in 2025 until March 2026, when the electrolyzer is commissioned.
- **Operation and maintenance:** Wind farm commissioning is anticipated to start Q1 2026 at the Port au Port wind farm and Q3 2027 at the Codroy wind Farm. The 600 MW electrolyzer is expected to be commissioned in Q1 2026. The operational life of the Project is 30 years at each site.
- **Decommissioning and rehabilitation:** The decommissioning phase is anticipated to take two years, occurring between 2056 and 2058. Decommissioning is anticipated to begin Q1 2056 at the Port au Port wind farm, with completion in Q3 2058 at the Codroy wind farm.



19.2 Existing Environmental Conditions

Section 4.3 of the EIS guidelines identified the following four areas where baseline studies were required to identify and assess adverse environmental effects that may be caused by the Project; identify and characterize the beneficial effects of the Project; and provide the data necessary to enable effective follow-up:

- Atmospheric environment - air quality, noise, vibration, and light
- Aquatic environment - water resources and use, wastewater discharge, fish- fish habitat- fisheries
- Terrestrial environmental - avifauna, species at risk and relevant habitat, and areas of conservation concern
- Land and resource use - traditional, cultural, recreational, and industrial land use

The methods and findings of each of these baseline studies are summarized and discussed in Chapter 6 (Atmospheric Environment), Chapter 7 (Acoustic Environment), Chapter 9 (Surface Water Resources), Chapter 10 (Freshwater Fish and Fish Habitat), Chapter 11 (Marine Environment), Chapter 13 (Avifauna), Chapter 14 (Bats), Chapter 15 (Other Wildlife), Chapter 20 (Land Resource Use), and Chapter 21 (Indigenous Fisheries).

A baseline study specific to human health and quality of life was not requested in the EIS guidelines. Rather, the baseline conditions pertinent to evaluation of human health and quality of life are established in this assessment based on available data from the completed baseline studies as reported in other chapters of this document, or based on publicly available site conditions, as summarized below for each specific effect and effect pathway being evaluated:

- **Change to human health due to Project-related emissions of air quality contaminants.** Baseline conditions with respect to air quality are evaluated as a component of the “Atmospheric Environment” baseline study. Further information is available in Chapter 6 (Atmospheric Environment).
- **Change to quality of life due to audible noise, low frequency noise, and vibration.** Baseline conditions with respect to audible noise, low frequency noise, and vibration are evaluated as a component of the “Atmospheric Environment” baseline study. Further information is available in Chapter 7 (Acoustic Environment).
- **Change to quality of life due to shadow flicker.** None of the baseline studies provide direct discussion of the baseline conditions relative to shadow flicker from turbines because there are no wind turbines currently present in the LAA/RAA.
- **Change to quality of life due to light emissions.** Baseline conditions with respect to light emissions are evaluated as a component of the “Atmospheric Environment” baseline study. Further information is available in Chapter 6 (Atmospheric Environment).



- **Change to quality of life due to viewscape.** Baseline conditions with respect to landscape character and current viewscape are evaluated as a component of the visual impact assessment (Appendix 19-A).
- **Change to public safety due to ice throw from turbines.** None of the baseline studies provide direct discussion of the baseline conditions relative to ice throw from turbines because there are no wind turbines currently present in LAA/RAA.

A description of environmental effects and effect pathways specific to human health and quality of life for this Project is presented Section 19.3.3.

19.3 Assessment Criteria and Methods

This section describes the criteria and methods used to assess environmental effects on human health and quality of life. Residual environmental effects (Section 19.5) are assessed and characterized using criteria defined in Section 19.3.1. The assessment also evaluates the significance of residual effects using threshold criteria or standards beyond which a residual environmental effect is considered significant. The definition of a significant effect for human health and quality of life is provided in Section 19.3.2. Section 19.3.3 identifies the environmental effects to be assessed for human health and quality of life, including effect pathways and measurable parameters. This is followed by the identification of potential Project interactions with this VEC (Section 19.3.4). Analytical assessment techniques employed for the assessment of potential Project-related environmental effects on human health and quality of life are provided in Section 19.3.5. The assumptions that were made to support a conservative approach to the assessment of residual effects on human health and quality of life are described in Section 19.3.5.1.

19.3.1 Residual Effects Characterization

Table 19.1 presents definitions for the predicted environmental effects characterization of the undertaking on human health and quality of life. The criteria are used to describe the potential residual effects that remain after mitigation measures have been implemented. Quantitative measures have been developed, where possible, to characterize residual effects. Qualitative considerations are used where quantitative measurement is not possible.



Table 19.1 Characterization of Predicted Environmental Effects of the Undertaking on Human Health and Quality of Life

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Nature	The long-term trend of the residual effect	• Neutral – No net change in the measurable parameter(s) for Human Health and Quality of Life relative to baseline • Positive – A residual effect that moves the measurable parameter(s) in a direction beneficial to Human Health and Quality of Life relative to baseline • Adverse – A residual effect that moves the measurable parameter(s) in a direction detrimental to Human Health and Quality of Life relative to baseline
Magnitude	The amount of change in measurable parameter(s) or the VEC relative to existing conditions	If expressed qualitatively, the categories are: • Negligible – A review of the Project's predicted effects on measurable environmental quality parameters (air quality, audible noise and low frequency noise, vibration, shadow flicker, light emissions, viewscape, and ice throw) suggests no measurable change • Low – A review of the Project's predicted effects on measurable environmental quality parameters (air quality, audible noise and low frequency noise, vibration, shadow flicker, light emissions, viewscape, and ice throw) suggests that the change in these parameters may be measurable, but will result in levels less than those associated with health effects or below guidelines published by federal or provincial agencies to be protective of health • Moderate – A review of the Project's predicted effects on measurable environmental quality parameters (air quality, audible noise and low frequency noise, vibration, shadow flicker, light emissions, viewscape, and ice throw) suggests that the change in these parameters will be measurable and result in levels that are greater than those associated with human health effects or greater than guidelines published by federal or provincial agencies to be protective of health • High – A review of the Project's predicted effects on measurable environmental quality parameters (air quality, audible noise and low frequency noise, vibration, shadow flicker, light emissions, viewscape, and ice throw) suggests that the change in these parameters will be measurable and result in levels that are reasonably expected to result in long-term human health effects
Geographic Extent	The geographic area in which a residual effect of a defined magnitude occurs	• Project Area – Residual effect is restricted to the Project Area • LAA – Residual effect extends into the LAA • RAA – Residual effect extends into the RAA



Table 19.1 Characterization of Predicted Environmental Effects of the Undertaking on Human Health and Quality of Life

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Timing	Considers when the residual environmental effect is expected to occur, where applicable or relevant to the VEC.	• No Sensitivity – Timing does not affect Human Health and Quality of Life. • Moderate Sensitivity – Residual effect may occur during a time period where potential for effects to Human Health and Quality of Life is more likely to occur (e.g., audible noise during nighttime hours). • High Sensitivity – Residual effect occurs during a time period where potential for effects to Human Health and Quality of Life are more likely to occur (e.g., audible noise during nighttime hours).
Duration	The period of time required until the measurable parameter(s) or the VEC returns to its existing (baseline) condition, or the residual effect can no longer be measured or otherwise perceived	• Short-term – Residual effect is restricted to no more than the duration of the construction phase • Medium-term – Residual effect extends through the operation and maintenance phase of the Project • Long-term – Residual effect extends beyond the operation and maintenance phase of the Project OR residual effect extends beyond the life of the Project
Frequency	Identifies how often the residual effect occurs during the Project, during a specific phase of the Project, or during another specified time period	• Single event • Multiple irregular event – Occurs at no set schedule • Multiple regular event – Occurs at regular intervals • Continuous – Occurs continuously
Reversibility	Describes whether a measurable parameter(s) or the VEC can return to its existing condition after the Project activity ceases, including through active management techniques	• Reversible – Residual effect is likely to be reversed after activity completion and rehabilitation • Irreversible – Residual effect is unlikely to be reversed
Ecological / Socio-economic Context	Existing conditions and trends in the area where the residual effect occurs	• Undisturbed – Area is relatively undisturbed or not adversely affected by human activity • Disturbed – Area has been substantially previously disturbed by human development or human development is still present



19.3.2 Significance Definition

A significant residual adverse effect on human health and quality of life is defined as a residual Project-related change to a measurable environmental quality parameter (air quality, noise, vibration, light, shadow flicker, ice throw) that is predicted to result in an adverse change to human health or quality of life within the LAA/RAA that incorporates the following characteristics:

- moderate or high in magnitude
- of moderate to high duration
- possibly irreversible,
- occur over a large spatial extent or within an area of exclusive/preferred Indigenous use, and
- cannot be addressed adequately through mitigation measures.

19.3.3 Potential Environmental Effects, Project Pathways, and Measurable Parameters

Table 19.2 lists the potential Project effects on human health and quality of life and provides a summary of the Project effect pathways and measurable parameters and units of measurement to assess potential effects. Potential environmental effects and measurable parameters were selected based on review of recent environmental assessments for large development projects in NL, renewable energy projects in other parts of Canada, comments provided during engagement, and professional judgment.

As shown in Table 19.2, the potential Project effects on human health and quality of life focus on the following three environmental effects:

- **Change to human health** due to exposure to air quality contaminants,
- **Change to quality of life** due to potential changes in non-chemical parameters (e.g., audible noise and low frequency noise, vibration, shadow flicker, light emissions, and viewscape), and
- **Change to public safety** due to potential ice throw from operating wind turbines.

With respect to evaluation of public safety, the evaluation in this chapter focuses only on safety issues related to potential ice throw from operating wind turbines. For an evaluation of potential safety issues related to accidents and malfunctions (e.g., accidental spills, fire and explosions, traffic accidents, dislodging of a wind tower or turbine blade, failure of industrial water supply; energy generation/transmission failure, and wildlife emergencies/incidents) see Chapter 24 (Accidents and Malfunctions).



Table 19.2 Environmental Effects, Effect Pathways, and Measurable Parameters for Human Health and Quality of Life

Environmental Effect(s)	Effect Pathway(s)	Measurable Parameter(s) and Units of Measurement
Change to Human Health	Air quality contaminants of potential concern (COPCs) released to the atmosphere during Project construction, operation and maintenance, decommissioning and rehabilitation have the potential to affect human health	- Potential measurable parameters include: - Exposure ratios (ERs) (unitless) calculated by dividing modelled ambient COPC concentrations to health-based air quality levels
Change to Quality of Life	- The Project may affect various environmental parameters that can affect perception of quality of life. These parameters include: - Audible noise and low frequency noise from the Project - Vibration - Shadow flicker - Light emissions - Viewscape	- Potential measurable parameters include: - Comparison of projected noise levels in A-weighted decibels (dBA) from noise assessment (Chapter 7 (Acoustic Environment)) to noise-related annoyance criteria based on change in percent highly annoyed (%HA) and criteria based on sleep disturbance (45 dBA) - Comparison of projected vibrations levels from (Chapter 7 (Acoustic Environment)) to vibration guideline levels for residential receptors (FTA 2018) - Comparison of projected hours of shadow flicker from shadow flicker reports (Appendix 6-A; Appendix 6-B) to acknowledged international criteria of 30 hours per year (Koppen et al. 2017) - Qualitative comparison to peer-reviewed literature for evaluation of potential for changes in lighting and viewscape to affect quality of life.
Change to Public Safety	Ice throw from turbines may present a safety hazard	Comparison of ice throw and ice drop projections from ice throw report (Appendix 19-B) to IEA Wind International Recommendations for Ice Fall and Ice Throw Risk Assessments (IEA TCP 2022)



19.3.4 Project Interactions with Human Health and Quality of Life

Table 19.3 uses checkmarks to indicate the routine Project activities that could interact with the VEC and result in the identified environmental effect(s) to be assessed. Immediately following Table 19.3, environmental effects pathways are briefly described for potential routine Project-related environmental effects and justification is provided in cases where no Project interaction with the VEC (and therefore no potential environmental effect on the VEC) is predicted.

Table 19.3 Project Interactions with Human Health and Quality of Life, Environmental Effects, and Environmental Effect Pathways

Project Activities	Environmental Effect(s) to be Assessed		
	Change to Human Health	Change to Quality of Life	Change to Public Safety
Construction			
Site Preparation and Civil Works (including turbine foundations, road construction, quarries, clearing, grubbing, blasting, cement production, and watercourse crossings)	–	–	–
Transportation of Resources and Equipment (includes trucking, shipping and barging of materials)	–	–	–
Construction / Installation, Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure	–	–	–
Installation and Commissioning of Wind Turbines	–	–	–
Installation and Commissioning of Collector Systems	–	–	–
Installation and Commissioning of Transmission Lines and Substations (including marine cable crossing)	–	–	–
Installation and Commissioning of Hydrogen / Ammonia Production, and Storage Facilities and Associated Infrastructure (including Industrial water supply infrastructure)	–	–	–
Restoration of Existing Port Facilities (including pile driving and dredging)	–	–	–
Emissions, Discharges, and Wastes ¹	✓	✓	–
Employment and Expenditures ²	–	–	–
Operation and Maintenance			
Presence, Operation, and Maintenance of Wind Farms (including wind turbines, access roads, and collector systems)	–	–	✓
Presence, Operation, and Maintenance of Transmission Lines and Substations			



Table 19.3 Project Interactions with Human Health and Quality of Life, Environmental Effects, and Environmental Effect Pathways

Project Activities	Environmental Effect(s) to be Assessed		
	Change to Human Health	Change to Quality of Life	Change to Public Safety
Presence, Operation, and Maintenance of Hydrogen / Ammonia Production, and Storage, Facilities and Associated Infrastructure (includes marine discharge from treatment plant)	–	–	–
Presence, Operation, and Maintenance of Port Facilities (includes loading of ammonia and vessel maneuvering within Port)	–	–	–
Emissions, Discharges, and Wastes ¹	✓	✓	–
Employment and Expenditures ²	–	–	–
Decommissioning and Rehabilitation			
Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure	–	–	–
Decommissioning and Rehabilitation of Wind Farms (including wind turbines, access roads, and collector systems)	–	–	–
Decommissioning and Rehabilitation of Transmission Lines and Substations	–	–	–
Decommissioning and Rehabilitation of Hydrogen / Ammonia Production, and Storage, Facilities and Associated Infrastructure	–	–	–
Decommissioning and Rehabilitation of Port Facilities	–	–	–
Emissions, Discharges, and Wastes ¹	✓	✓	–
Employment and Expenditures ²	–	–	–
Notes: ✓ = Potential interaction – = No interaction ¹ Emissions (e.g., light, noise, vibration, air contaminants and GHGs), discharges (e.g., wastewater and other liquid effluents), and hazardous and non-hazardous wastes are generated by many Project activities. Rather than acknowledging this by placing a checkmark against each of these activities, “Emissions, Discharges, and Wastes” is listed as a separate item under each phase of the Project. ² Project employment and expenditures are generated by most Project activities and are the main drivers of many potential socio-economic effects. Rather than acknowledging this by placing a checkmark against each of these activities, “Employment and Expenditures” is listed as a separate item under each phase of the Project.			



In the absence of mitigation, the Project may interact with human health and quality of life in the following ways:

- During construction, operation and maintenance, and decommissioning and rehabilitation phases of the Project, air quality contaminants with a potential to affect human health may be released to the environment.
- During construction, operation and maintenance, and/or decommissioning and rehabilitation phases of the Project, the Project may affect various environmental parameters that have the potential to affect perception of quality of life. These parameters include:
 - Audible noise, low frequency noise, and vibration
 - Shadow flicker
 - Light emissions
 - Viewscape
- During Project operation, ice throw from turbines may present a safety hazard

For the Project activities where there is no interaction with human health and quality of life (indicated with “-” in Table 19.3), additional rationale to support their exclusion from assessment is provided below:

- As noted in the footnote to Table 19.3, “Emissions, Discharges, and Wastes” is listed as a separate item under each phase of the Project. Therefore, specific interactions for each project activity were not identified.
- For Project interactions with change to public safety, ice throw can only occur when turbines are present and operating. Therefore, this effect is limited to the operating phase of the Project.

19.3.5 Analytical Assessment Techniques and Level of Knowledge

19.3.5.1 Assessment Approach for Evaluating Change to Human Health

Evaluation of changes to human health due to Project-related emissions of air quality contaminants was evaluated with a human health risk assessment (HHRA). All chemicals (anthropogenic and natural) have the potential to cause toxicological effects. The level of effect depends on the receptor (i.e., person) exposed, the route and duration of exposure (e.g., inhalation over a 24-hour period), and the hazard (i.e., inherent toxicity) of the chemical.

To determine the potential for Project-related emissions of air quality contaminants to affect human health, an HHRA approach was applied, consistent with guidance from Health Canada (listed above), which consists of the following components.

- **Problem Formulation:** The problem formulation identifies COPC, human receptors, and applicable exposure pathways. The objective of the problem formulation stage is to develop a conceptual site model (CSM) that aids in further stages of quantitative analyses.
- **Toxicity Assessment:** The toxicity assessment characterizes the potential toxic effects of each COPC and establishes health-based exposure limits.



- **Exposure Assessment:** The exposure assessment characterizes the COPC dose or exposure concentration for each operable pathway in the conceptual site model. The objective is to quantify the amount of COPC to which people could be exposed.
- **Risk Characterization:** The risk characterization compares the results of the exposure assessment to the toxicity assessment to qualitatively and/or quantitatively characterize potential health risk.
- **Uncertainty Assessment:** The uncertainty assessment provides an indication of the validity and confidence in the risk estimates. Uncertainties associated with the data, predictive modelling and other factors that could affect the final risk estimate are described. When uncertainties exist, they are identified and discussed in terms their influence on the risk characterization.

Further details of the methods and results of the HHRA are provided in the Human Health Risk Assessment Technical Data Report (Appendix 19-D).

19.3.5.2 Assessment Approach for Evaluating Change to Quality of Life

Evaluation of changes to quality of life due to Project-related changes to non-chemical parameters such as noise, low frequency noise, vibration, shadow flicker, light and viewscape were evaluated in the context of applicable regulatory guidance (where available) and qualitative discussion based on peer reviewed literature and regulatory guidance from alternate jurisdictions (where applicable), as summarized below.

Project-related noise (including low frequency noise):

Exposure to excessive levels of audible noise, regardless of the source, can cause noise-induced hearing loss, sleep disturbance, interference with speech comprehension, and annoyance and may also be linked to serious health effects. For example, the World Health Organization (WHO), reports that nighttime exposure to noise levels above 55 dB(A) outdoors (annual average) is increasingly dangerous for public health and will cause a sizeable proportion of the population to be highly annoyed and sleep-disturbed (WHO 2009). Health Canada has therefore prepared guidance for evaluating human health effects in environmental assessment for noise (Health Canada, 2017). This document includes generic guidance on predicting health risks related to levels and/or types of sound predicted in the construction and operation of major resource and infrastructure projects (such as mines, dams, pipelines, and other projects). The Health Canada (2017) guidance specifically addresses risks associated with potential effects of various types of noise including audible noise, low frequency noise, tonal noise, and impulsive noise. Therefore, an evaluation of noise from various Project components during each phase of the Project, as well as baseline/existing conditions, has been provided in Chapter 7 (Acoustic Environment).

The potential for the predicted levels of noise to affect quality of life is discussed herein in accordance with the Health Canada (2017) guidance, with particular focus on the change in percent highly annoyed (%HA) and sleep disturbance criteria. Health Canada (2017) indicates that noise mitigation measures should be considered when a change in %HA (above existing conditions) at an evaluated receptor location exceeds 6.5%. The Health Canada (2017) limit for sleep disturbance for continuous noise with windows at least partially open is 45 dBA (57 dBA with windows fully closed). For individual noise events,



Health Canada (2017) also indicates that indoor sound pressure levels should not exceed approximately 45 dBA maximum A-weighted sound level (LA_{max}) more than 10-15 times per night.

Low frequency noise was not assessed independently from audible noise in the effects assessment. From the perspective of assessing change to quality of life from noise, Berger et al. (2015) determined that health-based audible noise limits (e.g., those references above) provide an effective means to evaluate, monitor, and protect potential receptors from audible noise as well from low frequency noise (Berger et al. 2015).

Project-related vibration

The EIS guidelines specifically requested an evaluation of the potential for Project-related vibrations to affect quality of life. Vibration is a less common environmental problem than noise, with respect to potential effects on quality of life. However, it is known that certain activities such as blasting or pile-driving during construction can generate levels of vibration that may be perceptible inside nearby buildings. In extreme cases, high levels of vibration can damage buildings and infrastructure (FTA 2018). In the absence of Newfoundland and Labrador provincial criteria or Canadian federal criteria for evaluating the effects of Project-related vibration on quality of life, the potential for the predicted levels of vibration to affect quality of life has been evaluated qualitatively in Chapter 7 (Acoustic Environment) in context of vibration criteria described by the U.S. Department of Transportation Federal Transit Administration (FTA 2018).

Shadow Flicker

Shadow flicker is a temporary condition resulting from the sun casting intermittent shadows from the rotating blades of a wind turbine. The flicker is due to alternating light intensity between the direct beam of sunlight and the shadow from the turbine blades. Shadow flicker intensity is defined as the difference in brightness at a given location in the presence and absence of a shadow. Shadow flicker intensity from a turbine diminishes with distance; beyond 1,500 meters (m) it is of very low intensity and generally considered imperceptible by the human eye.

For shadow flicker to occur, all of the following conditions must be met:

- the sun must be low enough on the horizon to cast a long shadow (late fall, winter, early spring, or very early or very late in the day)
- the sun must be bright enough to cast a clear shadow (not obscured by clouds or intervening buildings and vegetation)
- the turbine must be spinning

Some people may find the visual experience of shadow flicker annoying, which may in turn affect quality of life. Shadow flicker assessments were undertaken for the Project (for the Codroy and Port au Port wind farms) to predict the duration and frequency of shadow flicker effects for potentially active dwellings located within 1,500 m of the proposed turbine locations for the Project (Appendix 6-A; Appendix 6-B). Modelled flicker was compared to a worst-case exposure limit of 30 hours per year that is largely based



on German guidance and considered to be a common standard in the turbine industry (Koppen et al. 2017). Additional discussion of the potential for shadow flicker from wind turbines during Project operation to affect quality of life, based on the results of the shadow flicker assessment, is provided below.

Some people believe that shadow flicker from wind turbines can cause those with photosensitive epilepsy to have an increase number of seizures. However, turbines do not rotate with a speed that is known to induce seizures. As reviewed by Knopper and Ollson (2011), Harding et al. (2008) and Smedley et al. (2010) have published the seminal studies dealing with this concern. Both studies suggest that flicker from turbines at frequencies >3Hz pose a potential risk of inducing photosensitive seizures in 1.7 people per 100,000 of the photosensitive population. For turbines with three blades, this translates to a maximum speed of rotation of 60 rpm. The turbines proposed for this Project (Siemens Gamesa Renewable Energy SG 6.6-155) have a maximum rate of rotation of 9.31 rpm, which is well below the rate known to induce seizures.

Viewscape, Lighting, and Other Visual Effects

The potential for the Project to affect the viewscape has been evaluated in the Visual Impact Assessment (Appendix 19-A). The potential for the Project to create lighting issues such as light trespass and glare according to CIE (2017) guidelines has been evaluated in Chapter 6 (Atmospheric Environment). There are no Canadian or provincial guidelines available that can be applied to assess the potential for changes in viewscape/other visual effects (e.g., navigation lighting) to affect quality of life. However, the potential for visual impacts of wind turbines to result in annoyance for some, which may indirectly affect quality of life, has been discussed in scientific literature. Therefore, the potential for changes in viewscape/other visual effects to affect quality of life will be discussed qualitatively in the context of the available scientific literature.

19.3.5.3 Assessment Approach for Evaluating Change to Public Safety

There are no Canadian or NL guidelines specific to evaluating the potential for ice throw from wind turbines to affect public safety. In the absence of a regulatory standard, WEGH2 retained DNV Canada Ltd. (DNV) to undertake an ice throw assessment in support of this Project (Appendix 19-B). The assessment relied on an approach developed in collaboration with the Finnish Meteorological Institute and Deutsches Windenergie-Institut (DEWI) as part of a research project on the implementation of wind energy in cold climates (Morgan and Bossanyi, 1996; Bossanyi and Morgan, 1996; and Morgan et al. 1997). The resulting guidelines for preparing a safety assessment related to ice throw are broadly consistent with the recent IEA Wind International Recommendations for Ice Fall and Ice Throw Risk Assessments (IEA TCP 2022).



19.3.5.4 Assumptions and Conservative Approach

The assumptions and conservative approaches applied in the modelling used to support the evaluation of potential effects of the Project on human health and quality of life are summarized for each effect in the following supporting documents:

- **Change to Human Health:** A review of conservative assumptions applied to model human exposure to Project-related COPCs in air is provided in Chapter 6 (Atmospheric Environment).
- **Change to Quality of Life:** A review of conservative assumptions applied to model human exposure to audible noise, low frequency noise, and vibration is provided in Chapter 7 (Acoustic Environment). A review of conservative assumptions applied to model human exposure to shadow flicker, lighting, and visual impact changes is provided in the shadow flicker supporting studies (Appendix 6-A; Appendix 6-B), Chapter 6 (Atmospheric Environment), and Visual Impact Assessment (Appendix 19-A).
- **Change to public safety:** A review of conservative assumptions applied to estimate risks to public safety due to ice throw from turbines is provided in the ice throw supporting study (Appendix 19-B).

19.4 Mitigation Measures

A series of environmental management plans will be developed by WEGH2 to mitigate the effects of the Project on the environment. A full list of mitigation measures to be applied throughout Project construction, operation and maintenance, and decommissioning and rehabilitation is provided in Section 26.2.

Given the connection between effects of the Project on the atmospheric environment (including air quality and lighting) and the acoustic environment (noise and vibration) and potential effects on human health and quality of life, the mitigation measures described in Chapter 6 (Atmospheric Environment) (Table 6.14) and Chapter 7 (Acoustic Environment) (Table 7.8) will also be applicable to mitigating potential effects of the Project on human health and quality of life. Those mitigation measures can be reviewed specifically in Chapter 6 and Chapter 7, respectively and are not repeated below.

Additional key measures to mitigate the potential effects of the Project on human health and quality of life that are not already listed in Chapter 6 (Atmospheric Environment), or Chapter 7 (Acoustic Environment) are listed in Table 19.4, by category and Project phase.



Table 19.4 Mitigation Measures: Human Health and Quality of Life

ID #*	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
320	Mitigation	WEGH2 will establish sufficient setback of wind turbines to mitigate risk to surrounding residence.	X	X	-
346	Mitigation	Wind turbine ice throw and ice drop mitigation will be evaluated and implemented on a turbine-by-turbine basis. For turbines where mitigation measures are deemed necessary, one or all of the following mitigation measures (informed by best practices described by CanREA 2020) will be considered.: i. Inform local populations of the risk and instruct local populations to avoid approaching to within the maximum throw distance of a wind turbine, when operating during icing conditions (290 m in this case). ii. Add signage on nearby public access roads or trails indicating the risk of ice throw. These signs can be equipped with signal lights to indicate an ongoing icing event. Consider recreational activity trails (snowmobile, hiking, skiing, etc.) when determining sign placement to support high visibility. iii. Implement more stringent icing shutdown algorithms to the wind turbine supervisory control and data acquisition (SCADA) system for turbines that have been determined to be near an at-risk area, to further mitigate risk. iv. Visually inspect turbines that have been determined to be near an at-risk area, after an icing shutdown and prior to re-start. v. Move turbines to a minimum setback on the order of at least the maximum throw distance from any high at-risk area (major highways, homes, other highly frequented areas). vi. Install ice detection sensors on the nacelle or blades, to increase accuracy in detecting icing events and trigger shutdown of the wind turbine during icing events (i.e., effectively turning ice throw events into ice drop events).	-	X	-
364	Engagement	Establish a community engagement program during wind turbine operation to receive and address community concerns related to issues such as audible noise and shadow flicker.	-	X	-
* Note: "ID #" denotes the master identification number for mitigation in Appendix 26-A. "C" denotes the construction phase of the Project. "O" denotes the operation and maintenance phase of the Project. "D" denotes the decommissioning and rehabilitation phase of the Project. "X" denotes the relevant Project phase for the mitigation measure.					



19.4.1 Application of the Precautionary Principle to Project Mitigation Measures

It is expected that potential Project effects on human health and quality of life will be mitigated, as required, through the application of standard and well understood methods to reduce human exposure to Project-related air quality contaminants, audible noise, low frequency noise, vibration, shadow flicker, lighting, changes to viewscape, and ice throw. The effectiveness of these mitigation measures will be confirmed by qualified environmental professionals and engineers as part of the development of detailed mitigation and environmental management planning. These detailed mitigation measures and monitoring programs including adaptive management procedures will be reviewed by applicable regulatory agencies prior to their implementation.

19.5 Residual Environmental Effects

19.5.1 Change to Human Health

This section describes and characterizes the potential for Project-related emissions of air quality contaminants to affect human health during each phase of the Project, based on the assessment approach described in Section 19.3.5.1 and results presented in detail in Appendix 19-D (Human Health Risk Assessment Technical Data Report).

19.5.1.1 Construction

As discussed in Chapter 6 (Atmospheric Environment) and Appendix 19-D, potential air contaminant releases during construction were estimated rather than modelled for specific Project sites because these releases are expected to be short-term and intermittent as construction of the turbines moves around the Project Area in a staggered approach.

In Chapter 6 (Atmospheric Environment), it is specified that construction activities will include site preparation and earthworks, including the clearing and cutting of vegetation and removal of organic materials, development of roads, excavation and preparation of areas within the turbine sites and access roads, and grading for infrastructure construction. Air contaminants may be released during construction activities in the form of combustion gases (sulphur dioxide (SO₂), nitrogen oxides (NO_x) and carbon monoxide (CO)) and particulate matter (total particulate matter (TPM), particulate matter with particles having an aerodynamic diameter less than 10 µm (PM₁₀) and particulate matter with particles having an aerodynamic diameter less than 2.5 µm (PM_{2.5})) from the operation of diesel and gas powered equipment and fugitive dust (particulate matter including TPM, PM₁₀ and PM_{2.5}) from earth and material moving and handling activities, blasting and equipment movements. Trace amounts of volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) may be released from the operation of diesel and gas powered equipment. Marine vessels and assist tugboats may also generate air contaminant emissions during maneuvering and hoteling during unloading.



It was concluded in Chapter 6 (Atmospheric Environment) that the main contribution to a change in air quality during construction at the Project sites is related to dust (particulate matter) releases from equipment and material movements during preparation of the turbine pads. Therefore, a detailed dust management plan including ambient monitoring will be implemented during construction to mitigate effects to air quality. Additional details regarding this dust management and monitoring plan are provided in Chapter 6 (Atmospheric). If ambient dust monitoring results indicate levels greater than applicable air quality criteria, construction activities will be adjusted, and additional controls will be applied. Therefore, in Appendix 19-D (Human Health Risk Assessment Technical Data Report), it was concluded that with this proactive mitigation and monitoring approach applied, unacceptable risks to human health are not predicted during the construction phase of the Project.

Summary

Project-related emissions of air quality contaminants are conservatively assumed to have moderate adverse residual effects on change to human health during the construction phase of the Project given that Project construction may result in increased concentrations of air quality contaminants relative to baseline conditions that may occasionally result in levels that are greater than applicable air quality criteria. However, construction planning will include a detailed dust management plan with ambient monitoring and adaptive management plan for increased mitigation as needed to avoid frequent occurrences of air quality contaminant levels greater than ambient air quality criteria. The geographic extent for change to human health is limited to the LAA/RAA, and the residual effects will be short-term (i.e., limited to the 30-month construction period) and continuous as construction activities were assumed to occur throughout the construction phase, but will occur in specific locations over the entire Project Area. These effects are not sensitive to timing. The residual effects are predicted to be reversible as the predicted increase in ambient concentrations would return to baseline conditions after the end of construction. The LAA/RAA in which the changes in air quality are assessed is considered undisturbed; there has been little anthropogenic sources of emissions within the LAA/RAA prior to the Project.

Based on the information above, a summary of residual effects on change to human health during the construction phase is provided in Table 19.5.

Table 19.5 Summary of Effects by Project Component During Construction

Project Site	Summary of Effect during Construction
Temporary Workforce Accommodations	In Chapter 6 (Atmospheric Environment), it is concluded that residual effects to changes in air quality are anticipated to be limited from the temporary workforce accommodation. Limited direct air contaminant emissions during construction of the temporary workforce accommodations are expected. It is assumed that the workforce accommodations will have electrical heating which will not contribute to direct air quality emissions. Therefore, residual effects to changes to human health are also anticipated to be limited from the temporary workforce accommodation.



Table 19.5 Summary of Effects by Project Component During Construction

Project Site	Summary of Effect during Construction
Port au Port Wind Farm and Associated Infrastructure	In Chapter 6 (Atmospheric Environment), it is concluded that residual effects to changes in air quality during construction of the Port au Port wind farm and associated infrastructure may be caused by emissions of air contaminants from combustion of fuel in vehicles, heavy equipment, and stationary combustion, blasting, material moving/handling activities, and equipment movement. With the application of a proactive dust management plan including ambient monitoring, it is expected that construction of the Port au Port wind farm and associated infrastructure may have moderate adverse residual effects to change to human health; but air quality changes will be short term and temporary.
Codroy Wind Farm and Associated Infrastructure	In Chapter 6 (Atmospheric Environment), it is concluded that residual effects to changes in air quality during construction of the Codroy wind farm and associated infrastructure may be caused by emissions of air contaminants from combustion of fuel in vehicles, heavy equipment, and stationary combustion, blasting, material moving/handling activities, and equipment movement. With the application of a proactive dust management plan including ambient monitoring, it is expected that construction of the Codroy wind farm and associated infrastructure may have moderate adverse residual effects to change to human health; but air quality changes will be short term and temporary.
230 kV Transmission Lines and Substations	In Chapter 6 (Atmospheric Environment), it is concluded that residual effects to changes in air quality during construction of the 230 kV transmission lines and Substations may be caused by emissions of air contaminants from combustion of fuel in vehicles, heavy equipment, and stationary combustion, blasting, material moving/handling activities, and equipment movement. With the application of a proactive dust management plan including ambient monitoring, it is expected that construction of the 230 kV transmission lines and Substations may have moderate adverse residual effects to change to human health; but air quality changes will be short term and temporary.
Hydrogen / Ammonia Production and Storage Facilities	In Chapter 6 (Atmospheric Environment), it is concluded that residual effects to changes in air quality during construction of the Hydrogen / Ammonia Production and Storage Facilities may be caused by emissions of air contaminants from combustion of fuel in vehicles, heavy equipment, and stationary combustion, blasting, material moving/handling activities, and equipment movement. With the application of a proactive dust management plan including ambient monitoring, it is expected that construction of the Hydrogen / Ammonia Production and Storage Facilities may have moderate adverse residual effects to change to human health; but air quality changes will be short term and temporary.
Port Facilities	In Chapter 6 (Atmospheric Environment), it is concluded that residual effects to changes in air quality during construction from the Port Facilities will be caused by emissions of air contaminants from marine vessels and tugboats. With the application of a proactive dust management plan including ambient monitoring, it is expected that the Port Facilities during construction may have moderate adverse residual effects to change to human health; but air quality changes will be short term and temporary.



19.5.1.2 Operation and Maintenance

As discussed in Chapter 6 (Atmospheric Environment), modelled sources of Project-related emissions of air quality contaminants during Project operation and maintenance included flares (pilot and NH₃), backup power generation (50 MW biodiesel combustion turbine), cooling tower, marine vessels (hoteling at port), and assist tugboats. Evaluation of changes to human health due to Project-related emissions of air quality contaminants produced by these sources during Project operation and maintenance was evaluated with an HHRA that followed standard practices and guidance, including (but not limited to) the guidance documents listed in Section 19.1.1.1 and detailed in Appendix 19-D.

For the Project operation phase, the HHRA was based on a ratio of maximum predicted ground level concentrations of COPC to applicable health-based exposure limits (Table 19.6) to generate ERs (i.e., the measurable parameter identified in Table 19.2). Where baseline data were available, ERs were compared to a target benchmark of 1.0. Where baseline data were not available, ERs were compared to a target benchmark of 0.2 to account for possible exposure of people to these chemicals from sources other than the Project. For COPCs where the calculated ER was less than the applicable target benchmark for the maximum predicted ground level concentration, the ER would also be less than the target benchmark throughout the LAA/RAA. This indicates that the predicted COPC concentrations throughout the LAA/RAA are less than the health-based exposure levels and therefore no unacceptable risks to human health are predicted. However, for COPCs where the calculated ER using the maximum predicted ground level concentration was greater than the applicable target benchmark, this does not indicate the presence of an unacceptable risk to human health. Rather, these risks should be discussed further in consideration of the nature and likelihood of potential adverse human health effects and the context of the assumptions made in the HHRA.

In the HHRA, the only parameters where ERs calculated using the maximum predicted ground level concentrations were greater than the applicable target exposure ratios were NO₂, PM_{2.5}, diesel particulate matter (DPM), and ammonia (NH₃). Therefore, further discussion is provided below to evaluate the potential for human health risk associated with exposure to Project-related NO₂, PM_{2.5}, diesel particulate matter (DPM), and ammonia (NH₃). In addition, further discussion is also provided below for specific COPCs with potential non-threshold health effects below their applicable health-based guidelines (i.e., NO₂, SO₂, PM_{2.5}, DPM as discussed in Health Canada 2016b, 2016c, and 2016d).

Table 19.6 Toxicological Reference Values and Exposure Limits

Chemical of Potential Concern	Exposure Period	Health-based Exposure Limit	Reference
Nitrogen Dioxide (NO ₂)	1-hour ^a	200 µg/m ³	WHO (2021)
	24-hour ^a	25 µg/m ³	WHO (2021)
	Annual	10 µg/m ³	WHO (2021)
Sulphur Dioxide (SO ₂)	10-minute	175 µg/m ³	Health Canada (2016b)
	24-hour ^a	40 µg/m ³	WHO (2021)



Table 19.6 Toxicological Reference Values and Exposure Limits

Chemical of Potential Concern	Exposure Period	Health-based Exposure Limit	Reference
Particulate Matter (PM _{2.5})	24-hour ^a	15 µg/m ³	WHO (2021)
	Annual ^a	5 µg/m ³	WHO (2021)
Diesel Exhaust (DPM)	2-hour ^b	10 µg/m ³	Health Canada (2016c)
	Annual	5 µg/m ³	Health Canada (2016c)
Ammonia (NH ₃)	1-hour	590 µg/m ³	TCEQ (2014)
	24-hour	100 µg/m ³	US EPA (2005)
Carbon Monoxide (CO)	1-hour	28,600 µg/m ³	Health Canada (2010b)
	8-hour	10,000 µg/m ³	WHO (2021)
Volatile Organic Compounds			
Benzene	1-hour	580 µg/m ³	TCEQ (2015a)
	24-hour	30 µg/m ³	ATSDR (2007)
	Annual	0.625 µg/m ³	Health Canada (2021b)
Toluene	1-hour	15,000 µg/m ³	TCEQ (2015b)
	24-hour	7,600 µg/m ³	ATSDR (2017)
	Annual	2,300 µg/m ³	Health Canada (2021b)
Xylenes	1-hour	7,400 µg/m ³	TCEQ (2015c)
	Annual	100 µg/m ³	Health Canada (2021b)
Acrolein	1-hour	38 µg/m ³	Health Canada (2021b)
	Annual	0.44 µg/m ³	Health Canada (2021b)
Formaldehyde	1-hour	50 µg/m ³	TCEQ (2008)
	Annual	2 µg/m ³	Environmental Canada and Health Canada (2001)
Polycyclic Aromatic Hydrocarbons (PAHs)			
Naphthalene	Annual	10 µg/m ³	Health Canada (2021b)
Benzo(a)pyrene	Annual	0.002 µg/m ³	Health Canada (2021b)
Aromatic C ₉ -C ₁₆ ^c	Annual	200 µg/m ³	TPHCWG (1997)
Benzo(a)pyrene TPE	Annual	0.017 µg/m ³	Health Canada (2021b)
Notes:			
^a value is based on a statistical comparison; refer to details in individual contaminant write-up			
^b although guideline applies to 2-hour exposure time, in the HHRA, 1-hour exposures were compared to this value			
^c sum of acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, pyrene			



As shown in Table 6.19 of Chapter 6 (Atmospheric Environment), the primary sources of NO₂ from the Project are the marine vessels (hoteling at port), assist tugboats, and backup power generation (50 MW biodiesel combustion turbine). For NO₂, the maximum predicted ground level concentrations were greater than the health-based exposure limit for the 24-hour and annual averaging periods but not for the 1-hour averaging period. However, a spatial analysis indicated that the annual NO₂ concentrations were only greater than the exposure limit in a small spatial area over the water where people will not be present for a long-term duration (see Appendix 19-D). For the 24-hour averaging period, NO₂ concentrations greater than the health-based exposure level were predicted to overlap with a portion of the residential area of Little Port Harmon; however, the predicted 24-hour concentrations in the residential area of Little Port Harmon were low relative to concentrations that are associated with respiratory, inflammatory, and immunology effects in controlled human exposure studies per Health Canada (Health Canada 2016d). As discussed in EIS Chapter 6 (Atmospheric Environment), there were several conservative assumptions made during the air dispersion modelling, and as such, the actual exposure concentrations are not expected to be as high as predicted. Additional discussion of the uncertainties associated with the modelled air quality are provided in Section 6.2 of Appendix 19-D. Therefore, human health risks associated with NO₂ from the Project determined not to be significant per the definition provided in Section 19.3.2. because:

- predicted concentrations are well below levels associated with adverse effects in healthy individuals and actual concentrations are not expected to be as high as predicted
- since annual exposure limit is not exceeded, the health burden related to a few days with higher concentrations is relatively very small (WHO 2021)
- while it is possible that individual asthmatic children or adults with chronic obstructive pulmonary disease could be more sensitive, the respiratory effects would likely be mild and transient
- the geographical extent of the maximum predicted 24-hour concentrations that are greater than the exposure limit is relatively small

As shown in Table 6.19 of Chapter 6 (Atmospheric Environment), the primary sources of PM_{2.5} from the Project are the cooling towers, backup power generation (50 MW biodiesel combustion turbine), marine vessels (hoteling at port), and assist tugboats. For PM_{2.5}, predicted concentrations greater than the 24 hour and annual average health-based guidelines established by WHO (2021) were limited to small areas near the hydrogen / ammonia plant property boundary, primarily over water, where people are unlikely to be present for 24 hour or annual exposures. The WHO health-based guidelines are described by WHO as “The lowest exposure level of an air pollutant above which the guideline development group is confident that there is an increase in adverse health effects,” and it is noted by WHO that, “It is assumed that adverse health effects do not occur or are minimal below this concentration level.” Therefore, it can be concluded that adverse health effects from short-term and long-term exposure to PM_{2.5} will not occur or would be minimal in the areas of the LAA/RAA where maximum predicted concentrations are below these health-based guidelines. As such, it was concluded that exposure to PM_{2.5} from the Project would not result in significant adverse effects on human health per the definition provided in Section 19.3.2.



As shown in Table 6.19 of Chapter 6 (Atmospheric Environment), the primary sources of DPM from the Project are the backup power generation (50 MW biodiesel combustion turbine), marine vessels (hoteling at port), and assist tugboats. For DPM, predicted concentrations were greater than the health-based guideline related to short-term exposure (2 hour) for a guideline protective of non-cancer effects (Health Canada 2016c). The spatial extent of concentrations greater than the 2-hour non-cancer guideline is predicted to be limited and located near the hydrogen / ammonia plant property boundary, in an area where people are unlikely to linger for an appreciable length of time. The predicted annual concentrations of DPM were less than the health-based exposure limit throughout the LAA/RAA. Therefore, non-cancer human health risks associated with DPM from the Project were considered to be acceptable. For carcinogenic risks of exposure to DPM, a qualitative assessment was completed. This evaluation determined that long-term exposure to DPM at concentrations less than the chronic non-cancer guideline provided by Health Canada (2016c) may be related to an increased cancer risk, and the level of exposure that would be associated with an acceptable incremental lifetime cancer risk is not known. Therefore, although concentrations of DPM were predicted to be lower than applicable health-based limits for non-cancer effects in areas where people may live, work, or recreate, monitoring and adaptive management of fine particulate (which includes DPM) is considered appropriate. The AQMP will measure $PM_{2.5}$ during operations and will specify the mitigation measures for the management and reduction of air emissions during Project operation. Ambient air monitoring will be implemented in conjunction with emissions mitigation to provide an understanding of the offsite $PM_{2.5}$ concentrations, and to evaluate the need for more rigorous mitigation. Additional details are provided in EIS Chapter 6 (Atmospheric Environment). Given that it is anticipated that potential health risks associated with exposure to DPM can be adequately addressed through mitigation measures, exposure to DPM is not predicted to have a significant residual adverse effect on human health per the definition provided in Section 19.3.2.

As shown in Table 6.19 of Chapter 6 (Atmospheric Environment), the primary sources of NH_3 from the Project are the NH_3 flares. For NH_3 , ERs were initially compared to targets of 0.2 because baseline concentrations were not available. This very protective approach allows up to 80% of the exposure limit to come from other sources. The 24-hour NH_3 ERs were greater than 0.2 for the maximum predicted ground level concentration but less than 0.2 at the maximum residential location. However, NH_3 is a short-lived pollutant and as such, it normally doesn't travel far from its source. As there are no known sources of NH_3 near the Project area, it is reasonable to assume that it is negligible in baseline. Therefore, given that the ERs for 1 hour and 24 hour NH_3 are less than 1.0 throughout the LAA/RAA, it is concluded that exposure for residents and recreational users in the LAA/RAA will remain below the applicable health-based exposure limits and risks to human health from NH_3 will be negligible. As such, exposure to NH_3 from the Project is not predicted to have a significant residual adverse effect on human health per the definition provided in Section 19.3.2.

It is expected that the AQMP will measure NO_2 and $PM_{2.5}$ during operations and will specify the mitigation measures for the management and reduction of air emissions during Project operation. Ambient air monitoring will be implemented in conjunction with emissions mitigation to provide an understanding of the offsite NO_2 concentrations, and to evaluate the need for more rigorous mitigation. Additional details are provided in EIS Chapter 6 (Atmospheric Environment). The AQMP typically relies on provincial or federal ambient air quality standards; however, because the Newfoundland and Labrador (NL) Ambient Air Quality Standards (NLAQS) are not based solely on health effects, it may be more appropriate to



compare air monitoring results to health-based exposure limits at residential areas (i.e., the values presented in Table 19.6).

Finally, it is acknowledged that concurrent exposure to the Project-related mixture of COPCs predicted to occur in ambient air is a potential source of uncertainty, and some health risks may be present at concentrations lower than the health-based exposure limits for some contaminants (i.e., NO₂, SO₂, PM_{2.5}, DPM). Therefore, planned monitoring and mitigation efforts during all phases of the Project remain valuable to limit exposure and potential for risks. In particular, the results of this HHRA suggest that targeted monitoring for NO₂ and PM_{2.5} in Little Port Harmon may be necessary to support adaptive management.

Summary

Project-related emissions of air quality contaminants are predicted to have low adverse residual effects on change to human health during the operation phase of the Project for COPCs other than NO₂. Adverse residual effects on changes to human health during the operation phase of the Project related to NO₂ are predicted to be moderate because Project operations may result in increased concentrations of NO₂ relative to baseline conditions that could result in occasional NO₂ concentrations that are greater than the health-based limits for short-term exposures for NO₂ in areas where people may live, work, or recreate. The primary sources of NO₂ from the Project are the marine vessels (hoteling at port), assist tugboats, and backup power generation (50 MW biodiesel combustion turbine). Ambient air monitoring will need to be implemented in conjunction with emissions mitigation to evaluate the need, if any, for more rigorous mitigation. The geographic extent for change to human health is limited to the LAA/RAA, and the residual effects are medium-term (i.e., extending through the operation and maintenance phase of the Project) and continuous. These effects are not sensitive to timing. With monitoring and mitigation in place, it is expected that adverse residual effects on change to human health due to exposure to air quality contaminants during the operation phase of the Project would be mild and transient (i.e., reversible). The LAA/RAA in which the changes in air quality are assessed is considered undisturbed; there has been little anthropogenic sources of emissions within the LAA/RAA prior to the Project.

Based on the information above, a summary of residual effects on Change to Human Health during the operation and maintenance phase is provided in Table 19.7.



Table 19.7 Summary of Effects by Project Component During Operation and Maintenance

Project Site	Summary of Effect during Operation and Maintenance
Port au Port Wind Farm and Associated Infrastructure	There are no anticipated residual effects to human health due to Project-related emissions of air quality contaminants as a result of the Port au Port wind farm and associated infrastructure as they will not result in direct emissions to atmosphere.
Codroy Wind Farm and Associated Infrastructure	There are no anticipated residual effects human health due to Project-related emissions of air quality contaminants as a result of the Codroy wind farm and associated infrastructure as they will not result in direct emissions to atmosphere.
230 kV Transmission Lines and Substations	There are no anticipated residual effects to human health due to Project-related emissions of air quality contaminants as a result of the transmission lines and substations as they will have no direct emissions to atmosphere.
Hydrogen / Ammonia Production and Storage Facilities	Project-related emissions of air quality contaminants from the hydrogen/ ammonia production and storage facilities and the port facilities combined are predicted to have low adverse residual effects on change to human health during the operation phase of the Project for COPCs other than NO₂. Adverse residual effects on changes to human health during the operation phase of the Project related to NO₂ are predicted to be moderate because Project operations may result in increased concentrations of NO₂ relative to baseline conditions that could result in occasional NO₂ concentrations that are greater than the health-based limits for short-term exposures for NO₂ in areas where people may live, work, or recreate. The primary sources of NO₂ from the Project are the marine vessels (hoteling at port), assist tugboats, and backup power generation (50 MW biodiesel combustion turbine). With monitoring and mitigation in place, it is expected that adverse residual effects on change to human health due to exposure to air quality contaminants during the operation phase of the Project would be mild and transient (i.e., reversible).
Port Facilities	Project-related emissions of air quality contaminants from the hydrogen/ ammonia production and storage facilities and the port facilities combined are predicted to have low adverse residual effects on change to human health during the operation phase of the Project for COPCs other than NO₂. Adverse residual effects on changes to human health during the operation phase of the Project related to NO₂ are predicted to be moderate because Project operations may result in increased concentrations of NO₂ relative to baseline conditions that could result in occasional NO₂ concentrations that are greater than the health-based limits for short-term exposures for NO₂ in areas where people may live, work, or recreate. The primary sources of NO₂ from the Project are the marine vessels (hoteling at port), assist tugboats, and backup power generation (50 MW biodiesel combustion turbine). With monitoring and mitigation in place, it is expected that adverse residual effects on change to human health due to exposure to air quality contaminants during the operation phase of the Project would be mild and transient (i.e., reversible).



19.5.1.3 Decommissioning and Rehabilitation

As discussed in Chapter 6 (Atmospheric Environment), potential air contaminant releases during decommissioning and rehabilitation were not modelled for this assessment because the release of air contaminants during decommissioning and rehabilitation is typically less than during construction and can be effectively managed through the application of standard operating procedures (SOPs) and best management practices (BMPs). Therefore, in Appendix 19-D (Human Health Risk Assessment Technical Data Report), it was concluded that the potential for decommissioning and rehabilitation to affect change to human health has conservatively been assumed to be equivalent to that during construction.

Summary

Project-related emissions of air quality contaminants are conservatively assumed to have moderate adverse residual effects on change to human health during the decommissioning and rehabilitation phase of the Project given that the release of air contaminants during decommissioning and rehabilitation is typically less than during construction and a finding of moderate adverse residual effects on change to human health during the construction phase was determined above. As described above under the construction phase, the geographic extent for change to human health is limited to the LAA/RAA, and the residual effects will be short-term (i.e., limited to the two-year decommissioning phase) and continuous as decommissioning activities were assumed to occur throughout the decommissioning phase. These effects are not sensitive to timing. The residual effects are predicted to be reversible as the predicted increase in ambient concentrations would return to baseline conditions after the end of decommissioning. The LAA/RAA in which the changes in air quality are assessed is considered undisturbed; there has been little anthropogenic sources of emissions within the LAA/RAA prior to the Project.

19.5.2 Change to Quality of Life

This section describes and characterizes the potential for Project-related changes to non-chemical parameters such as noise, low frequency noise, vibration, shadow flicker, lighting and viewscape to affect quality of life during each phase of the Project, based on the assessment approach described in Section 19.3.5.2.

19.5.2.1 Construction

Project-related noise (including low frequency noise):

As described in Chapter 7 (Acoustic Environment), Project-related noise during construction was modelled at receptor locations representative of noise-sensitive locations such as homes, cabins, hospitals or schools located outside of the facility property boundary.

This modelling included noise emissions associated with construction of the wind turbines, earthmoving and construction activities for the ammonia production facility, piledriving activities that may be required for the refurbishment of the port at Port Harmon and blasting during construction. Modelling was limited to daytime sound levels given that construction activities will be limited to daytime hours; therefore, Health Canada's sleep disturbance limits for noise during construction do not apply. The change in noise levels



attributable to construction at the modelled receptor locations was used to assess the predicted change in percent highly annoyed (%HA) and compared to the Health Canada (2017) criterion of a change of less than or equal to 6.5% HA. This evaluation determined that the change in %HA from existing conditions to the construction phase is less than the Health Canada (2017) criterion of 6.5% HA.

Project-related vibration

As described in Chapter 7 (Acoustic Environment), it is expected that Project-related vibration produced during Construction will not be perceptible outside of the Project Area and will therefore have negligible residual effects on quality of life.

Shadow Flicker

As discussed in Appendix 6-A and Appendix 6-B, shadow flicker is a potential source of annoyance in the presence of active and operating wind turbines; therefore, shadow flicker will not be present during construction and further evaluation of this potential effect pathway is not applicable during construction.

Lighting

With respect to lighting, it is noted in Chapter 6 (Atmospheric Environment) that construction activities will mostly occur during daytime hours; therefore Project-related lighting during nighttime will be limited. The use of mobile artificial lighting may occur for short periods of time when there is less daylight during the workday (i.e., in the fall and winter). The number of mobile artificial lighting units and their locations are currently unknown. However, it is probable that such equipment will be used throughout the Project Area, where construction and infrastructure installation activities will occur. The use of nighttime lighting will be limited and mitigated by using directional lighting.

Therefore, it was concluded in Chapter 6 (Atmospheric Environment) that residual effects from the Project during construction on change in light are anticipated to be low in magnitude and limited to the Project Area. Lighting is considered to have a negligible effect on quality of life during construction.

Viewscape

As discussed in Appendix 19-A, the focus of the Visual Impact Assessment is on the potential for active and operating wind turbines and the 230 kV transmission line to alter the viewscape. Evaluation of changes to viewscape is therefore not applicable during construction.

Summary

As discussed above, Project-related vibration, shadow flicker, lighting, and changes to viewscape are expected to have negligible residual effects on change in quality of life during construction. For Project-related noise, it was determined that with the implementation of mitigation measures, adverse residual effects on quality of life will be low in magnitude (predicted change in %HA was less than the Health Canada criterion of 6.5% HA), extend to the LAA/RAA, be short-term in duration, and regular in frequency. Effects due to Project-related noise would be sensitive to timing if noise occurred at night



when people are sleeping; however, for this Project, construction will be limited to daytime hours and therefore there is no sensitivity with respect to timing. Residual effects (an increase in %HA) due to Project-related noise during construction are reversible as annoyance will dissipate when the noise source is removed. With respect to socio-economic context, the receptor locations for which potential residual effects due to exposure to Project-related noise during construction were assessed include a mixture of both 'undisturbed' and 'disturbed' locations for baseline noise (i.e., pre-existing baseline noise levels were highest for locations close to major roadways or nearer to urban areas close the Stephenville and lowest for rural areas). Based on the information above, a summary of residual effects on quality of life during the construction phase is provided in Table 19.8.

Table 19.8 Summary of Effects by Project Component During Construction

Project Site	Summary of Effect during Construction
Temporary Workforce Accommodations	There are no anticipated residual effects to quality of life as a result of the temporary workforce accommodations.
Port au Port Wind Farm and Associated Infrastructure	Project-related effects due to vibration, shadow flicker, lighting changes, and changes to viewscape will be negligible during construction. Audible noise will be generated during construction, but sound levels are not predicted to increase beyond guideline criteria for annoyance or sleep disturbance. Residual effects to quality of life will be low.
Codroy Wind Farm and Associated Infrastructure	Project-related effects due to vibration, shadow flicker, lighting changes, and changes to viewscape will be negligible during construction. Audible noise will be generated during construction, but sound levels are not predicted to increase beyond guideline criteria for annoyance or sleep disturbance. Residual effects to quality of life will be low.
230 kV Transmission Lines and Substations	Project-related effects due to vibration, shadow flicker, lighting changes, and changes to viewscape will be negligible during construction. Audible noise will be generated during construction, but sound levels are not predicted to increase beyond guideline criteria for annoyance or sleep disturbance. Residual effects to quality of life will be low.
Hydrogen / Ammonia Production and Storage Facilities	Project-related effects due to vibration, shadow flicker, lighting changes, and changes to viewscape will be negligible during construction. Audible noise will be generated during construction, but sound levels are not predicted to increase beyond guideline criteria for annoyance or sleep disturbance. Residual effects to quality of life will be low.
Port Facilities	Project-related effects due to vibration, shadow flicker, lighting changes, and changes to viewscape will be negligible during construction. Audible noise will be generated during construction, but sound levels are not predicted to increase beyond guideline criteria for annoyance or sleep disturbance. As such, residual effects to quality of life will be low.



19.5.2.2 Operation and Maintenance

Project-related noise (including low frequency noise)

As described in Chapter 7 (Acoustic Environment), Project-related noise during operation and maintenance was modelled at receptor locations representative of noise-sensitive locations such as homes, hospitals or schools located outside of the facility property boundary. This modelling included noise emissions from Project infrastructure and equipment related to operation and maintenance of the Port au Port wind farm, the Codroy wind farm, the Hydrogen/Ammonia Production facility, and substations associated with the 230 kV transmission lines. The change in noise levels attributable to construction at the modelled receptor locations resulted in a predicted change in percent highly annoyed (%HA) of less than the Health Canada (2017) criterion of 6.5% HA and the predicted daytime (L_d), nighttime (L_n) and day-night average sound levels (L_{dn}) at the receptors do not exceed the Health Canada sleep disturbance criteria (L_n of 45 dBA). There were no sources identified that would result in individual noise events that exceed 45 dBA; therefore, the Health Canada (2017) guidance that indoor sound pressure levels should not exceed approximately 45 dBA L_{Amax} more than 10-15 times per night was also met.

Project-related vibration

As described in Chapter 7 (Acoustic Environment), it is expected that Project-related vibration produced during operation and maintenance will not be perceptible outside of the Project Area and will therefore have negligible residual effects on quality of life.

Shadow Flicker

Separate shadow flicker assessments were completed for the Codroy wind farm and the Port au Port wind farm to evaluate the duration and frequency of potential shadow flicker during Project operation for active dwellings located within 1,500 m of the proposed turbine locations for the Project (Appendix 6-A; Appendix 6-B). The shadow flicker assessments for the Project considered two assessment cases representing two different sets of environmental conditions: "Worst Case" assumes that the sun is always shining during daylight hours (i.e., there are no cloudy periods), all Project wind turbines are always active (i.e., rotors spinning), and all Project wind turbines are always oriented with their rotors perpendicular to the line joining the sun and all receptor points. "Worst Case" is highly conservative (i.e., likely to overestimate potential shadow flicker effects) because the sun is not always visible, and Project wind turbines are not always active. The orientation of the Project wind turbines will also change continuously based on wind direction, so turbine rotors are not always oriented perpendicular to the line joining the sun and receptor. In contrast, the "Expected Case" scenario makes use of statistical weather data to reduce some of the conservatism inherent in the "Worst Case" assessment. In particular, "Expected Case" uses statistical weather data to estimate the probability of sunshine for each month of the year. Even with the use of statistical weather data, "Expected Case" is still a conservative evaluation of potential shadow flicker effects because it assumes that Project wind turbines are always active (i.e., turbine rotors are always spinning), and turbine rotors are always oriented perpendicular to the line joining the sun and receptor, which is not the case.



A commonly used assessment criterion or allowable worst-case limit for shadow flicker is 30 hours per year (Koppen et al. 2017). For the Port au Port wind farm, in the 'Expected Case' assessment, the predicted duration of shadow flicker was less than three hours per year for any of the receptors. For the Codroy wind farm, 26 of the 28 evaluated receptor locations had less than 30 hours of predicted shadow flicker occurrence under the 'Expected Case' scenario. There were two receptor locations identified where predicted duration of shadow flicker exceeded the 30-hour per year criterion, with >59 and >97 hours of shadow flicker predicted at these two locations under the 'Expected Case' scenario. However, both of the receptor locations with greater than 30-hour per year predicted shadow flicker are located less than 1 km from the closest turbine(s) and WEGH2 is committed to not constructing turbines within 1 km from a residence as described in Chapter 2 (Project Description). Therefore, the proximity of these turbines to receptors will require a turbine relocation or engagement with the owners of the identified receptor location. With this mitigation in place (i.e., limiting receptor location proximity to turbines to greater than 1 km), it is expected that shadow flicker will have a low effect on quality of life during operation and maintenance.

Lighting

With respect to lighting, it is noted in Chapter 6 (Atmospheric Environment) that there will be nighttime safety lighting for the Project buildings, navigation lighting for the wind turbines, and lighting for vehicle parking lots and access roads within the Project Area. The number, type and locations of lights, are currently unknown. However, the final lighting design will be developed using the minimum lighting levels recommended by the Illuminating Engineering Society (IES) of North America's IES Lighting Handbook for outdoor worksite lighting, and in consideration of the CIE guidelines. Light trespass and glare will be reduced where practicable using full cut-off luminaires to focus light on work areas. Navigation light fixtures will likely follow design standards issued by Transport Canada that balance safety needs for aviation with obtrusive impacts from facility lighting (Transport Canada 2021).

It was concluded in Chapter 6 (Atmospheric Environment) that residual effects from the Project during operation and maintenance on change in light are anticipated to be low in magnitude and limited to the Project Area. Lighting is therefore considered to have a negligible effect on quality of life during operation and maintenance.

Viewscape

The Visual Impact Study (Appendix 19-A) evaluated the potential for active and operating wind turbines and the 230 kV transmission line to alter the viewscape. The visual impact study area encompassed an area with a radius of 15 km around the outermost turbines of each wind farm and an area with a radius of 5 km around the centreline of the proposed 230 kV transmission line. For wind turbines, the visual impact assessment concluded that modern wind turbines are large, manufactured, and highly visible structures. The siting of these turbines within a rural area (including coastal settings) provides the potential for a change in view scape both near and far. Where a view of the turbines is available, they will at first be seen in contrast with the landscape, but over time will become an integral part of the recognized landscape. The level of impact will depend on the viewers' sensitivity to visual change among other influencing factors. It was also concluded that the 230 kV transmission line will likely not affect the overall



aesthetic characteristics of the visual study area as it is similar to the existing transmission lines that run adjacent to or near to the proposed new transmission line. While the proposed monopole structures may appear different to those already visible, they will not appear out of place. Therefore, it is reasonable to expect that simple visibility of the Port au Port and Codroy Wind Farms, and 230 kV transmission line does not automatically translate to a visual impact nor imply a negative effect on the perceived beauty or enjoyment of visiting the visual study areas. The level of perceived visual impact would ultimately be determined based on a viewers' sensitivity to the visual change.

Summary

As noted above, modelled levels of Project-related noise, vibration, and flicker are below the applicable guidelines used in the determination of environmental effects. The visual impact assessment concluded that views of the turbines and 230 kV transmission line will likely not affect the overall aesthetic characteristics of the visual study area, but the level of impact will depend on the viewers' sensitivity to visual change among other influencing factors.

Overall, these findings can be interpreted in the context of available scientific literature on the topic of wind turbines and health effects. There are numerous peer-reviewed publications and government agency reports that have reviewed this evidence and concluded that when sited correctly, wind turbines are not related to adverse health effects (e.g., Berger et al. 2015; Health Canada 2014; Knopper et al., 2014). One of the largest and most comprehensive studies on the topic of wind turbines and health was completed by Health Canada (2014) and published as a series of peer-reviewed articles (e.g., Feder et al. 2015, Michaud et al. 2016a-d; Michaud et al. 2018). In brief, Health Canada, in partnership with Statistics Canada, conducted a study in Southern Ontario and Prince Edward Island, Canada, to better understand the relationship between wind turbines and human health. The study involved 1,238 randomly selected participants (606 males, 632 females) aged 18-79 years, living between 250 m to more than 10 km from operational wind turbines. In this study, with calculated outdoor wind turbine noise levels reaching 46 dBA (higher than what is predicted for this Project), Health Canada found exposure to wind turbine noise had no association with self-reported sleep, self-reported illnesses, self-reported perceived stress and quality of life, hair cortisol, blood pressure, resting heart rate or measured sleep. Health Canada also investigated the potential impact of wind turbine noise on quality of life using an abbreviated version of the World Health Organization's Quality of Life scale and found that exposure to wind turbine noise was not associated with any significant changes in overall quality of life and satisfaction with health.

What Health Canada did find, and what has been reported in the literature before and after that study, is that wind turbines can be a source of annoyance for some people, and that annoyance may be associated with certain reported health effects (e.g., sleep disturbance), even when guidelines are met (e.g., Knopper et al., 2014). However, it is important to note that annoyance towards wind turbines is known to be strongly affected by subjective variables like attitude, economics and visual cues, rather than turbine specific variables such as audible (including low frequency) noise. Indeed, Health Canada (2014) reported that while "An association was found between increasing levels of wind turbine noise and individuals reporting to be very or extremely annoyed...No association was found with any significant changes in reported quality of life, or with overall quality of life and satisfaction with health".



While public attitude is generally overwhelmingly in favor of wind energy, this support does not always translate into local acceptance of projects by all involved. In an attempt to mitigate local annoyance, it is recommended that community concerns be considered through constructive community engagement based on open and honest dialogue.

When the information provided above about Project-related noise, vibration, shadow flicker, lighting and changes to viewscape is considered in the context of the available scientific literature, it is concluded that although the change in these parameters may be measurable, levels of these parameters during operation and maintenance will not exceed guidelines published by federal or provincial agencies to be protective of health or levels associated with health effects in the scientific literature. Therefore, with the implementation of mitigation measures, adverse residual effects from the Project during operation and maintenance on change in quality of life are anticipated to be low in magnitude, extend to the LAA/RAA, have a medium-term duration and irregular frequency. Adverse residual effects associated with Project-related noise will have moderate sensitivity to timing, given that potential for effects to quality of life are more likely to occur for audible noise that occurs during nighttime hours. Adverse residual effects on quality of life during Project operation and maintenance (i.e., an increase in annoyance) due to Project-related noise, vibration, shadow flicker, and viewscape are reversible as annoyance will dissipate when these sources are removed. With respect to socio-economic context, the receptor locations for which potential residual effects due to exposure to Project-related noise and vibration were assessed include a mixture of both 'undisturbed' and 'disturbed' locations for baseline noise (i.e., pre-existing baseline noise levels were highest for locations close to major roadways or nearer to urban areas close the Stephenville and lowest for rural areas). In contrast, the baseline condition for assessed receptor locations was 'undisturbed' with respect to shadow flicker and viewscape. Based on the information above, a summary of residual effects on quality of life during the operation and maintenance phase is provided in Table 19.9.

Table 19.9 Summary of Effects by Project Component During Operation and Maintenance

Project Component	Summary of Effect during Operation and Maintenance
Port au Port Wind Farm and Associated Infrastructure	• Project-related effects due to vibration will be imperceptible outside of the Project Area and therefore have a negligible residual effect on quality of life. • Project will generate shadow flicker, but highest levels are well below generally accepted guidelines of 30 hours/year, therefore, residual effect on quality of life will be low. • Changes to lighting will be low in magnitude and limited to the Project Area; therefore, residual effect on quality of life will be low. • With respect to visual impact, for locations where a view of the turbines is available, they will at first appear in contrast with the landscape, but over time will become an integral part of the recognized landscape. The level of impact will depend on the viewers' sensitivity to visual change among other influencing factors. • Audible noise will be generated during operation and maintenance, but sound levels are not predicted to increase beyond guideline criteria for annoyance or sleep disturbance. As such, residual effects to quality of life will be low.



Table 19.9 Summary of Effects by Project Component During Operation and Maintenance

Project Component	Summary of Effect during Operation and Maintenance
Codroy Wind Farm and Associated Infrastructure	• Project-related effects due to vibration will be imperceptible outside of the Project Area and therefore have a negligible residual effect on quality of life. • Project will generate shadow flicker, but with mitigations in place, highest levels will not exceed generally accepted guidelines of 30 hours/year, therefore, residual effect on quality of life will be low. • Changes to lighting will be low in magnitude and limited to the Project Area; therefore, residual effect on quality of life will be low. • With respect to visual impact, for locations where a view of the turbines is available, they will at first appear in contrast with the landscape, but over time will become an integral part of the recognized landscape. The level of impact will depend on the viewers' sensitivity to visual change among other influencing factors. • Audible noise will be generated during operation and maintenance, but sound levels are not predicted to increase beyond guideline criteria for annoyance or sleep disturbance. As such, residual effects to quality of life will be low.
230 kV Transmission Lines and Substations	• With respect to visual impact, the 230 kV transmission line will likely not affect the overall aesthetic characteristics of the visual study area as it is similar to the existing transmission lines that run adjacent to or near to the proposed new transmission line. • Audible noise will be generated during operation and maintenance, but sound levels are not predicted to increase beyond guideline criteria for annoyance or sleep disturbance. As such, residual effects to quality of life will be low.
Hydrogen / Ammonia Production and Storage Facilities	• Project-related effects due to vibration will be imperceptible and therefore have a negligible residual effect on quality of life. • Changes to lighting will be low in magnitude and limited to the Project Area; therefore, residual effect on quality of life will be low. • Audible noise will be generated during operation and maintenance, but sound levels are not predicted to increase beyond guideline criteria for annoyance or sleep disturbance. As such, residual effects to quality of life will be low.
Port Facilities	• Project-related effects due to vibration will be imperceptible and therefore have a negligible residual effect on quality of life. • Changes to lighting will be low in magnitude and limited to the Project Area; therefore, residual effect on quality of life will be low. • Audible noise will be generated during operation and maintenance, but sound levels are not predicted to increase beyond guideline criteria for annoyance or sleep disturbance. As such, residual effects to quality of life will be low.



19.5.2.3 Decommissioning and Rehabilitation

Project-related noise (including low frequency noise):

As described in Chapter 7 (Acoustic Environment), it is expected that Project-related noise and low frequency noise during decommissioning and rehabilitation will be less than or equal to the noise projected during construction or operation and therefore it is not expected that this phase of the Project will result in an exceedance of the Health Canada (2017) percent highlight annoyed (%HA) criteria of 6.5% for the evaluated receptor locations. As with construction, decommissioning and rehabilitation activities will be limited to daytime hours, as Health Canada's sleep disturbance limits for noise during decommissioning and rehabilitation do not apply.

Project-related vibration

As described in Chapter 7 (Acoustic Environment), it is expected that Project-related vibration produced during decommissioning and rehabilitation will not exceed those predicted to occur during construction. As vibration during construction was predicted to be imperceptible outside of the Project Area, vibration during decommissioning and rehabilitation will also be imperceptible and have negligible residual effects on quality of life.

Shadow Flicker

Shadow flicker is a potential issue in the presence of active and operating wind turbines; therefore, shadow flicker will not be present during decommissioning and rehabilitation and further evaluation of this potential effect pathway is not applicable during decommissioning and rehabilitation.

Lighting

With respect to lighting, it is noted in Chapter 6 (Atmospheric Environment) that the use of light during decommissioning and rehabilitation is expected to be less than during construction and operation and can be effectively managed through the application of standard operating procedures (SOPs) and best management practices (BMPs). Therefore, it was concluded in Chapter 6 (Atmospheric Environment) that residual effects from the Project during decommissioning and rehabilitation of change in light are anticipated to be low in magnitude and limited to the Project Area. Lighting is considered to have a negligible effect on quality of life during decommissioning and rehabilitation.

Viewscape

The focus of the visual impact assessment is on the potential for active and operating wind turbines and the 230 kV transmission line to alter the viewscape. The Visual Impact Assessment (Appendix 19-A) concluded that both wind turbines and the 230 kV transmission line will become an integral part of the recognized landscape during the operation phase of the Project. At decommissioning, these parameters may be removed from the viewscape, which may change perception. However, this change is considered likely to be positive as it will return the viewscape to its pre-construction condition.



Summary

As discussed above, Project-related vibration, shadow flicker, and lighting, are expected to have negligible residual effects on change in quality of life during decommissioning and rehabilitation. Changes to viewscape are expected to be positive, but low, after 30 years of integration of wind turbines and transmission lines into the known landscape. For Project-related noise, adverse residual effects during decommissioning and rehabilitation were evaluated qualitatively based on comparison to construction and operation and it was determined that with the implementation of mitigation measures, adverse residual effects on quality of life will be low in magnitude (predicted change in %HA was less than the Health Canada criterion of 6.5% HA), extend to the LAA/RAA, be short-term in duration, and regular in frequency. Effects due to Project-related noise would be sensitive to timing if noise occurred at night when people are sleeping; however, for this Project, this sensitivity can be avoided by scheduling decommissioning activities during daytime hours only. Adverse residual effects (an increase in %HA) due to Project-related noise during decommissioning and rehabilitation are reversible as annoyance will dissipate when the noise source is removed. With respect to socio-economic context, the receptor locations for which potential residual effects due to exposure to Project-related noise during decommissioning and rehabilitation were assessed include a mixture of both 'undisturbed' and 'disturbed' locations for baseline noise (i.e., pre-existing baseline noise levels were highest for locations close to major roadways or nearer to urban areas close the Stephenville and lowest for rural areas). Based on the information above, a summary of residual effects on quality of Life during the decommissioning and rehabilitation phase is provided in Table 19.10.

Table 19.10 Summary of Effects by Project Component During Decommissioning and Rehabilitation

Project Component	Summary of Effect during Decommissioning and Rehabilitation
Temporary Workforce Accommodations	There are no anticipated residual effects to quality of life as a result of the temporary workforce accommodations.
Port au Port Wind Farm and Associated Infrastructure	- Project-related effects due to vibration, shadow flicker, and lighting changes, will be negligible during decommissioning and rehabilitation. Changes to viewscape will be low but positive. - Audible noise will be generated during decommissioning and rehabilitation, but sound levels are not predicted to increase beyond guideline criteria for annoyance or sleep disturbance. As such, residual effects to quality of life will be low.
Codroy Wind Farm and Associated Infrastructure	- Project-related effects due to vibration, shadow flicker, and lighting changes, will be negligible during decommissioning and rehabilitation. Changes to viewscape will be low but positive. - Audible noise will be generated during decommissioning and rehabilitation, but sound levels are not predicted to increase beyond guideline criteria for annoyance or sleep disturbance. Residual effects to quality of life will be low.



Table 19.10 Summary of Effects by Project Component During Decommissioning and Rehabilitation

Project Component	Summary of Effect during Decommissioning and Rehabilitation
230 kV Transmission Lines and Substations	• Project-related effects due to vibration and lighting changes will be negligible during decommissioning and rehabilitation. Changes to viewscape will be low but positive. • Audible noise will be generated during decommissioning and rehabilitation, but sound levels are not predicted to increase beyond guideline criteria for annoyance or sleep disturbance. As such, residual effects to quality of life will be low.
Hydrogen / Ammonia Production and Storage Facilities	• Project-related effects due to vibration and lighting changes will be negligible during decommissioning and rehabilitation. Changes to viewscape will be low but positive. • Audible noise will be generated during decommissioning and rehabilitation, but sound levels are not predicted to increase beyond guideline criteria for annoyance or sleep disturbance. Residual effects to quality of life will be low.
Port Facilities	• Project-related effects due to vibration and lighting changes will be negligible during decommissioning and rehabilitation. Changes to viewscape will be low but positive. • Audible noise will be generated during decommissioning and rehabilitation, but sound levels are not predicted to increase beyond guideline criteria for annoyance or sleep disturbance. As such, residual effects to quality of life will be low.

19.5.3 Change to Public Safety

This section describes and characterizes potential for ice throw from wind turbines to affect public safety during the operation phase of the Project, based on the assessment approach described in Section 19.3.5.3. As ice throw cannot occur in the absence of operating wind turbines, this effect pathway is not applicable during construction or decommissioning.

With respect to evaluation of public safety, the evaluation in this chapter focuses only on safety issues related to potential ice throw from operating wind turbines. For an evaluation of potential safety issues related to accidents and malfunctions (e.g., accidental spills, fire and explosions, traffic accidents, dislodging of a wind tower or turbine blade, failure of industrial water supply; energy generation/transmission failure, and wildlife emergencies/incidents) see Chapter 24 (Accidents and Malfunctions).

19.5.3.1 Operation and Maintenance

There are no Canadian or Newfoundland and Labrador guidelines specific to evaluating the potential for ice throw from wind turbines to affect public safety. In the absence of a regulatory standard, the ice throw analysis completed in support of this Project (Appendix 19-B) relied on an approach developed in collaboration with the Finnish Meteorological Institute and DEWI as part of a research project on the implementation of wind energy in cold climates (Morgan and Bossanyi, 1996; Bossanyi and Morgan, 1996; and Morgan et al. 1997). The resulting guidelines for preparing a safety assessment related to ice



throw are broadly consistent with the recent IEA Wind International Recommendations for Ice Fall and Ice Throw Risk Assessments (IEA TCP 2022).

For the Port au Port wind farm, the ice throw analysis completed for this Project identified a potential risk (although rare) that ice throw or ice fall may occur in a radius of up to 290 m from the turbine. For the Port au Port wind farm, only two turbines were deemed to be within range of a potential risk area. These two locations consist of turbine 6 (near highway 463) and turbine 18 (near Cape St. George Community pasture). For these two turbine locations, it is recommended that additional review be completed to identify the frequency of human presence within the potential risk area and apply mitigations, as needed to further reduce risk using mitigations described in Table 19.4. For the Codroy wind farm, the maximum ice throw radius, taking into account the influence of terrain elevation differences, was calculated to be 400 m. For the Codroy wind farm, the identified potentially inhabited structures and evaluated roadways were all greater than 510 m from the nearest turbines. Therefore, DNV (2023) concluded that the risk of ice throw for the Codroy wind farm to be negligible for the turbine layout and model considered in their analysis.

With mitigation strategies described in Table 19.4 applied, adverse residual effects on public safety will be low in magnitude, limited to the LAA/RAA (specifically, within a 400 m radius from individual turbines), and moderately sensitive to timing (i.e., effect must occur when a person is present in the risk area for an actual harm to occur). The duration of these adverse residual effects will be medium-term, with an irregular frequency. Adverse residual effects to public safety due to ice throw during operation and maintenance are reversible as no risk to public safety will persist when turbines are removed and/or no longer operating. With respect to socio-economic context, the receptor locations for which potential residual effects to public safety were assessed are undisturbed under baseline conditions as no ice throw is present in the absence of operating wind turbines. Based on the information above, a summary of residual effects on public safety during the operation and maintenance phase is provided in Table 19.11.

Table 19.11 Summary of Effects by Project Component During Operation and Maintenance

Project Site	Summary of Effect during [Project Phase]
Port au Port Wind Farm and Associated Infrastructure	There is a potential for ice throw in a limited area (within a 290 m radius) around individual turbines under specific weather conditions. With mitigation in place, this is expected to pose a negligible adverse effect to public safety.
Codroy Wind Farm and Associated Infrastructure	There is a potential for ice throw in a limited area (within a 400 m radius) around individual turbines under specific weather conditions. However, the identified potentially inhabited structures and evaluated roadways were all greater than 510 m from the nearest turbines. Therefore, this is expected to pose a negligible adverse effect to public safety.
230 kV Transmission Lines and Substations	There are no anticipated residual effects to public safety a result of the 230 kV transmission lines and substations
Hydrogen / Ammonia Production and Storage Facilities	There are no anticipated residual effects to public safety a result of the Hydrogen / Ammonia Production and Storage Facilities
Port Facilities	There are no anticipated residual effects to public safety a result of the Port Facilities



19.5.4 Residual Environmental Effects Summary

19.5.4.1 Residual Environmental Effects Characterization

Overall, residual effects of the Project on human health and quality of life are predicted to be adverse and moderate in magnitude given that the Project is expected to generate changes to measurable environmental quality parameters (i.e., air quality, audible noise and low frequency noise, vibration, shadow flicker, light emissions, viewscape, and ice throw), and that emissions of air quality contaminants may result in occasional NO₂ concentrations that are greater than the health-based limits for short-term exposures for NO₂ in areas where people may live, work, or recreate. Ambient air monitoring will be implemented in conjunction with emissions mitigation to evaluate the need for additional mitigation, if necessary. Residual effects are anticipated to be limited to the LAA/RAA and range in duration from short-term to medium-term. Residual effects will occur continuously, irregularly or regularly (depending on the effect), and occur in areas that range from primarily undisturbed (i.e., at the wind farm sites) to previously disturbed (i.e., at the sites of the hydrogen / ammonia production and storage). With monitoring and mitigation in place, it is expected that adverse residual effects on change to human health during the operation phase of the Project would be mild and transient (i.e., reversible). In most cases, these effects are not sensitive to timing. However, for audible noise, it is noted that noise can be more disruptive when it occurs at night when it may disturb sleep. This has been accounted for in this evaluation by comparing to sleep disturbance criteria, where applicable.

Table 19.12 summarizes the predicted environmental effects (residual effects) of the undertaking on human health and quality of life.



Table 19.12 Summary of Predicted Environmental Effects of the Undertaking on Human Health and Quality of Life

Residual Effect	Residual Effects Characterization							
	Nature	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological and Socio-economic Context
Construction								
Change to Human Health	A	M	LAA/RAA	NS	ST	R	R	U, D
Change to Quality of Life	A	L	LAA/RAA	NS	ST	C	R	U, D
Change to Public Safety	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Operation and Maintenance								
Change to Human Health	A	M	LAA/RAA	NS	MT	C	R	U, D
Change to Quality of Life	A	L	LAA/RAA	MS	MT	C	R	U, D
Change to Public Safety	A	L	LAA/RAA	MS	MT	IR	R	U
Decommissioning and Rehabilitation								
Change to Human Health	A	M	LAA/RAA	NS	ST	R	R	U, D
Change to Quality of Life	A	L	LAA/RAA	NS	ST	C	R	U, D
Change to Public Safety	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KEY: Nature: P: Positive A: Adverse N: Neutral Magnitude: N: Negligible L: Low M: Moderate H: High Geographic Extent: PA: Project Area LAA: Local Assessment Area RAA: Regional Assessment Area Duration: ST: Short-term MT: Medium-term LT: Long-term Timing: NS: No Sensitivity MS: Moderate Sensitivity HS: High Sensitivity Frequency: S: Single Event IR: Irregular Event R: Regular Event C: Continuous Reversibility: R: Reversible I: Irreversible Ecological / Socio-Economic Context: D: Disturbed U: Undisturbed								



19.5.4.2 Summary of Predicted Environmental Effects

This chapter has presented an evaluation of the potential effects of the Project on human health due to exposure to air quality contaminants, quality of life due to changes to non-chemical parameters (e.g., noise, vibration, shadow flicker, light emissions, and viewscape), and public safety due to potential ice throw from operating wind turbines. An overall summary of this evaluation is provided below:

- During construction, operation and maintenance, and decommissioning and rehabilitation phases of the Project, air quality contaminants with a potential to affect human health may be released to the environment and may result in NO₂ concentrations that are greater than the health-based limits for short-term exposures for NO₂ in areas where people may live, work, or recreate. With monitoring and mitigation in place, it is expected that adverse residual effects on change to human health due to exposure to air quality contaminants during the operation phase of the Project would be mild and transient (i.e., reversible). Ambient air monitoring will be implemented in conjunction with emissions mitigation to evaluate the need for additional mitigation, if necessary.
- During construction, operation and maintenance, and decommissioning and rehabilitation phases of the Project, the Project may generate audible noise that has a potential to affect quality of life by causing annoyance or sleep disturbance. However, the modelling completed in support of the EIS indicates that the change in annoyance will be less than the acceptable threshold level identified by Health Canada of 6.5% and that the guideline specific to sleep disturbance will not be exceeded. Vibration associated with these Project activities was also evaluated and determined to have a low effect on quality of life.
- During operation and maintenance, the Project may generate shadow flicker, light emissions, and changes to the viewscape that have potential to cause annoyance, but a review of the modelled effects and available literature indicates that these factors will have a low effect on quality of life.
- During operation and maintenance, there is a potential risk to public safety related to ice throw from wind turbines. However, with mitigation strategies applied, adverse residual effects on public safety will be avoided or reduced.

19.6 Determination of Significance

The definition of significance provided in Section 19.3.2 indicates that a significant adverse residual effect on human health and quality of life occurs when the Project's predicted effects on measurable environmental quality parameters are expected to result in an adverse change to human health or quality of life within the LAA/RAA that incorporates all of the following characteristics: moderate or high in magnitude, moderate to high duration, possibly irreversible, occurs over a large spatial extent or within an area of exclusive/preferred Indigenous use, and cannot be addressed adequately through mitigation measures.

The evaluation of the potential effects of the Project on human health and quality of life presented above determined that residual effects, where present, would be low to moderate in magnitude, short term to moderate in duration, reversible, limited in geographic extent, and can be addressed adequately through mitigation measures. Therefore, in consideration of the VEC-specific significance criteria defined above,



the residual effect(s) of routine Project activities on human health and quality of life (i.e., change to human health, change to quality of life, and change to public health) are characterized as not significant. The level of confidence in this prediction is discussed in Section 19.7.

19.7 Prediction Confidence

The assumptions and uncertainties associated with the modelling relied on to evaluate residual environmental effects on human health and quality of life are discussed in the VEC chapters and supporting studies where this modelling was completed, namely Chapter 6 (Atmospheric Environment); Chapter 7 (Acoustic Environment); Shadow Flicker supporting studies (Appendix 6-A; Appendix 6-B), Visual Impact Assessment (Appendix 19-A), and ice throw supporting study (Appendix 19-B). In general, in VEC chapters and supporting studies, assumptions were made to have a bias towards overestimation of Project residual effects (i.e., to be conservative under most conditions).

Given this bias toward overestimation of Project residual effects, the conclusions presented above regarding the potential for the Project to affect human health and quality of life are made with a high level of confidence.

19.8 Follow-Up and Monitoring

Follow-up and monitoring are intended to verify the accuracy of predictions made during the EA, to assess the implementation and effectiveness of mitigation, and to manage adaptively, if required. Compliance monitoring, where required by permitting or regulations, will be conducted to confirm that mitigation measures are properly implemented. Should an unexpected deterioration of the environment be observed as part of follow-up and/or monitoring, intervention mechanisms will include the adaptive management process. This may include identification of existing and/or new mitigation measures to be implemented to address it (i.e., managing equipment schedules if air quality emissions are higher than anticipated). Follow-up or monitoring required by applicable permits, will be provided, as appropriate to regulators.

Given the connection between effects of the Project on the atmospheric environment (including air quality and lighting) and the acoustic environment (noise and vibration) and potential effects on human health and quality of life, the follow-up or monitoring measures described in Chapter 6 (Atmospheric Environment) and Chapter 7 (Acoustic Environment) will also be applicable to follow-up or monitoring of potential Project effects on human health and quality of life. Those follow-up or monitoring measures can be reviewed specifically in Chapter 6 and Chapter 7, respectively, and are not repeated below. However, in addition to the follow-up or monitoring measures described in Chapter 6 (Atmospheric Environment), the results of the HHRA suggest that targeted monitoring for NO₂ and PM_{2.5} in Little Port Harmon is recommended to support adaptive management and that it may be more appropriate to compare air monitoring results to health-based exposure limits at residential areas (i.e., the values presented in Table 19.6) at these locations than solely provincial or federal ambient air quality standards as typically relied on in the AQMP.



Additional follow-up and monitoring associated with shadow flicker, changes to viewscape, or ice throw, beyond the establishment of a community engagement program and institution of recommended ice throw mitigations per Table 19.4 are not planned at this time based on the results of the residual environmental effects assessment.

19.9 Capacity of Renewable Resources and Effects on Biological Diversity

Potential interactions between the Project and human health and quality of life are not anticipated to adversely affect renewable resources or biological diversity. Therefore, adverse Project-related effects on the capacity of renewable resources to meet the needs of the present and those of the future, and adverse Project-related effects on biological diversity, are not anticipated with respect to human health and quality of life.

19.10 Predicted Future Environmental Conditions if the Project Does Not Proceed

The Project is located in an area that has been designated for wind farm development, and it is likely that other wind farm projects would occur in this area if this Project were not to proceed. Future projects would be anticipated to have similar effects on human health and quality of life. Should the Project Area remain undeveloped, the predicted future condition of human health and quality of life would be relatively unchanged from that discussed in the existing environment portion of this assessment (Section 19.2).

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20.0 Land and Resource Use

20.1 Scope of Assessment

The Land and Resource Use (LRU) VEC considers the use of lands (including designated and non-designated lands), inland waters, and resources for commercial / industrial, recreational, and subsistence purposes:

- Designated lands and parks, municipal land use, including public protected water supply areas (PPWSA) and water supply infrastructure
- Commercial / industrial LRU includes forestry, agriculture, mining, quarrying, petroleum development, mineral / petroleum exploration (outfitters and tourism operators, while commercial enterprises, are considered in the context of recreational LRU)
- Recreational LRU includes sport and leisure activities such as sport hunting, sport fishing, hiking, cross-country skiing, all-terrain vehicle (ATV) use / snowmobiling, bird watching / whale watching, swimming, canoeing / kayaking
- Subsistence LRU includes hunting, trapping, fishing, domestic wood harvesting, and the harvesting of food / medicinal plants for personal consumption or use

LRU was selected as a VEC because of the potential interactions between the Project and the use of lands and resources in and nearby the Project Area and their socio-economic value to the region.

Potential Project-related effects on ocean users are assessed separately in the context of the Marine Environment and Use VEC (Chapter 11). Potential Project-related effects on Indigenous fisheries are assessed separately in Chapter 21 (Indigenous Fisheries). The assessment of Project-related effects on LRU is linked to and informed by the conclusions of the effect assessments for the following VECs:

- Atmospheric Environment (Chapter 6) – given that Project-related activities may result in a change in air quality and lighting levels that may cause a disturbance to both resources and resource users
- Acoustic Environment (Chapter 7) – given that Project-related activities may result in an increase in noise and vibration levels that may cause a disturbance to both resources and resource users
- Groundwater Resources (Chapter 8) – given the link to public water supply well availability and use
- Surface Water Resources (Chapter 9) – given the link to domestic and industrial water supply availability and use
- Fish and Fish Habitat (Chapter 10) – given the link with recreational and sport fishing
- Marine Environment (Chapter 11) – given the link to marine and land-based aquaculture
- Vegetation and Wetlands (Chapter 12) – given the importance of vegetation communities to vegetation-based resource activities (i.e., forestry activities) and the importance of natural habitat to wildlife



- Avifauna and Other Wildlife (Chapters 13 and 15, respectively) – given the link with hunting, trapping and guided outfitting
- Areas of Conservation Concern (Chapter 16) – given the link to designated land and/or protected areas
- Employment and Economy (Chapter 17) – given the link to commercial resources (i.e., mineral occurrences of potential economic significance, productive forestland, outfitting businesses)
- Communities (Chapter 18) – given the link to community infrastructure and services (e.g., water supply)
- Human Health (Chapter 19) – given the link with human health through direct consumption of vegetation, fish and wildlife gathered, hunted, or caught during recreational or commercially-based land and resource use
- Indigenous Fisheries (Chapter 21) – given shared use of land and resources with Indigenous groups.

Other technical supporting studies that are linked to and inform the LRU VEC assessment include the following: Domestic Wood Cutting Consultation Plan (Appendix 4-B); Land and Resource Use Survey (Appendix 4-C); Shadow Flicker Study (Appendix 19-C, 19-D); Transportation Impact Study and Traffic Management Plan (Appendix 2-D); Visual Impact Assessment Study (Appendix 19-A); and an Ice Throw Study (Appendix 19-B).

20.1.1 Regulatory and Policy Setting

In addition to the Newfoundland and Labrador *Environmental Protection Act*, the Project is subject to other federal and provincial legislation, policies, regulations, standards, and guidance. This section identifies the primary regulatory requirements and policies of the federal and provincial authorities which influence the scope of the assessment on land and resource use.

20.1.1.1 Federal

Applicable federal legislation related to land and resource use includes the *Canadian Navigable Waters Act* (CNWA). Under the CNWA, a navigable water is defined as a body of water where there is a reasonable likelihood that it will be used by vessels for any part of the year as a means of transport or travel for recreational or commercial purposes or for Indigenous peoples of Canada exercising their rights as recognized by section 35 of the *Constitution Act, 1982*. The CNWA requires owners who propose to construct or place a work in a waterway on the List of Scheduled Waters, where that work may interfere with navigation, to apply or prepare a Notice to the Minister unless the work meets the criteria set out in the Minor Works Order regulations. Works meeting the assessment criteria are classed designated works under the Minor Works Order and conditions of construction are the criteria that allow them to be considered a minor work. Section 3 of the Minor Works Order provides that for the following works, the owner must submit a description of the proposed activity and minor work's location in the registry established under the CNWA and publish a notice of minor work, unless the work has gone through a provincial review process: erosion-protection works, aerial cables, submarine cables, buried pipelines, outfalls and water intakes, dredging, and watercourse crossings. Based on the Project Description, aerial cables and submarine cables would be the relevant minor works. These classes of designated works can



proceed without Notice if the work complies with requirements of the Minor Works Order. Although the Project Area does not include waterways listed as scheduled waters under the CNWA, the CNWA would also apply to waterways in the Project Area where navigation by canoe / kayak is possible, such as Harry's Brook, Mainland Brook, Robinsons River, Crabbe's River, and Grand Codroy River. However, there are no Project features which would result in a change to navigation within these waterbodies. Road crossings along the existing access roads have culverts / bridges currently and upgrades to the existing access roads are not anticipated to result in changes to navigation.

Federal legislation and policies related to fish harvesting and wildlife harvesting (e.g., *Fisheries Act*, *Migratory Birds Convention Act, 1994*) are addressed in Chapter 10 (Fish) and Chapter 13 (Avifauna) respectively. The NL *Fisheries Act* and *Fishery Regulations* fall under the federal Fisheries Act, RSC 1985, C F-14. Fishery regulations specified under the federal *Fisheries Act* govern daily and yearly quotas, possession limits and length limit for species fished in the inland and tidal waters. The regulations focus on the management and allocation of domestic fishery resources of the region. These regulations provide for fish harvester licensing, who may hold licences, vessel registration, gear requirements, open and closed seasons, restricted areas and other conservation and management measures. The Project may affect certain federal land/properties engaging section 82 of the *Impact Assessment Act*.

20.1.1.2 Provincial

Provincial legislation, regulations policy and guidance that are applicable to land and resource use include:

- *Forestry Act* – A cutting permit is required for cutting or removal of trees on forest lands or for activities that are likely to cause a wildfire. There are also environmental protection guidelines for planning forest operation for both industry and Crown that pertain to such things as existing and planned access roads, areas sensitive to erosion and buffers around waterbodies.
- *Lands Act* – This Act governs the leasing, licence to occupy, providing easement, or granting of Crown lands in the province. Crown lands are designated for various purposes, such as provincial parks and reserves and agricultural areas of interest, as well as tenured Crown lands subject to other legal uses (e.g., domestic wood harvesting, commercial forestry, mining, quarrying, petroleum development and associated exploration activities, and utility easements.
- *Minerals Act* – This Act governs the acquisition of rights to minerals in the province through issuance of license, permit, lease, or agreement.
- *Mining Act* – The Act governs the operation of mines and mills in the province via a mineral lease and mill license. The *Mining Act* includes regulations pertaining to development and operation plans for a mine, including rehabilitation and closure.
- *Municipalities Act, 1999* – This Act gives municipalities in and around the Project the authority to construct and maintain public water supply and sewage systems, public roads, and area lighting, to collect and remove waste, to require persons to apply for certain permits to build and occupy buildings and construct water and sewer systems.



- *Provincial Parks Act* – This Act gives the Lieutenant-Governor in Council the authority to establish, control and manage, and make regulations respecting provincial parks.
- *Quarry Materials Act, 1998* – This Act governs the exploration for quarry materials, granting of a quarry permit, granting of a beach permit, or issuance of a quarry lease. The *Quarry Materials Act* includes regulations pertaining to permits, including for beach and highway quarries, exploration licences, and leases.
- *Petroleum and Natural Gas Act* – This Act governs petroleum and natural gas development in the province. The *Petroleum and Natural Gas Act* includes regulations pertaining to exploratory surveys and exploratory and development wells.
- *Urban and Rural Planning Act, 2000 (URPA)*– This Act establishes the mandate for municipalities to adopt development plans and zoning by-laws to guide land use decisions and reduce land use conflicts within their boundaries.
- *Water Resources Act* – This Act manages water resources in the province, with the intent of providing clean water for environmental, social, and economic well-being. Under the Act, a permit would be required for development activity within a PPWSA.
- *The Wilderness and Ecological Reserves Act* – This Act gives the Lieutenant-Governor in Council the authority to establish wilderness and ecological reserves, establish provisional reserves, carry out reserve measures or programs, enlarging or decreasing the area of a reserve, establish emergency reserves, and dictate what activities are prohibited on reserves.
- *Wild Life Act* – This Act governs the establishment of hunting zones and regulations regarding seasons. The *Wild Life Act* includes regulations and orders pertaining to hunters and trappers who hold a valid licence and is the regulatory basis for the Newfoundland and Labrador Hunting and Trapping Guide.

20.1.1.3 Municipal

The Project Area overlaps with areas regulated under the URPA; the Towns of Stephenville, Kippens, and Cape St. George are within the Regional Assessment Area (RAA) (Section 20.2.2.1). These municipalities are regulated under the URPA and respective Municipal Plan and Development Regulations and under the *Municipalities Act, 1999*.



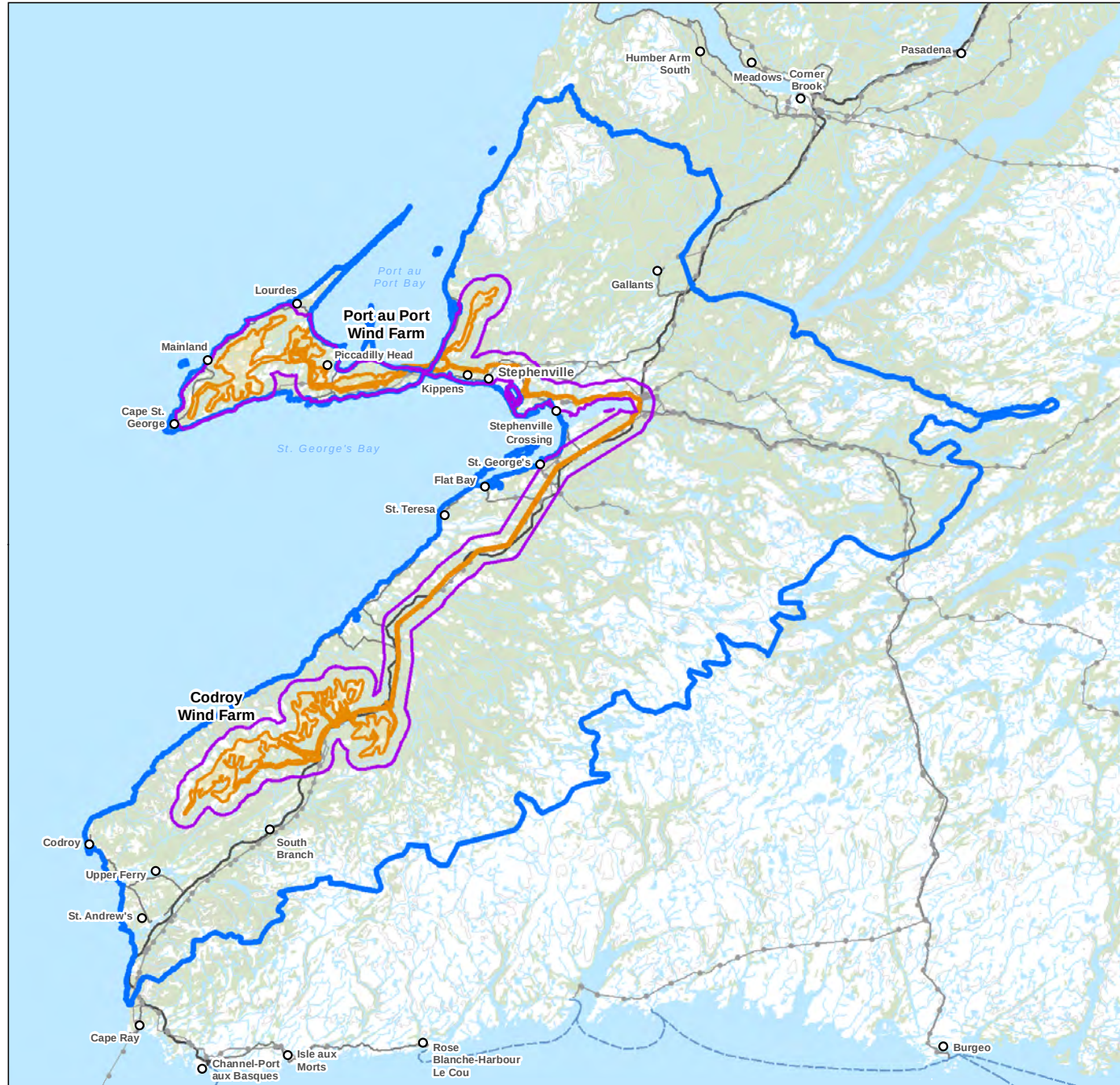
20.1.2 Boundaries

20.1.2.1 Spatial Boundaries

The following spatial boundaries were used to assess Project effects, including residual environmental effects, on land and resource use in areas surrounding the Project components (Figure 20.1):

- **Project Area:** The Project Area encompasses the immediate area in which Project activities and components occur and is comprised of following distinct areas: the Port au Port Wind Farm, the Codroy Wind Farm, the Hydrogen/Ammonia Production and Storage Facility (hydrogen / ammonia plant), Port facilities, and the 230 kV Transmission Lines, as well as associated infrastructure including roads, substations, and water supply infrastructure. The Project Area is the anticipated area of direct physical disturbance associated with the construction, operation and decommissioning, rehabilitation and closure of the Project. In addition to encompassing the immediate area in which Project components and activities will occur, the Project Area also includes a buffer of up to 300 m for access roads and turbines and a 350 m corridor to accommodate the 70 to 75 m wide RoW for the transmission line. These buffers allow flexibility for the micro-siting of Project components during detailed design, based on technical considerations as well as the avoidance of environmentally sensitive areas, where practicable.
- **Local Assessment Area (LAA):** The LAA for the LRU VEC comprises the Project Area and a 2-km buffer surrounding the Project Area. These LAA boundaries have been selected to capture the area where effects on LRU are likely to be most prevalent (e.g., sensory disturbance and nuisance effects on nearby land users).
- **Regional Assessment Area:** The RAA for the LRU VEC aligns with the spatial boundaries for Statistics Canada Census Division No. 4. It is approximately 7,540 km² in size and encompasses the Project Area, LAA, and surrounding communities.





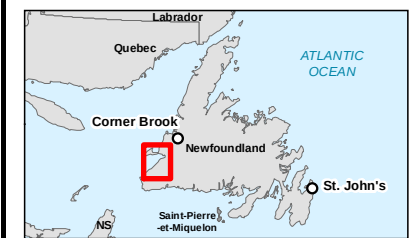
 Regional Assessment Area	Other Features
 Local Assessment Area	 Transmission Line, Existing
Proposed Project Features	 Trans-Canada Highway
 Project Area	 Other Highway
	 Ferry Route
	 Contour (100 m)
	 Watercourse
	 Waterbody
	 Forested Area



0 10 20 km
(At original document size of 8.5x11)
1:950,000

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2
3. Background: NRCan, CanVec



Project Location: Stephenville, NL
Prepared by AC on 2023-07-24
QR by AW on 2023-07-19
IR by BK on 2023-07-28

Client/Project: World Energy GH2
Project Nujo'qonik
121417233_027a

Figure No.

20.1

Title

Local and Regional Assessment Areas

20.1.2.2 Temporal Boundaries

The temporal boundaries for the assessment of potential effects on the land and resource use include:

- **Construction:** Overall, the construction phase of the Project will be from Q4 2023 through Q2 2027, pending EA approval and receipt of other required permits and approvals. Early civil works are planned to start Q4 2023 through Q3 2024. Construction of the Port au Port Wind Farm and associated infrastructure is expected to start in Q3 2024 with completion of the construction in Q1 2026. Construction of the Codroy Wind Farm and associated infrastructure is expected to start Q4 2025 with completion in Q1 2027. The hydrogen and ammonia plant will be constructed in phases from Q2 2024 to Q1 2026.
- **Operation and maintenance:** Wind farm commissioning is anticipated to start Q1 2026 at the Port au Port Wind Farm and Q2 2027 at the Codroy Wind Farm. The 600 MW electrolyzer is expected to be commissioned in Q1 2026. The operational life of the Project is 30 years at each site.
- **Decommissioning and rehabilitation:** After a 30-year operational life, the decommissioning phase is anticipated to occur during 2057 and 2058. Decommissioning is anticipated to begin Q1 2057 at the Port au Port Wind Farm, with completion in Q3 2058 at the Codroy Wind Farm.

Temporal boundaries also consider the criteria of timing (i.e., seasonal sensitivities) for the assessment of potential effects on land and resource use (e.g., hunting/trapping, gathering, recreational uses).

20.2 Existing Environmental Conditions

20.2.1 Methods

Information on existing conditions for land and resource use was obtained through primary and secondary research. Primary data were collected through government, stakeholder, community, and Indigenous engagement activities undertaken for the Project. A Land and Resource Use Survey (Appendix 4-C) was also developed and implemented to engage the public and solicit feedback, identify land and resource use activities that occur in the proposed Project locations, and to identify public perceptions around the potential risks and benefits of the Project (Appendix 4-C). Correspondence with identified stakeholders was conducted and data was requested and received from government agencies. Secondary research included a desktop review of existing and publicly available research and studies, research findings, other environmental assessments conducted for infrastructure projects in other jurisdictions, and a review of traditional knowledge, where available. Note that Indigenous fisheries are specifically addressed in Chapter 21 (Indigenous Fisheries).



Land and resource use metrics generated through spatial analysis have also been used to describe the existing environment. Geospatial data were plotted using Geographic Information Systems (GIS) software to determine the spatial distribution and nature of overlapping land uses within the Project spatial boundaries, as identified in Figure 20.1. By using GIS overlay mapping, the following information on land uses occurring in the vicinity of the Project was quantified:

- The number of buildings in the LAA (e.g., residences, educational/religious buildings)
- The municipalities, local service districts, and planning areas in the LAA and RAA
- The number and/or area of provincial forests, wildlife management units (Bear / Caribou / Moose), provincial Crown lands, conservation lands, ecological reserves, and protected area lands in the LAA and RAA
- The number of agricultural areas of interest in the LAA and RAA
- The number and/or area of recreational use areas (e.g., campgrounds, lodges, recreational sites, canoe routes, hiking trails, ATV trails, snowmobile trails) in the LAA and RAA
- The number and/or area of Forest Management Districts (FMDs), research and monitoring sites and domestic wood harvesting in the LAA and RAA
- The number and/or area of mineral dispositions (e.g., mining claims, mineral leases, quarry leases, quarry permits, mining areas, aggregate resources) in the RAA
- The number and/or extent of onshore petroleum exploration areas in the LAA and RAA
- The extent of potential Project interaction with traplines and outfitters in the LAA and RAA
- The extent of game hunting areas and game bird hunting zones in the LAA and RAA
- The extent of potential Project interaction with sport fished lakes in the LAA and RAA
- The number of public protected water supply areas (PPWSA) and water supply infrastructure in the LAA and RAA
- Hydro and power infrastructure within the LAA and RAA

Questionnaires were conducted with representatives from the outfitter sector to supplement baseline information (e.g., important sites, usage, and types of activities). An interview guide was developed to gather information from the outfitters (Appendix 4-D). WEGH2 also received Project-specific comments that were compiled from various government departments for consideration.

20.2.2 Existing Conditions

Although the RAA is primarily rural in nature, with a dispersed low-density population, it contains several small communities and sensitive receptors and supports a variety of land and resource uses, including designated land and resource use, commercial and industrial land and resource use, and recreational and subsistence land and resource use. Project activities and components can interact with existing land and resource uses in the RAA, particularly in the Project Area and LAA.



Designated land use includes lands within the RAA, LAA and Project Area that have defined uses as per provincial and municipal regulations and may be subject to property rights or interests. These areas include municipal planning areas and town boundaries, provincial crown land, protected water supply areas and water supply infrastructure, protected conservation areas, and wildlife management areas. A description of these areas and their overlap with the RAA, LAA and/or Project Area are discussed in Section 20.2.2.1.

Commercial / industrial resource use describes how the land in the RAA, LAA and Project Area is currently used for commercial and industrial resource extraction, including mining and quarrying, petroleum exploration and development, forestry, agriculture, and hydro and electrical infrastructure. Section 20.2.2.2 provides a discussion of these activities and the level to which these activities occur in the RAA, LAA and/or Project Area.

Recreational / subsistence LRU includes sport and leisure activities in which people take part on the land within the RAA, LAA and Project Area (e.g., hiking, hunting, trapping, fishing, domestic wood harvesting, snowmobiling, canoeing/kayaking, and outfitting/tourism operation). Section 20.2.2.3 describes the various landscapes within the spatial boundaries of the Project and the recreational activities in which people participate within and around those areas.

Further information regarding designated land use, commercial / industrial resource use, and recreational / subsistence LRU is provided in the Socio-economic Environment and Land and Resource Use Baseline Study (Appendix BSA-4) and the Aquatic Environment Baseline Study (Appendix BSA-2).

20.2.2.1 Designated Lands

Land and Property Ownership

Port au Port and Codroy wind farms are located on provincially owned Crown land. The transmission lines for the Project will intersect Crown lands and private lands. The properties / lands on which Project activities and components will occur at the Port of Stephenville are privately owned by WEGH2 and the Town of Stephenville, with the exception of certain property / lands which are held by private landowners and the Newfoundland and Labrador Housing Corporation. WEGH2 is in consultation with these property / landowners. Some members of the public have expressed concern about the use of Crown lands for the Project, particularly on the Port au Port Peninsula.

In addition to provincial Crown lands and private lands, the RAA also encompasses several federal buildings and other federal properties (Stantec 2023b). A portion of the Project Area overlaps a parcel of federally owned Crown land in Port au Port East that is managed by PSPC and is associated with the former Pinetree Line network of radar stations. Federal contaminated sites are located on land that is owned or leased by the federal government, or on land where the federal government has accepted responsibility for the contamination (Government of Canada 2022). There are six sites located within the Project Area. Within the Project Area, three of the federal contaminated sites are in Port Harmon at the DFO Stephenville Base, two are located at the Pinetree Radar Site, and one is located at the DFO Gravels site in Port au Port East (Government of Canada 2022). There are 142 federal contaminated sites within the RAA, including 54 sites that overlap the LAA (Government of Canada 2022).



Designated Lands and Parks

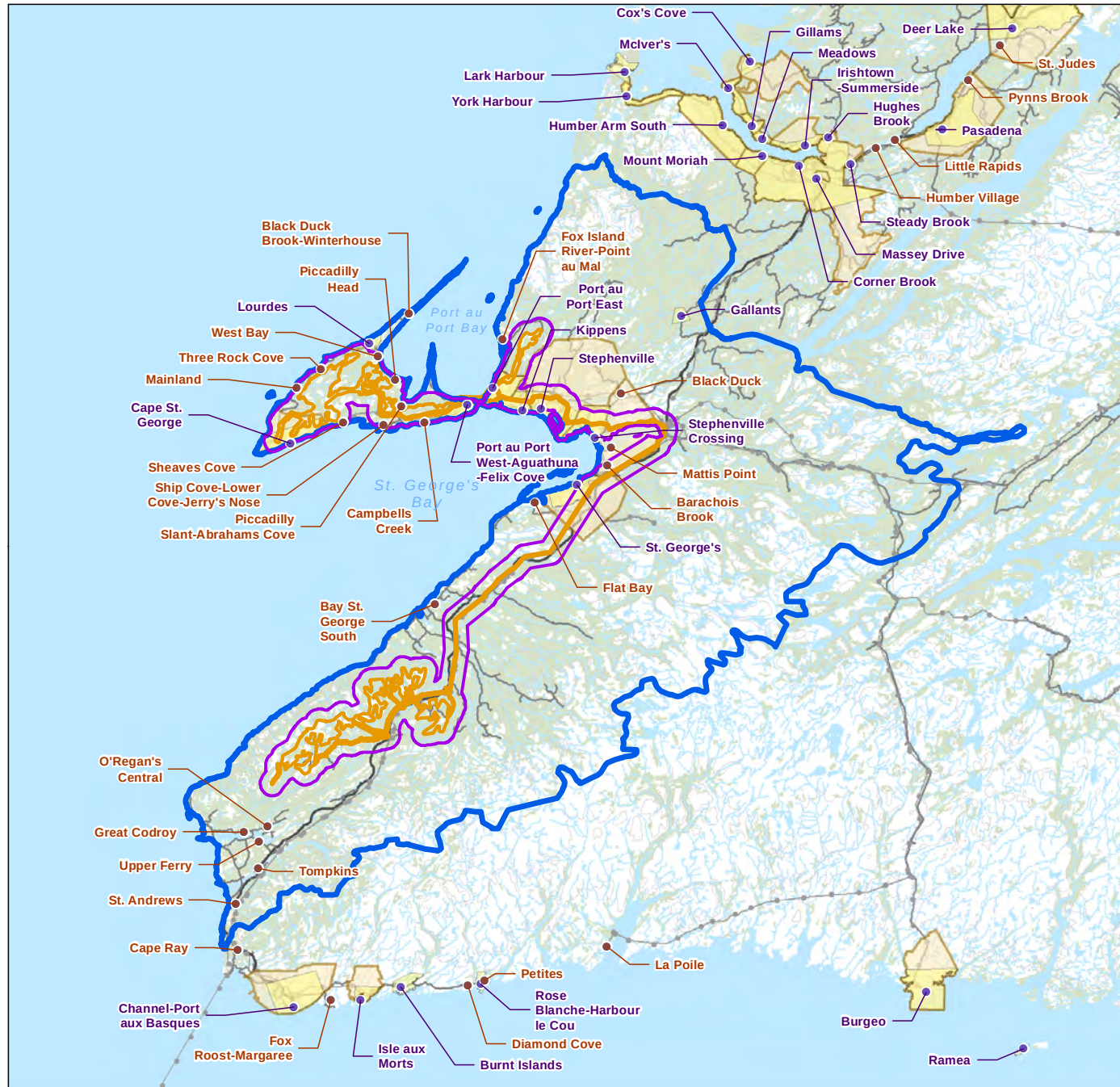
Designated lands within the RAA include municipal planning areas, protected roads, and provincially owned Crown lands that are designated for various purposes, such as wind energy reserve lands as well as provincial parks and protected areas and wildlife management areas. The Nature Conservancy of Canada (NCC) protects land within designated nature reserves on private property, including within the RAA. Chapter 16 (Areas of Conservation Concern) provides further details on parks and reserves.

Municipal Land Use

The RAA encompasses seven municipalities that are associated with the following towns: the Town of Cape St. George, the Town of Port au Port West-Aguathuna-Felix Cove, the Town of Port au Port East, the Town of Kippens, the Town of Stephenville, the Town of Stephenville Crossing, and the Town of St. George's (Figure 20.2). Each of these towns was continued or incorporated, by order, under the *Municipalities Act, 1999* and is the subject of a municipal plan registered under the URPA. In addition to generic Development Regulations, which are broadly applicable to each planning area registered under the URPA, the respective Councils for each of these seven municipalities in the RAA have also approved municipality-specific Development Regulations. Applicable development plan and zoning controls are outlined in the Socio-economic Environment and Land and Resource Use Baseline Study (Appendix BSA-4).

Within the Town of Cape St. George Municipal Planning Area (Town of Cape St. George 2013a), wind turbines and transmission cables will be placed in the Environmental Protection (EP) Zone, Rural Use (RU) Zone and Protected Public Water Supply (PPWS) Zone. Schedule B of the Town's Development Regulations defines Utilities as: windmills, wind turbines, solar, and other energy sources not classed as a Public Utility under the *Public Utilities Act* (Town of Cape St. George 2013b). These Development Regulations classify Utilities as a Discretionary Use in the RU Zone, EP Zone, and the PPWS Zone. Development in the RU Zone is to be approved by the Department of Government Services and Department of Natural Resources prior to permit issuance as per Condition 1: Development Standards of the RU Zone. Development in the EP Zone is subject to the approval of the Department of Environment and Conservation as well as the Authority (Town). Prior to permit issuance, the Authority and appropriate agencies are required to determine that the development will not negatively affect the rare plants sites as indicated on Land Use Zoning Map 1. As per Condition 1, General Conditions and Referrals, development in the PPWS Zone is subject to the approval of the Minister of Environment and Conservation. The application(s) in each Zone must be processed as a Discretionary Use and approved by council prior to permit issuance. Discretionary Use Application(s) must be submitted and advertised as per Section 83 and 23 of the Development Regulations (Town of Cape St. George 2013b).





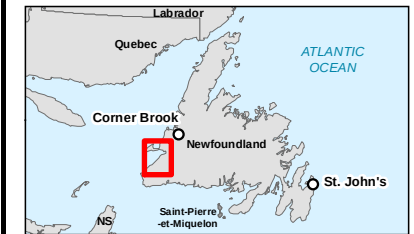
- Local Service District
- Municipality
- Municipal Boundary
- Municipal Planning Area
- Local Assessment Area
- Regional Assessment Area
- Proposed Project Features
- Other Features
- Transmission Line, Existing
- Trans-Canada Highway
- Road / Highway
- Contour (100 m)
- Watercourse
- Waterbody
- Forested Area



0 10 20 km
(At original document size of 8.5x11)
1:1,100,000

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCan, CanVec, OpenStreetMap
3. Background: NRCan, CanVec



Project Location: Stephenville, NL
Prepared by MB/NW/AC on 2023-07-25
QR by AW on 2023-07-18
IR by BK on 2023-07-28

Client/Project: World Energy GH2
Project Nujo/yonik: 121417233_049b

Figure No.

20.2

Title

Municipal Boundaries and Planning Areas in the RAA

Within the Town of Kippens Planning Area, the high voltage transmission line will pass through the municipality abutting an existing transmission line. According to the Town of Kippens Future Land Use Map, the proposed route of the transmission line is located in the Rural Zone. The Town of Kippens Development Regulations, 2011 Schedule C - Rural Use Zone Table classifies Utilities as a Discretionary Use Class, reflecting Municipal Plan Policy 4.5. Development of transmission lines must be processed as a Discretionary Use, approved by council as per Section 24 and 98 of the Town's Development Regulations. As per Condition 1 Development Standards of the Town's Development Regulations, 2011 Schedule C-Rural, development in the Rural Zone shall be approved by the Department of Government Services, Department of Natural Resources, and other agencies or departments as required before a permit is issued by the Town (Town of Kippens 2011a, b).

The high voltage transmission line will pass through the Town of Port au Port East Municipal Planning Area (municipality) abutting an existing transmission line and transition via a proposed substation to a high-voltage underground transmission line. Subject to Municipal Plan Policy B.2.6 and Development Regulations Section E.2 Use Zone Regulations, proposed transmission lines and substations are permitted in every use zone subject to an application being made by the proponent and permit issued by the Authority (i.e., municipality) (Town of Port Au Port East 2022a, b).

The high voltage underground transmission line will pass through the Town of Port au Port West-Aguathuna-Felix Cove Municipal Planning Area (municipality) abutting an existing transmission line and transition to a high-voltage transmission line via a proposed substation. Appendix C of the Development Regulations Use Group - Utilities includes the terms (undefined) Commercial Wind Farm and Power as examples of Public Utilities (defined). Within the Municipal Planning Area, the high voltage transmission line will intersect the Community Development (CD) and RU Zone. A 230 kV Riser Substation (and a transition from overhead to underground lines) will also be in the RU Zone. In the CD Zone Public Utilities inclusive of commercial wind farms and cables are permitted uses. In the RU Zone utilities are permitted uses. As per Section A.1.6 General Prohibitions and Section A 2.1.4 Issuance of Development Permit – Delegated Employee (General Prohibitions) an application must be submitted to the Authority (i.e., municipality) and permit issued prior to works commencing (Town of Port au Port West-Aguathuna-Felix Cove 2019).

The 230 kV transmission line will cross through the Town of Stephenville Crossing Municipal Planning Area. According to the Town of Stephenville Crossing Future Land Use Map, the proposed route of the transmission line is in the Designated Floodway (DF), Designated Floodway Fringe (DFF), EP, Management Unit (MU), Rural (RUR), Town-Rural Residential T-RRES), and Town-Urban (T-URB) Zones (Town of Stephenville Crossing 2021b). Subject to Municipal Plan Policy 6.2.6 and Section 55 of the Town's Development Regulations, 2021, proposed transmission lines are permitted uses in every zone subject to an application being made by the proponent and permit issued by the Authority (Town of Stephenville Crossing 2021a).

The 230 kV transmission line will pass through St. George's Municipal Planning Area. According to the Town of St. George's Future Land Use Map, the proposed route of the transmission line is in the EP, Dribble Brook Protected Water Supply (DBPWS), and Rural (RUR) Zones (Town of St. George's 2020b). Subject to Section 55 of the Town's Development Regulations, 2021, proposed transmission lines are



permitted uses in every zone subject to an application being made by the proponent and permit issued by the Authority. Further as per Section 54 and Section 6.1.11 of the Municipal Plan, any application for development within the Nalcor Corridor is to be submitted to Nalcor for approval before any permit is issued by the Authority (Town of St. George's 2020a).

Development of transmission lines must be permitted by the Town of Stephenville Authority and are allowed in every Zone as per Section 2.1.13 of the Town's Municipal Plan, 2014 on the condition they reflect the definition of Public Utility as defined by the *Public Utilities Act*, 1990, and Schedule C – WPWSA-K of the Town's Development Regulations (Town of Stephenville 2014a, b).

According to the Town of Stephenville's Future Land Use Map, the Hydrogen / Ammonia Facility – Port of Stephenville is located primarily in the Industrial General Zone with a portion of its eastern flank in the Rural Zone. Hazardous Industry is a Discretionary Use in the Industrial General Zone under the Town of Stephenville's Development Regulations, 2014. A Discretionary Use Application must be made to the Town of Stephenville and processed as such under Section 109, 24 and 11 of the Development Regulations and Condition 4 of Schedule C: Use Zone Table – Industrial General Zone. Should the Town of Stephenville Council approve the Discretionary Use Application, a Development Permit must be issued by the Authority before any development commences as defined by the URPA.

Hazardous Industry is not a Permitted Use in the Rural Zone under the Town of Stephenville's Development Regulations, 2014 with the exception of Condition 3 of Schedule C: Use Zone Table – RU Zone (Town of Stephenville 2014a). Should the use be compliant with Condition 3 of Schedule C: Use Zone Table – RU Zone, as determined by the Town's Discretionary Powers under Section 11 of the Development Regulations, the following approvals must be obtained prior to permit issuance: approval by appropriate Provincial agencies and departments, including the Forestry and Agrifoods Agency of the NL Department of Fisheries, Forestry and Agriculture (NLDDFA) and Mines Branch of the NL Department of Industry, Energy and Technology, and Service NL as per Municipal Plan Policy 3.8 (Town of Stephenville 2014b).

Should the use not be compliant with Condition 3 of Schedule C: Use Zone Table – RU Zone, as per Section 11 of the Development Regulations, (e.g., which provides that general industry shall be restricted to, amongst other uses, uses involving hazardous substances), the land must be rezoned to allow the subject use as either a permitted or discretionary use. Alternatively, the facility footprint can be altered so that elements are solely within the Industrial General Designation. A Permit must be obtained before any work commences in both the Industrial General and Rural Zone.

Public Protected Water Supply Areas and Water Supply Infrastructure

Two Proposed Indirect Land Use Changes (ILUC) Protected Surfacewater Legal Boundaries (i.e., Cape St. George, Rouzes Brook, and Cointres Brook) are located within the Project Area near the Port au Port Wind Farm, encompassing 4.3 km². There are four intersections of Public Protected Water Supply Areas (PPWSAs) by the transmission line RoW (i.e., Protected Groundwater Zones) at Port au Port East and in the Stephenville area. The total Project Area overlap between the transmission line RoW and these areas is 2.2 km². Project road construction is not planned for within the RoW corridor; however, the length of the



RoW within the PPWSA boundaries is 6.5 km. No PPWSAs are intersected by the Codroy Wind Farm or occur in the vicinity of the hydrogen/ammonia facility.

The Terrestrial LAA / RAA intersects 79 water intakes or wellheads, as well as 96 public water supplies (i.e., wells, brooks, and watersheds). Four occurrences of ILUC Water Supplies intersect with the Terrestrial LAA / RAA at Rouzes Brook (Cape St. George), Caribou Brook (Mainland), #3 Well Robinson's (Gales) (Bay St. George South), and Cointres Brook (Cape St. George) (Government of NL 2023).

Protected Roads

Protected roads are designated under the URPA, as a means of controlling development alongside the protected road and are subject to the *Protected Road Zoning Regulations* under the URPA. There are several designated protected roads within the RAA (NLMPA n.d.): Route 1 (Trans-Canada Highway) connects Channel-Port aux Basques to Corner Brook; Route 460 (Port au Port Highway); Route 480 (Burgeo Highway); and Route 490 (St. George's Highway). There are no designated protected roads on the Port au Port Peninsula.

Protected Road Zoning Plans are currently in place for a portion of Route 1 (i.e., between Channel-Port aux Basques and Corner Brook) and for Route 480 (NLMPA n.d.). Route 460 and Route 490 do not currently have Protected Road Zoning Plans in place; these roads are subject to Stephenville Crossing Development Regulations since they overlap with the municipal planning area for the Town of Stephenville Crossing.

The Project Area overlaps approximately 11 km of Route 1, approximately 1 km of Route 460, and approximately 4 km of Route 490.

Provincial Crown Lands

The RAA, LAA, and Project Area are mainly comprised of provincially owned Crown land. Occupied Crown lands within the RAA include areas that are leased, licensed to occupy, or subject to license to occupy applications for cabins, outfitting lodges, and outfitting satellite camps. Recreational cabin use is permitted on Crown land through the acquisition of a grant in rural areas that are accessible by a road and where no conflicting land uses exist, or in areas without road access that have been designated by the Crown Lands Division for recreational cabin development. Cabin use is also permitted through Remote Recreational Cottage Licenses to Occupy in remote areas that are not accessible by conventional motor vehicle and where there is no conflicting land use.

The Crabbes River Cottage Development Plan was approved by the Lands Management Division in 2002; the associated Cottage Planning Area overlaps the LAA and Project Area and is subject to surface-level restrictions that may prevent development (Government of NL n.d.[a]).

There are 22 outfitters operating on Crown lands within the RAA. One outfitter can have multiple lodges or other facilities. Five outfitter lodges / facilities are located within the LAA, and two outfitter lodges / facilities are located within the Project Area.



Protected Areas

Four provincially managed protected areas overlap the RAA: Barachois Pond Provincial Park, Grand Codroy Provincial Park, Codroy Valley Provincial Park, and the T'Railway Provincial Park (Figure 20.3). There is one existing ecological reserve within the RAA (i.e., Little Grand Lake Provisional Ecological Reserve) as well as several proposed protected areas that are currently in the process of becoming ecological and transitional reserves (i.e., Barachois South Proposed Ecological Reserve, Cape John Proposed Ecological Reserve, Bras Mort Bog Proposed Ecological Reserve, Eastern Tolt Proposed Ecological Reserve, Barachois South Transitional Reserve, and Cape St. George Transitional Reserve).

Portions of the Project Area and/or LAA overlap with the following provincial parks and reserves:

- The existing Barachois Pond Provincial Park and the existing T'Railway Provincial Park
- Proposed Cape St. George Transitional Reserve (Port au Port Wind Farm)
- Proposed Cape John Ecological Reserve (Codroy wind farm)
- Proposed Bras Mort Bog Ecological Reserve near Stephenville Crossing (Stantec 2023b).

Project activities and components within these areas may be subject to permitting implications, including Crown land leasing requirements and associated restrictions. Further detail on protected areas is provided in Chapter 16 – Areas of Conservation Concern.

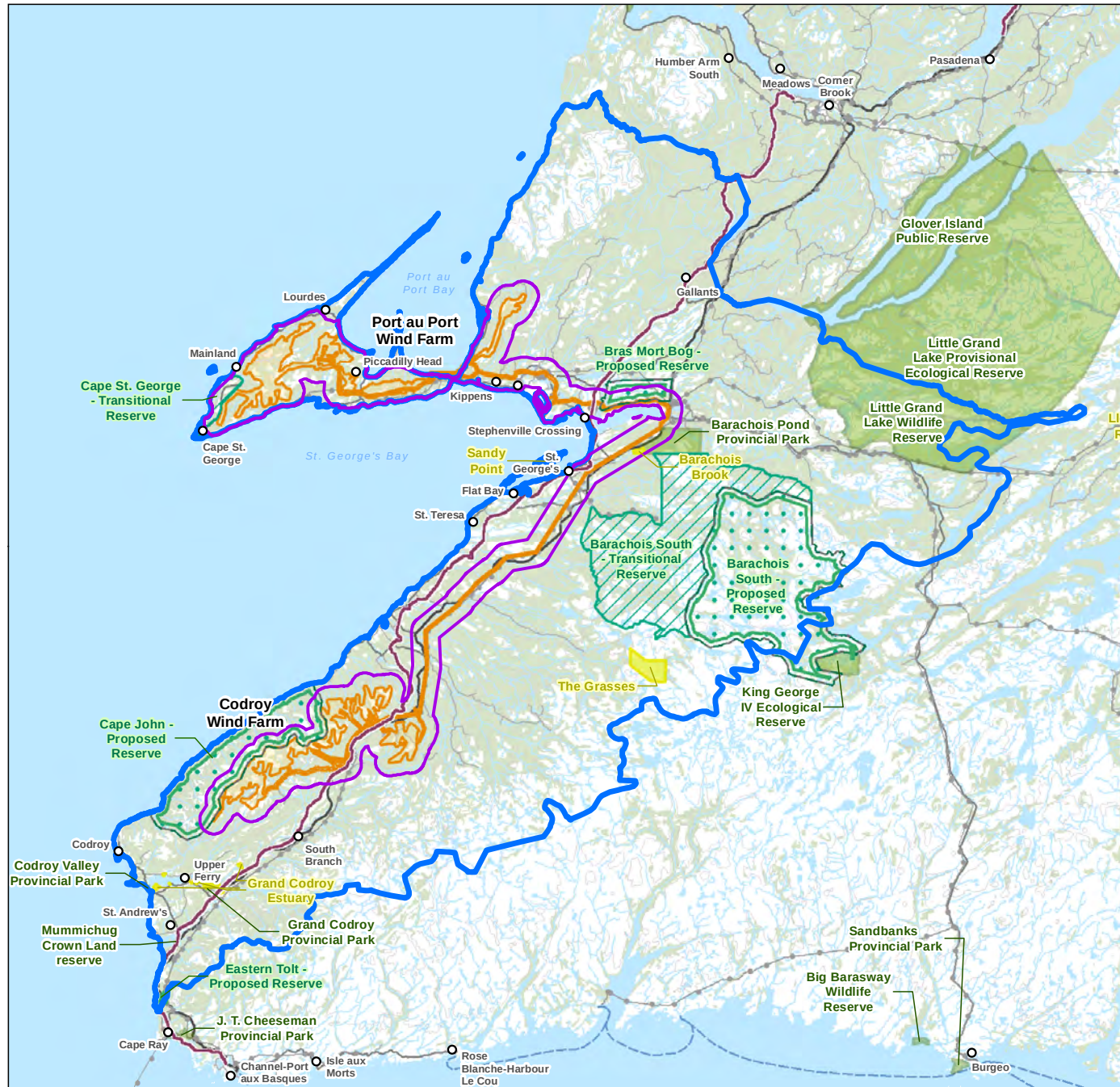
Private Nature Reserves

In addition to the existing and proposed provincially managed protected areas within the RAA, there are currently four NCC nature reserves that overlap the RAA (Stantec 2023b): Barachois Brook, Grand Codroy Estuary, Sandy Point, and The Grasses (Figure 20.3). NCC secured the lands for these nature reserves through purchase or donation; the titles to the lands have been transferred to NCC (NCC 2023). Further detail on private nature reserves is provided in Chapter 16 – Areas of Conservation Concern.

Wildlife Management Areas

Hunting and trapping are regulated by the Wildlife Division of the NLDFFA, which is responsible for managing and conserving NL's biodiversity and wildlife resources (NLDFFA n.d.[a]), in accordance with the provincial *Wild Life Act* and associated Wild Life Regulations. Several wildlife management areas spatially overlap with the RAA, LAA, and Project Area (Appendix BSA-4). The Project Area overlaps nine of the 19 traplines in Fur Zone 9 and 11 of the 27 traplines in Fur Zone 10 but does not overlap any traplines in Fur Zone 7 (Figure 20.4; Stantec 2023b).





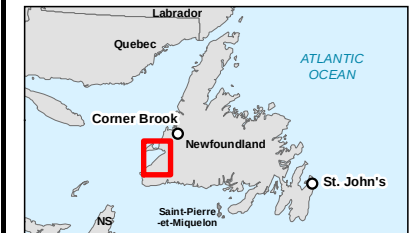
- T'Railway - Provincial Park - Nature Conservancy of Canada Nature Reserve - Proposed Reserve - Transitional Reserve - Provincial Protected Areas - Local Assessment Area - Regional Assessment Area	- Project Area - Other Features - Transmission Line, Existing - Trans Canada Highway - Other Highway - Arterial / Collector - Ferry Route - Contour (100 m) - Watercourse - Waterbody - Forested Area



0 10 20 km
(At original document size of 8.5x11)
1:950,000

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2
3. Background: NRCAN, CanVec



Project Location: Stephenville, NL
Prepared by: MB/NW/AC on 2023-07-25
QR by AW on 2023-07-18
IR by BK on 2023-07-28

Client/Project: 121417233_063

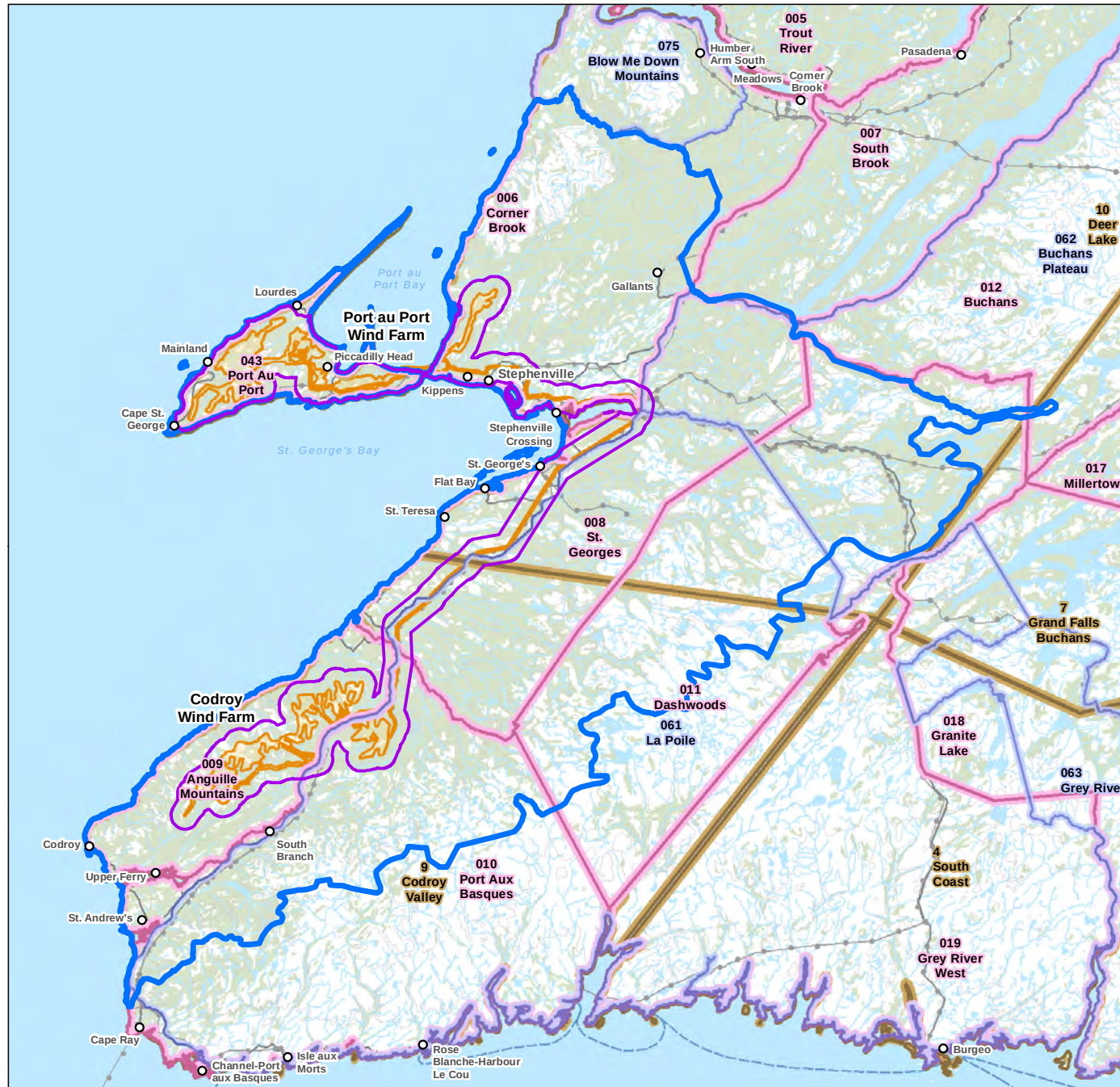
World Energy GH2
Project Nujia'qonik

Figure No.

20.3

Title

Provincial Parks, Provincial Reserves, and Private Reserves in the RAA



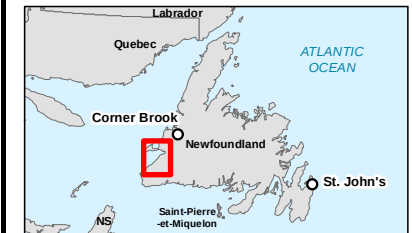
 Local Assessment Area	Proposed Project Features
 Regional Assessment Area	 Project Area
Wildlife Management Areas	Other Features
 Caribou	 Transmission Line, Existing
 Moose and Black Bear	 Trans-Canada Highway
 Fur Zone	 Other Highway
	 Ferry Route
	 Contour (100 m)
	 Watercourse
	 Waterbody
	 Forested Area



0 10 20 km
(At original document size of 8.5x11)
1:950,000

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2
3. Background: NRCan, CanVec



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IR by BK on 2023-07-28

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Project Nujo'qonik: 121417233_062

Figure No.

20.4

Title

Wildlife Management Areas in the Regional Assessment Area

20.2.2.2 Commercial and Industrial Resource Use

Current and historical commercial and industrial LRU within the RAA, LAA, and/or Project Area include:

- tenured Crown lands for mining, quarrying, petroleum development, and associated exploration activities, potentially including mining and petroleum production leases
- commercial forestry lands, including tenured Crown lands held by Corner Brook Pulp and Paper
- agricultural areas of interest on Crown land

Mining, Quarrying, Mineral and Petroleum Exploration

There are 46 mineral commodities known to be present within the RAA (NLDIET n.d.). There are also two producing mines within the RAA: a limestone and dolomite mine operated by CEMEX (formerly Atlantic Minerals Ltd.) on the Port au Port Peninsula and a gypsum mine operated by Atlas Salt Inc. (formerly Red Moon Resources Inc.) in Flat Bay (Stantec 2023b).

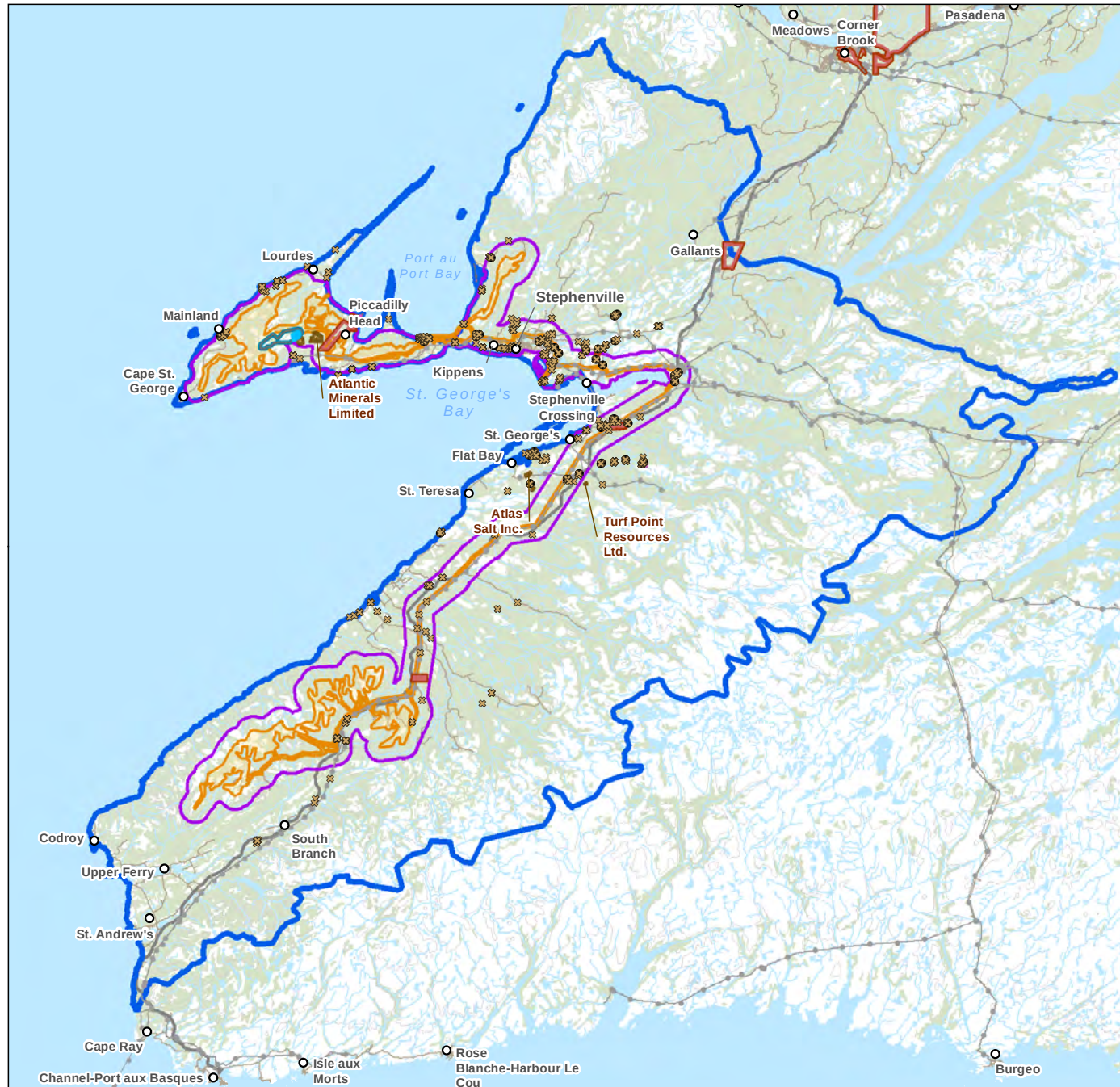
There are also a small number of existing mining leases in and around the RAA. This includes mining leases on the Port au Port Peninsula associated with CEMEX, mineral tenure impost land on the Port au Port Peninsula associated with Dallard Management Inc., and three parcels of mineral tenure impost land in and around (i.e., to the northeast and southeast of) Stephenville associated with Westside Asphalt & Concrete Inc. (Figure 20.5) In addition, there are mining leases that were issued to Red Moon Resources Inc. for a producing gypsum mine in Flat Bay that is currently operated by Atlas Salt Inc.¹, as well as a mining lease associated with Turf Point Resources Inc. and its proposed aggregate quarry in Flat Bay (NLDECC 2023) and a mineral tenure impost land associated with Westside Asphalt & Concrete Inc. (Stantec 2023b). Multiple, relatively short duration, commercial quarry permits have been issued to individuals or small local contractors throughout the Port au Port Peninsula, Codroy / Bay St. George South area, in and around the Town of Stephenville and the general RAA (Figure 20.5; NLDIET 2023a). The permits are typically only valid for a short time and are understood to be related to use of local pit run sand and gravel fill for construction activities.

One onshore well, the Garden Hill Port au Port #1 well on the Port au Port Peninsula, was successful in achieving limited hydrocarbon production (Hicks and Owens 2015). One production lease, owned by Enegi Oil Ltd. / Gestion Resources Ltd., occupies approximately 19.5 km² on the western tip of Port au Port Peninsula (NLDIET 2023b); the Project Area overlaps approximately 5.3 km² of this production lease area (Figure 20.6; Stantec 2023b).

Approximately 1,100 km of seismic survey lines have been collected in Western Newfoundland, with concentrations in specific regions including Parsons Pond, Port au Port Peninsula, northern St. George's Bay, and the Deer Lake area lowlands of the upper Humber River (Hinchey et al. 2014).

¹ Red Moon Resources Inc. formally changed its name to Atlas Salt Inc. on September 1, 2021 (Atlas Salt Inc. 2021).





- ✱ Quarry - Archive
- Quarry - Lease or Permit
- Mining Lease
- Impost Land
- Exempt Mineral Land
- Local Assessment Area
- Regional Assessment Area
- Proposed Project Features**
- Project Area
- Other Features**
- Transmission Line, Existing
- Trans-Canada Highway
- Road
- Contour (100 m)
- Watercourse
- Waterbody
- Forested Area

Atlantic Minerals Limited

- Mineral Lease Area
- Expansion Area



0 10 20 km
(At original document size of 8.5x11)
1:900,000

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2; Government of NL Dept. of Fisheries, Forestry and Agriculture; NRC CanVec; OpenStreetMap
3. Background: NRC CanVec



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Client/Project: World Energy GH2
Project Nujio'qonik
121417233_051b

Figure No.
20.5

Title

Mining and Quarrying Resource Use in the Regional Assessment Area



Proposed Project Features

Project Area

Other Features

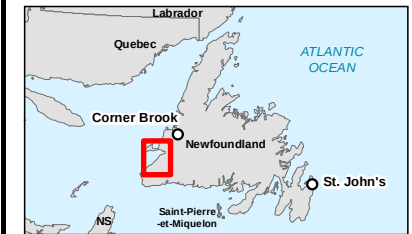
- Transmission Line, Existing
- Trans-Canada Highway
- Road
- Contour (100 m)
- Watercourse
- Waterbody
- Forested Area



0 5 10 km
(At original document size of 8.5x11)
1:520,000

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, GovNL Petroleum Development Mapping Application Hub
3. Background: NRCan, CanVec



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IR by BK on 2023-07-28

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121417233_065

Figure No.
20.6

Title
**Geophysical seismic survey lines,
Western NL**

Forestry

The provincial *Forestry Act* (1990) mandates the Forest Service of Newfoundland and Labrador to manage the forest resources of the province. The province is divided into 24 Forestry Management Districts (FMDs), with 18 in Newfoundland and six in Labrador. To facilitate planning, some districts are combined into Planning Zones (Stantec 2023b). The RAA encompasses FMDs 14 and 15, which are located within Planning Zone 6 (Zone 6) in southwestern Newfoundland (Stantec 2023b). Major towns located within Zone 6 include Deer Lake, Pasadena, Corner Brook, Stephenville, Port aux Basques and Burgeo. The Project Area is located entirely within FMD 14 of Zone 6. Overall, the landscape in Zone 6 has approximately 45% productive forest (NLDFLR 2018).

The provincial Crown and Corner Brook Pulp and Paper Limited (CBPPL) are the two major forestry land tenure holders within Planning Zone 6 (30% and 70% of land area respectively) (Stantec 2023b). Most of these licenses are due to expire in 2037. The productive forest breakdown for the zone is approximately 50% for each tenure holder (Figure 20.7). In FMD 14, the Crown controls 92% of the total land area and 63% of the productive forest. This is mainly due to the large area of unmapped Crown land on the south coast (NLDFLR 2018). Details on forestry management plans and domestic cutting permits for these lands are provided in Section 4.3.3.2 of the Socio-economic Environment and Land and Resource Use Baseline Study (Appendix BSA-4).

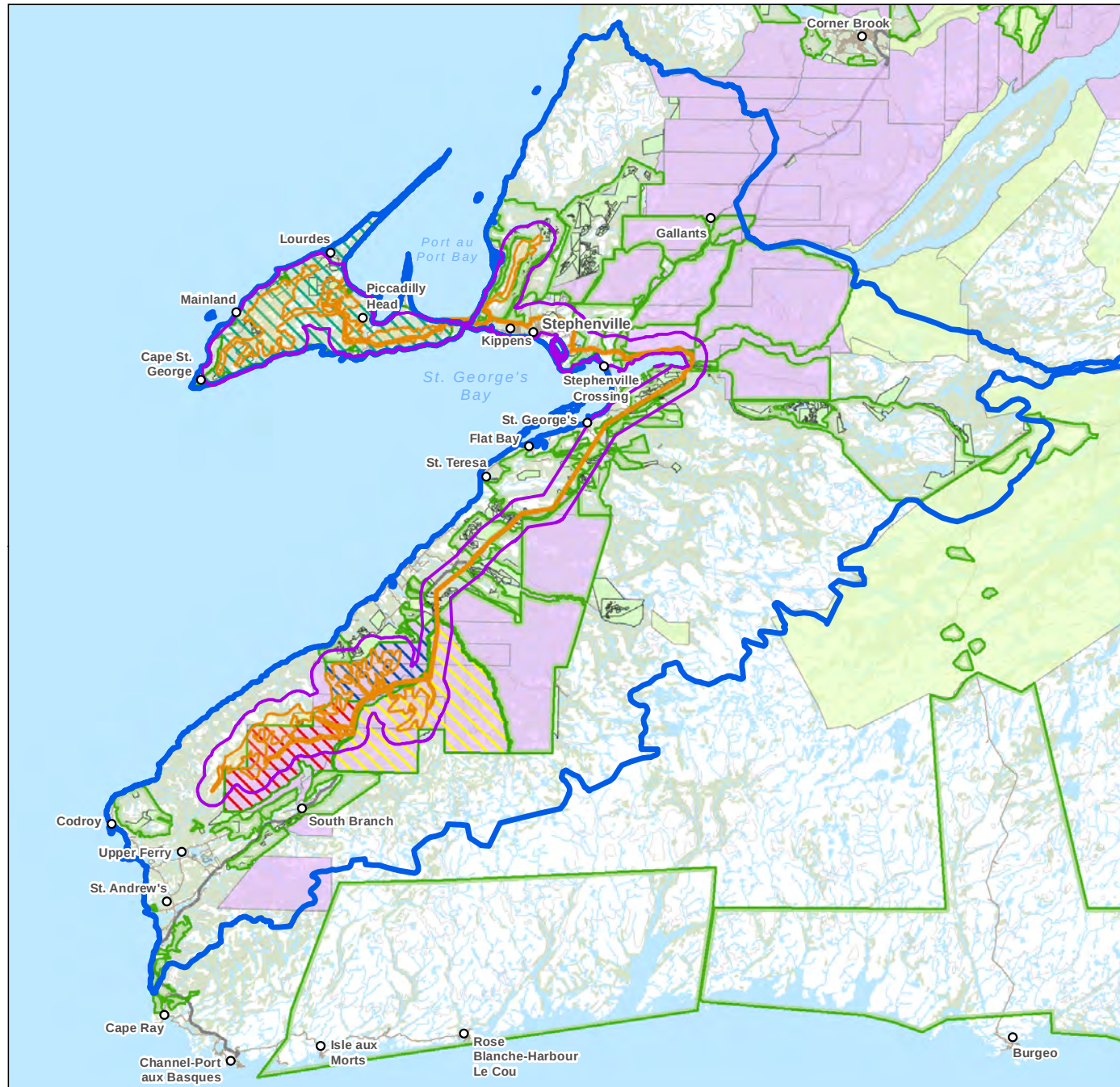
Agriculture

Approximately 5% of soils in the province of NL are suitable for agriculture (Kruger 2018). There are approximately 80-100 farms in Forestry Planning Zone 6 (Kruger 2018), which encompasses the RAA for the Project and extends beyond the RAA to the north and east. Within the RAA, there are several plots of provincially owned Crown land designated for agricultural purposes (Figure 20.8). These areas are advertised by the Agriculture and Lands Branch of NLDFFA for farmers to apply for a lease and use the land as an Agricultural Crown Land Lease (NLDFFA n.d.[a]). There are currently nine Agricultural Areas of Interest (AAOIs) available for application in the vicinity of Stephenville and the Anguille Mountains (Appendix BSA-4). There are no plots of land designated for agriculture purposes on the Port au Port Peninsula (Stantec 2023b).

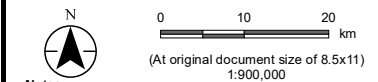
Hydro and Electrical Infrastructure

The Newfoundland generation and transmission system is currently made up of eleven hydroelectric plants, one thermal generating station, four gas turbines, and 25 diesel plants generating electricity, along with 54 high-voltage terminal stations, 25 lower-voltage substations, and thousands of kilometres of transmission and distribution lines across the province. The Project Area includes NL Hydro-owned 230 kV transmission equipment running in and out of Bottom Brook and on to Stephenville, 138 kV and $\pm 350 / \pm 200$ kV HVdc transmission equipment to the south near Codroy, and Newfoundland Power 69 kV transmission equipment near Port au Port, Stephenville, Bottom Brook, and southwest towards Codroy. Many of these locations also include medium voltage and/or low voltage distribution as well. Along with these transmission lines, there are associated terminal stations used for switching operations, or stepping up/down the voltage. In addition to the transmission infrastructure, the Project Area contains gas turbine generation in Stephenville, an electrode station at Indian Head, and a converter station near Bottom Brook.

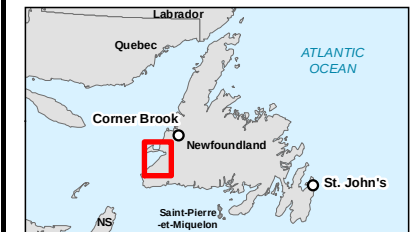




- Crown Land; Development-Lands; Private - Corner Brook Pulp and Paper (CBPPL) Timber Limits - Silviculture; Silviculture Roadside Clearing - Forestry - Crown Reserve - Domestic Harvest Area	- Local Assessment Area - Regional Assessment Area
- C1401-Port au Port - K1449-Round Valley - K1450-Morris Brook - K1451-Bauld Mountain - All Other	- Proposed Project Features - Project Area - Other Features - Trans-Canada Highway - Road - Contour (100 m) - Watercourse - Waterbody - Forested Area



- Notes**
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
 2. Data Sources: World Energy GH2; Government of NL Dept. of Fisheries, Forestry and Agriculture; NRCAN CanVec; OpenStreetMap
 3. Background: NRCAN CanVec Province of Newfoundland and Labrador

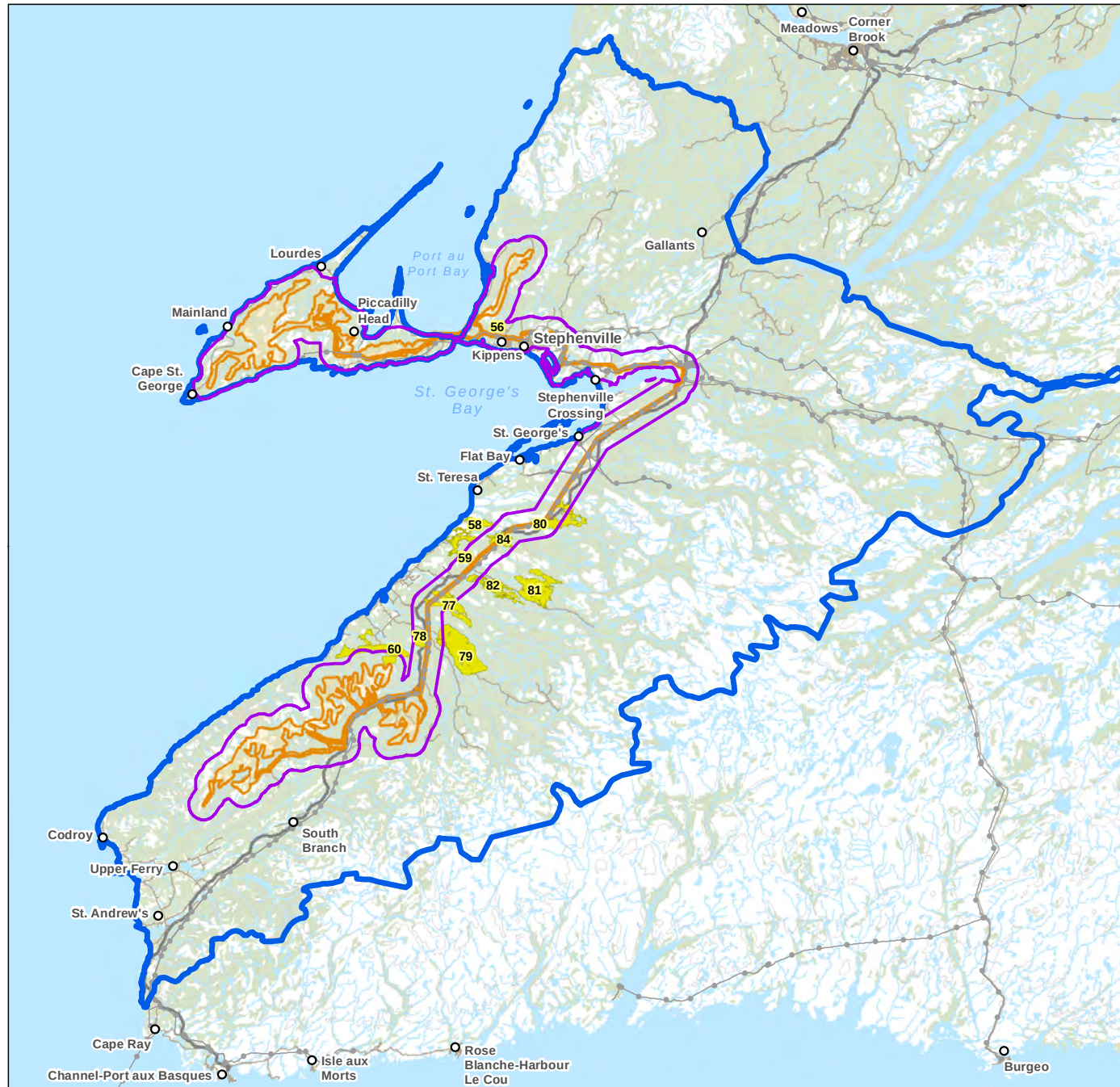


Project Location: Stephenville, NL
Prepared by MB/AC on 2023-07-25
QR by AW on 2023-07-19
IR by BK on 2023-07-28

Client/Project: 121417233_051a
World Energy GH2
Project Nujlo'qonik

Figure No.: 20.7
Title:

Forestry Use in the Regional Assessment Area



Agricultural Area of Interest	Other Features
Local Assessment Area	Transmission Line, Existing
Regional Assessment Area	Trans-Canada Highway
	Road
Proposed Project Features	Contour (100 m)
Project Area	Watercourse
	Waterbody
	Forested Area



0 10 20 km
(At original document size of 8.5x11)
1:900,000

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2; Government of NL Dept. of Fisheries, Forestry and Agriculture; NRC CanVec; OpenStreetMap
3. Background: NRC CanVec



Project Location: Stephenville, NL
Prepared by NW/AC on 2023-07-25
QR by AW on 2023-07-18
IR by BK on 2023-07-28

Client/Project: 121417233_051c
World Energy GH2
Project Nujio'qonik

Figure No.
20.8

Title

Agricultural Areas of Interest in the Regional Assessment Area

20.2.2.3 Recreational and Subsistence Land and Resource Use

Recreational and subsistence LRU activities within the RAA are widespread and diverse and have potential to occur in the Project Area and LAA. Commercial tourism (i.e., outfitting) and hunting, trapping, angling, and domestic wood harvesting are described in this section due to their substantial overlap with the recreational and subsistence aspects of land and resource use.

Recreational Activities

LRU Survey results regarding recreational activities in and around Port au Port Peninsula, Codroy, and Stephenville, respectively are summarized below.

Recreational Activities in and Around the Port au Port Peninsula

Walking / hiking was the most common recreational activity identified for Port au Port Peninsula area by survey participants. Other common recreational activities in and around the Port au Port Peninsula, as identified by survey participants, include ATV use or other touring, camping, snowmobiling, snowshoeing, bird watching, whale watching, swimming, boating, and canoeing / kayaking. Running / jogging, cycling, cross-country skiing, and skating were also reported. "Other" recreational activities undertaken in or around the Port au Port Peninsula that were not listed as options in the survey, and were instead submitted in open-ended responses by survey participants, include driving to restaurants, scenic activities and sightseeing, hunting, fishing, photography, visiting / picnicking / having fires at the beach, picking berries, harvesting shellfish (mussels, clams), collecting sea glass and shells on the beach, guiding tourists, harvesting medicinal plants and other foraging activities, spiritual rituals and meditation (e.g., forest bathing), connecting with nature, snorkelling, star gazing, firewood collection, motorcycling, and rock / mineral / fossil identification, collection, and preservation (Stantec 2023a).

Recreational Activities in and Around Codroy

Walking / hiking was the most common recreational activity identified for the Codroy area by survey participants. Other common recreational activities in or around Codroy, as identified by survey participants, include camping, ATV use or other touring, camping, snowmobiling, swimming, bird watching, snowshoeing, canoeing / kayaking, and boating (motor). Cycling, whale watching, running / jogging, and skating were also reported. "Other" recreational activities undertaken in or around Codroy that were not listed as options in the survey and were instead submitted in open-ended responses by survey participants, include berry picking / foraging, hunting, fishing, gardening, tracking, outfitting tourists, exploring, painting, photography, travelling, geocaching, festivals, and outdoor yoga (Stantec 2023a).

Recreational Activities in and Around Stephenville

Walking / hiking was the most common recreational activity identified for this area by survey participants. Other common recreational activities within or near Stephenville, as identified by survey participants, include ATV use or other touring, camping, snowmobiling, swimming, bird watching, snowshoeing, canoeing / kayaking, cycling, running / jogging, whale watching, boating (motor), and skating. "Other"



recreational activities undertaken in or near Stephenville that were not listed in the survey and were instead submitted in open-ended responses by survey participants, include hunting, berry picking, foraging, fishing, picnicking, golf, sightseeing, photography, cross-country skiing, and beach combing (Stantec 2023a). There is a camping area in Stephenville near the existing Port facilities, Harmon Seaside Park, that offers 100 (approx.) camping sites during the open season from mid-May to first week of October (Harmon Seaside Park 2023).

Tourism

The “Western Region” of NL – which stretches 750 km from Channel-Port aux Basques on the southwest corner to the Viking site of l’Anse aux Meadows at the tip of the Great Northern Peninsula – is categorized as a tourist destination for marketing purposes (NL Tourism n.d.[a]). Popular tourist attractions in the Western Region include the Codroy Valley within the surrounding area (i.e., RAA). Codroy Valley is described as “a haven for birders, nature lovers, adventurers, historians, and travellers alike” due to the presence of the Grand Codroy Estuary Ramsar Site and IBA (refer to Section 4.3.2.4), which can be visited for hiking and bird watching, as well as scenic features in the surrounding area (i.e., RAA) such as dramatic churches standing on cliffs overlooking the ocean, traditional farmlands with grazing Newfoundland ponies, and the lighthouses at Cape Anguille (NL Tourism n.d.[a]). The Project Area itself is not located within the Codroy Valley or in Cape Anguille.

The Western Region of NL also offers a variety of dining, shopping, nightlife, and outdoor adventures and tourist attractions which are located within the RAA (NL Tourism 2023). The provincial parks, nature reserves, and proposed ecological and transitional reserves also serve as potential tourist attractions, as do the hunting and outfitting opportunities, and trails and unique sites.

Tourism operators in NL include CapeRace Newfoundland Adventures Inc., Linkum Tours, Maxxim Vacations, McCarthy’s Party Tours, Miki Enterprises, Newfoundland International Vacation Group, Newfoundland Tours, Platinum Limousine Tours, Rock+Water Stan Cook Travel, Shamasha, and Wildland Tours (NL Tourism 2023).

Hunting, Trapping, Fishing, and Outfitting

Hunting in NL is a valued cultural and/or recreational activity for residents and non-residents, who, as a result, contribute to the province’s wildlife management programs and economy through local spending and the outfitting industry (NLDDFA n.d.[i]). Hunting is regulated by NLDDFA and a licence is required to hunt, take, or kill any wildlife in the province. Non-residents must apply for a licence through outfitting companies for big game hunting as well as possess a non-resident hunting licence (NLDDFA n.d.[b]). Hunting must also take place during open seasons with bag limits in place, depending on the species. Target species for hunting are divided into two categories: big game (moose, caribou, black bear), and small game (e.g., grouse and snowshoe hare).



Big Game

The hunting season for moose varies year to year but generally occurs between mid-September and late December. The 2023-2024 moose quota for the Island of Newfoundland is set to 27,575 licenses, which is 90 licences less compared to 2022-2023 (Government of NL n.d.[b]). This is a result of a decrease in moose quotas within 14 Moose Management Areas (MMAs), none of which are found within the RAA. Moose quotas remained stable from the previous year in five out of the six MMAs within the RAA, apart from MMA 6, which saw an increase by 50. In 2021, success rates for the six MMAs within the RAA were approximately 59% (Government of NL n.d.[c]). The overall moose population on the Island between 2012-2022 has been relatively stable with a population estimate of 110,000 in 2022 (Government of NL n.d.[c]).

The 2023 woodland caribou hunting season is scheduled to take place between mid-September and early December. There are 55 caribou licences issued in total for Caribou Management Area (CMA) 61 and 75 licences for CMA 62 with a bag limit of one caribou per licence (Government of NL n.d.[b]).

For black bear, the bag limit is two per licence in management areas open to hunting (Government of NL n.d.[b]). Hunting on the Island is permitted in either of the designated spring or fall seasons. In 2023, the spring hunting season is set to start early May to mid-July and the fall hunting season will start early September and mid-November. There is also a fall bow hunting season, which begins on August 26 in 2023. Further information on the existing conditions for wildlife in the vicinity of the Project is provided in the Terrestrial Baseline Study.

Less than half of the LRU survey participants indicated that they, or a member of their family, hunt for big game (e.g., moose, bear, caribou) in or around the Port au Port Peninsula, in or around Codroy / Bay St. George South, or near Stephenville. Of these three areas, big game hunting was most commonly reported by survey participants as being conducted in or around Codroy / Bay St. George South (where 48.3% of survey participants indicated that they, or a member of their family, hunt for big game) and least commonly reported near Stephenville (where 35.5% of survey participants indicated that they, or a member of their family, hunt for big game) (Stantec 2023a).

Small Game, Birds and Furbearers

Small game harvesting is considered an important recreational and subsistence activity with up to 35,000 people in the province participating by shooting and snaring (NLDDFA n.d.[c]). Six small game species are currently managed and hunted in NL: snowshoe hare, Arctic hare (hunted in Labrador only), willow ptarmigan, rock ptarmigan, ruffed grouse, and spruce grouse. Management zones for hares, ptarmigan, and grouse are established in the fall of the year when breeding has stopped, and the young have reached adult size. Small game licences are issued for locations that overlap with the Project Area and RAA.

Migratory bird game hunting also occurs in NL, likely including within the RAA, and is permitted in accordance with the *Migratory Birds Hunting Regulations* (ECCC 2023) under the federal *Migratory Birds Convention Act*. Migratory birds that are of interest for hunting include ducks, geese, snipe, and terns. Hunting of migratory birds is managed by the Canadian Wildlife Service of ECCC, and participants



require a valid Migratory Bird Hunting Permit. Since migratory bird hunting occurs primarily along the coast, details pertaining to migratory bird hunting is discussed within the Aquatic Environment Baseline Study – Other Ocean Users (Appendix BSA-2).

A variety of furbearer species that are subject to trapping activity in the province include beaver, muskrat, otter, mink, coyote, fox (coloured and white), lynx, wolf, ermine, and squirrel. Trapping seasons vary, although generally are set from late-October to February (Government of NL n.d.[a]). The RAA overlaps with Fur Zones 7, 9, and 10, which have several trapline zones within each. The RAA also overlaps with Restricted Snaring / Trapping Areas where the use of snaring / trapping devices may be prohibited, depending on the area, to mitigate accidental mortality of American marten (Newfoundland population) in areas of known presence (Government of NL n.d.[b]).

Less than half of the LRU survey participants indicated that they, or a member of their family, hunt and/or trap for small game (e.g., rabbit, partridge, muskrat, fox) in or around the Port au Port Peninsula, in or around Codroy / Bay St. George South, or near Stephenville. Of these three areas, small game hunting was most commonly reported by survey participants as being conducted in or around Codroy / Bay St. George South (where 43.8% of survey participants indicated that they, or a member of their family, hunt and/or trap for small game) and least commonly reported near Stephenville (where approximately 19.5% of survey participants indicated that they, or a member of their family, hunt and/or trap for small game) (Stantec 2023a).

Fishing/Angling

Fishing / angling occurs regularly in the inland waters of the RAA. These activities are regulated federally by DFO, under the federal *Fisheries Act* and associated Newfoundland and Labrador Fishing Regulations, and provincially by NLDDFA, under the *Wild Life Act* and associated Wild Life Regulations. Target species include salmon and trout. Fishing / angling is discussed further in the Aquatic Environment Baseline Study – Other Ocean Users (Appendix BSA-2).

Less than half of the LRU survey participants indicated that they, or a member of their family, catch freshwater fish and/or aquatic species (e.g., trout, salmon, eel) in or around the Port au Port Peninsula, in or around Codroy / Bay St. George South, or near Stephenville. Of these three areas, freshwater fishing / angling was most commonly reported by survey participants as being conducted in or around Codroy / Bay St. George South (where 48.9% of survey participants indicated that they, or a member of their family, catch freshwater fish and/or aquatic species) and least commonly reported near Stephenville (where approximately 27.1% of survey participants indicated that they, or a member of their family, catch freshwater fish and/or aquatic species) (Stantec 2023a).

Outfitting

As described earlier, there are 22 outfitters operating on Crown lands within the RAA (Figure 20.9). One outfitter can have multiple lodges or other facilities. There are a total of 31 outfitter lodges / facilities in the RAA (five of which are located within the LAA, and two of which are located within the Project Area) (Appendix BSA-4).



Six LRU survey participants self-identified as being members of the Newfoundland and Labrador Outfitters Association (NLOA). Every respondent indicated that they participate in recreational activities in or around Codroy / Bay St. George South, while half (50%) indicated that they participate in recreational activities in or around the Port au Port Peninsula, and one-third (33.3%) indicated that they participate in recreational activities in or around Stephenville (Stantec 2023a).

Each one (100%) of the self-identified NLOA members who participated in the survey indicated that they hunt big game (e.g., moose, bear, caribou) in or around Codroy / Bay St. George South, while one-third (33.3%) hunt big game in or around the Port au Port Peninsula and Stephenville, respectively. The self-identified NLOA members indicated that their big game hunting activities are conducted primarily for recreational / food, commercial, and traditional / cultural purposes. One survey participant submitted "tourists outfitting" as an open-ended response indicating their purpose for conducting big game hunting in or around Codroy (Stantec 2023a).

Every one (100%) of the self-identified NLOA members who participated in the survey indicated that they hunt and/or trap small game (e.g., rabbits, partridge, ducks, muskrat, fox) in or around Codroy / Bay St. George South, one-third (33.3%) indicated that they hunt and/or trap small game in or around the Port au Port Peninsula, and one (16.7%) indicated that they hunt and/or trap small game near Stephenville. The self-identified NLOA members indicated that their small game hunting activities are conducted primarily for recreational / food, commercial, and traditional / cultural purposes. "Outfitting" was also submitted by survey participants as an open-ended response indicating their purpose for conducting small game hunting in or around Port au Port Peninsula and Codroy / Bay St. George South (Stantec 2023a).

Every one (100%) of the self-identified NLOA members who participated in the survey indicated that they catch freshwater fish and/or aquatic species (e.g., trout, salmon, eel) in or around Codroy / Bay St. George South, and one-third (33.3%) indicated that they catch freshwater fish and/or aquatic species in or around Stephenville, primarily for recreational / subsistence, commercial, and traditional / cultural purposes. "Outfitting" was also submitted by a survey participant as an open-ended response indicating their purpose for harvesting freshwater fish and/or aquatic species in or around Codroy / Bay St. George South. One (16.7%) of the self-identified NLOA members who participated in the survey indicated that they catch freshwater fish and/or aquatic species in or around the Port au Port Peninsula for recreational / food purposes (Stantec 2023a).

As part of the community and stakeholder engagement process, WEGH2 developed a questionnaire to solicit feedback from outfitters about the Project, as well as to identify their issues, concerns, or inquiries related to the Project. Chapter 4 provides additional information regarding the outfitter questionnaire and the input received from outfitters on key issues and concerns.



Domestic Wood Harvesting

As described in Section 20.2.2.2, the Project Area is located entirely within FMD 14, which is part of Zone 6 (Figure 20.7). Domestic fuelwood and sawlogs are harvested from four main sources in FMD 14: designated domestic cutting blocks on land; cutover clean-up on Crown and industry limits; landing and roadside clean-up on Crown and industry limits; and hardwood harvest on industry limits. There are several designated domestic wood harvesting areas within FMD 14 where Domestic Cutting Permit holders can cut / remove timber for subsistence purposes, including the following domestic cutting blocks in the vicinity of the Port au Port and Codroy wind farms: C1401 Port au Port, K1449 Round Valley, K1450 Morris Brook, and K1451 Bauld Mountain (Stantec 2023b).

Domestic Cutting Permit allocations for FMD 14 and 15 vary from 14.4 m³ to 25 m³ (NLDFLR 2018). Most domestic cutting happens in the winter where harvesting is conducted by chainsaw and access for extraction is achieved using an ATV or snowmobile. Approximately 2,000 domestic cutting permits were issued each year during the last planning period (2014–2018) for FMD 14 (NLDFLR 2018). The volume of softwood and hardwood harvested domestically on Crown land was approximately 143,902 m³ and 21,700 m³, respectively (NLDFLR 2018).

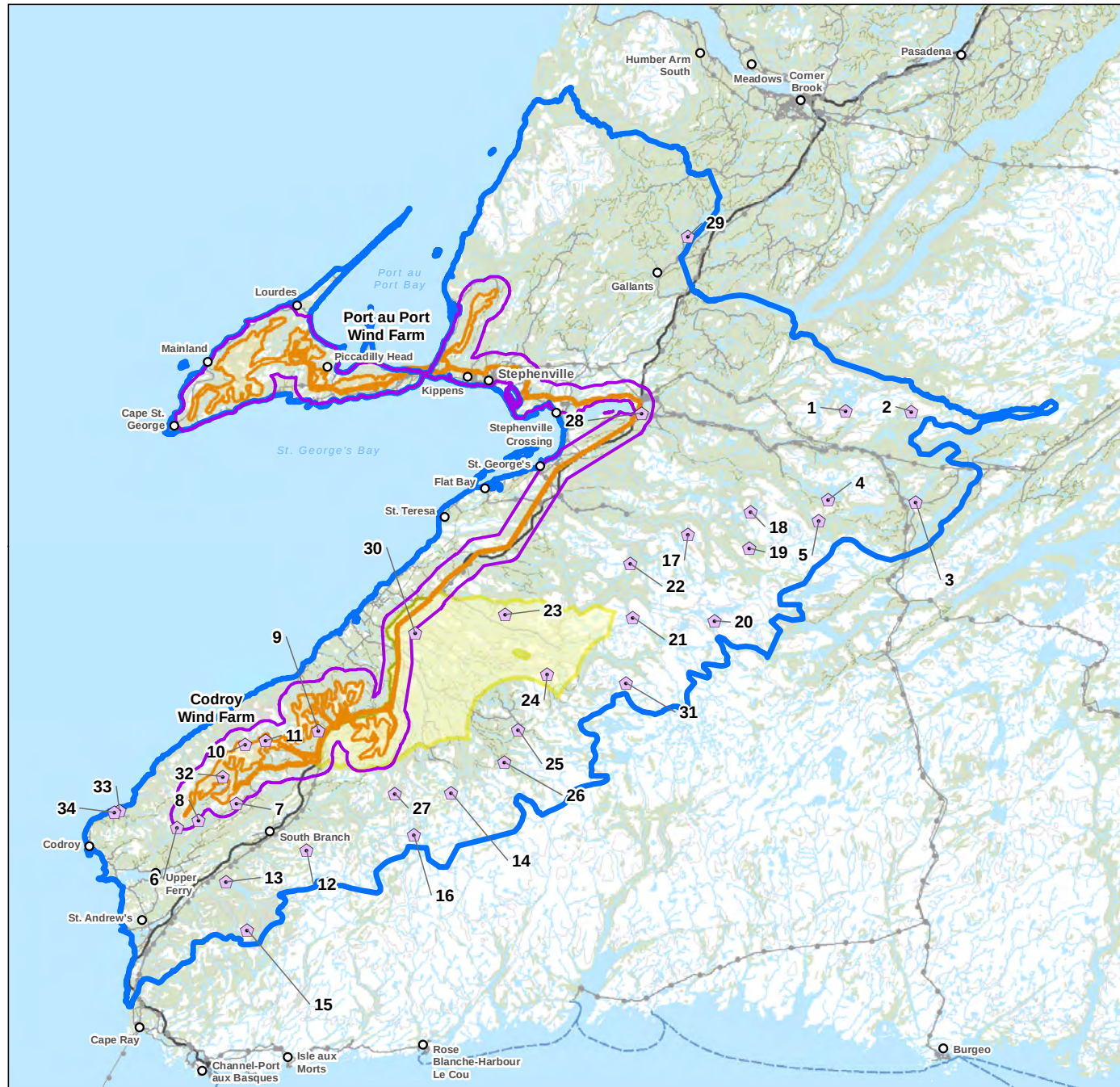
Between 2018–2022, the number of Domestic Cutting Permits issued near the proposed Port au Port Wind Farm ranged from 609 to 759 for the domestic cutting block on the Port au Port Peninsula (G. Carroll, pers. comm, 2023). For domestic cutting blocks near the proposed Codroy wind farm, the number of permits issued between 2018-2022 ranged from 10 to 13 in the Round Valley area, 7 to 28 in the Morris Brook area, and 26 to 56 in the Bauld Mountain area (G. Carroll, pers. comm. 2023).

The three domestic cutting blocks near the Codroy wind farm are located within CBPPL limits; NLDFFA issues domestic permits for hardwoods only in these blocks (G. Carroll, pers. comm, 2023). CBPPL does not manage its land base for domestic harvesting with segregated blocks. Historically, CBPPL issues 100 domestic permits, in each of its Zone 6 tenures, for the harvest on non-commercial hardwood and larch species (Kruger 2018).

Wildberry and/or Wild Plant Harvesting

According to the LRU Survey, almost two-thirds of survey participants pick wild berries and/or harvest other wild plants in or around the Port au Port Peninsula. Less than a quarter of survey respondents indicated that they pick wild berries and/or harvest other wild plants in or around Codroy / Bay St. George South. Half of the respondents indicated that they pick wild berries and/or harvest other wild plants in or around Stephenville. Primary purposes are for recreational/food, traditional/cultural, commercial, and other (i.e., tourism) (Stantec 2023a).



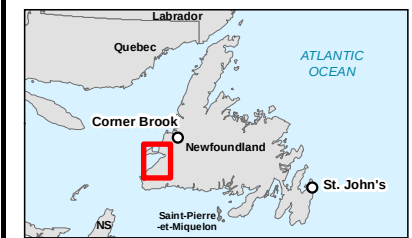


- Outfitter Lodge - Cottage Planning Area - Local Assessment Area - Regional Assessment Area - Proposed Project Features - Project Area	- Other Features - Trans-Canada Highway - Road - Resource Road / Trail - Ferry Route - Contour (100 m) - Watercourse - Waterbody - Forested Area



0 10 20 km
(At original document size of 8.5x11)
1:950,000

- Notes**
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
 2. Data Sources: Outfitters Association of NL; GovNL Fisheries, Forestry and Agriculture Land Use Atlas; World Energy GH2; Stantec.
 3. Background: NRCan, CanVec



Project Location: Stephenville, NL
Prepared by MB on 2023-05-29
QR by AW on 2023-07-19
IR by BK on 2023-07-28

Client/Project: World Energy GH2
Project Nujio'qonik
121417233_064

Figure No.: 20.9

Title: Outfitters in the Regional Assessment Area

Trails and Unique Sites

Other recreational land use activities that may take place at trails and unique sites in the RAA include backcountry camping, hiking, swimming, ATV use, and snowmobiling. Recreational swimming may occur in freshwater and coastal bodies of water in the RAA, including at Benois Beach (near Marches Point on the Port au Port Peninsula), The Bar Beach and Blue Beach (northeast of Black Duck Brook-Winterhouse on the Port au Port Peninsula), Port Harmon Beach (in Stephenville), and Black Banks Beach (in St. George's).

Barachois Pond Provincial Park, which is located approximately 8 km east of Black Banks Beach, is one of the largest and most popular provincial parks in NL; it includes a large lake for swimming, boating, angling, and kayaking (Parks NL n.d.). The Erin Mountain Trail at Barachois Pond Provincial Park offers hikers with varying levels of ability (NL Tourism n.d.[b]). There are also a variety of hiking trails associated with the other provincial parks, nature reserves, and proposed ecological and transitional reserves, including the T'Railway Provincial Park, which provides an approximately 900-km trail system for hikers, bikers, horseback riders, cross-country skiers, ATVs, and snowmobilers (Parks NL n.d.).

A segment of the International Appalachian Trail (IAT 2020) intersects the RAA only. The Newfoundland segment of the IAT extends from Channel-Port aux Basques (outside of the RAA), northeast along the Long-Range Mountains (within the RAA) and ends at L'Anse aux Meadows National Historic Site (outside of the RAA). Adventurous hikers can explore numerous side trails into extremely remote and scenic areas such as the Lewis Hills (within the RAA) and Gros Morne National Park (outside of the RAA) (IAT 2020).

Other trails within the RAA are described in the Land and Resource Use Baseline Study (Stantec 2023b).

Snowmobiling occurs throughout the Island of Newfoundland and is managed by the Newfoundland and Labrador Snowmobile Federation (NLSF), which is the provincial governing body with volunteer clubs across the Island responsible for the maintenance of 3,300 km of trails (NLSF 2020). There are groomed snowmobile trails in the RAA leading to the community of Kippens; around Stephenville, Noels Pond, and Stephenville Crossing; and along the Newfoundland T'Railway corridor (NLSF 2020).

The Port au Port Peninsula presents many scenic views. The French Ancestor's Route is a 161 km scenic drive around the perimeter of the peninsula, which gives tourists access to Felix Cove, Abrahams Cove, Jerry's Nose, Lower Cove, and Sheaves Cove and Hidden Falls.

Landscapes and Viewscapes

The landscape character of an area, and its associated viewscape, can be defined by the basic pattern of landform (topography), vegetation, water features, land use, and development. The following subsections provide an overview of existing visual conditions in and around the portions of the LAA associated with the proposed Port au Port Wind Farm, hydrogen / ammonia plant, Codroy Wind Farm, and high-voltage transmission line corridor. Additional information regarding landscapes and viewscapes is provided separately in the Visual Impact Assessment Study for the Project (Appendix 19-A).



Proposed Port au Port Area Wind Farm

The proposed Port au Port Wind Farm is located within the Western Newfoundland Forest Ecoregion, which includes the Port au Port Subregion. The Port au Port Subregion is dominated by wind-exposed limestone barrens, bedrock, and shallow soils. These have restricted vegetation that have adapted to shallow soil conditions and can survive on the limestone barrens. The Port au Port Peninsula is characterized by hilly lands to the south.

Dominant tree species in the area include balsam fir, yellow birch, red maple, white spruce, eastern larch, trembling aspen, balsam poplar, white pine, and black ash (NRCan 2006). Outside of developed areas (e.g., Stephenville) and scattered cleared areas for residential and commercial uses, this portion of the LAA and surrounding RAA contains many forested lands.

This portion of the LAA is bordered, to the north, south and west, by the Gulf of St. Lawrence, and includes numerous rivers (including tributaries) and ponds and is characterized by a series of bays (e.g., St. George's Bay and Port au Port Bay) of varying sizes, steep dramatic cliffs, and beaches. The Port of Stephenville (formerly Port Harmon), located on the north shore of Bay St. George, is a sheltered and ice-free deep seaport that operates year-round.

The primary roadway in and around this portion of the LAA is the east-west running Route 460, which also connects the Port au Port Peninsula with the mainland. Additional major thoroughfares include Route 490, and Route 463. These corridors are two lanes with multiple access points, connecting multiple community centers. There are numerous local roads in and around this portion of the LAA.

Community centres (also referred to as population centres) in and around this portion of the LAA vary in size and density. The largest centre is the Town of Stephenville. Development density drops substantially to the north and east of the municipal boundary. Smaller community centres in the area include Boswarlos, Cape St. George, Kippens, Lourdes, Port au Port East, Port au Port West-Aguathuna-Felix Cove, and Red Brook.

Transmission structures of varying heights, styles, and configurations are visible in and around the LAA. These structures range from single wooden poles to wooden H-frame transmission structures, to steel lattices carrying lines with voltages up to 230 KV. On the Port au Port Peninsula, there are wooden monopole transmission structures, wooden H-frame transmission structures (69 kV line), and substations. On the mainland, there are several transmission structures and associated infrastructure, as well as wooden monopoles needed for the local communities or roadside development. Several 69 kV lines are found along the route.

There is a history of mining on the Port au Port Peninsula; much of its interior has been claimed by mineral exploration and quarrying companies. Currently, mining operations near Lower Cove consist of the mine, processing facilities, and a marine terminal on the Port au Port Peninsula.



Proposed Codroy Area Wind Farm

The proposed Codroy Wind Farm is located within the Western Newfoundland Forest Ecoregion, which includes the Codroy Subregion. The landscape exhibits a significant amount of vegetation, and a series of undulating ridge tops with deeply cut ravines and valleys. The shoreline in and around this portion of the LAA is characterized by steep, vertical cliffs. The land then rises by traversing hilly to mountainous landforms.

Dominant tree species in the area include balsam fir, yellow birch, red maple, white spruce, eastern larch, trembling aspen, balsam poplar, white pine, and black ash (NRCan 2006). This portion of the LAA and surrounding RAA contains many forested lands; however, there are scattered cleared areas for uses such as residential and commercial development.

This portion of the LAA is bordered, to the north and west, by the Gulf of St. Lawrence, and includes numerous rivers (including tributaries) and ponds. The shoreline of the Gulf is irregular and is characterized by a series of bays of varying sizes and steep dramatic cliffs.

There are several water bodies in and around this portion of the LAA that drain westerly to the Gulf. There is also a series of waterways entering the Gulf in a northerly fashion.

The primary roadway in and around this portion of the LAA is the north-south running Trans-Canada Highway. There are several roads originating / terminating from the Highway that connect to smaller communities (e.g., Codroy, Jeffreys, Millville, and Robinsons), including Highways 404, 405, 406, and 407. The Trans-Canada Highway is four lanes (paved), while others are two lanes (paved) with multiple access points, in part a result of roadside residences. There is also a vast network of dirt log roads that extend into the hilly, forested, non-developed areas.

Residential dwellings and commercial buildings are clustered within small roadside communities (e.g., Millville).

In addition to wooden monopoles found roadside or in populated areas, there are two transmission lines that generally follow the Trans-Canada Highway corridor: steel lattice structures are used to carry an existing 138 kV transmission line as well as existing lines associated with the Maritime Link. A terminal station is located towards the southwestern extent of the RAA.

Proposed Transmission Line Corridor

The proposed high-voltage transmission line corridor for the Project is located within the Western Newfoundland Forest Ecoregion and spans the Port au Port and Codroy Subregions. The landscape in and around the LAA exhibits a substantial amount of vegetation and exhibits hilly to mountainous terrain with ravines and valleys.

Dominant tree species in the area are as noted above, representative of the balsam fir zonal forest found throughout much of the region (NRCan 2006). This portion of the LAA and surrounding RAA contains many forested lands; however, there are scattered cleared areas for uses such as residential and commercial development.



Water features are an important and scenic component of the visual landscape, particularly in the vicinity of Stephenville Crossing. The LAA in this area is bordered to the west by the Rothesay Bay, with a shoreline that is irregular and contains additional bays of varying sizes. The LAA and surrounding RAA include numerous rivers (including tributaries) and ponds throughout.

The primary roadways around the transmission line corridor include the north-south running Trans-Canada Highway and the east-west running Route 460. The proposed transmission route generally parallels each of these roads. There are several roads originating / terminating from the Highway and Route 460 that connect communities of varying sizes.

Communities in and around the LAA are limited and primarily found along Route 461. Population centres consist of the Town of Stephenville Crossing and the Town of St. George's. In between and just outside of these communities, dwellings are found along the roadside and connecting roads. While mostly residential in nature, there are scattered commercial and institutional services.

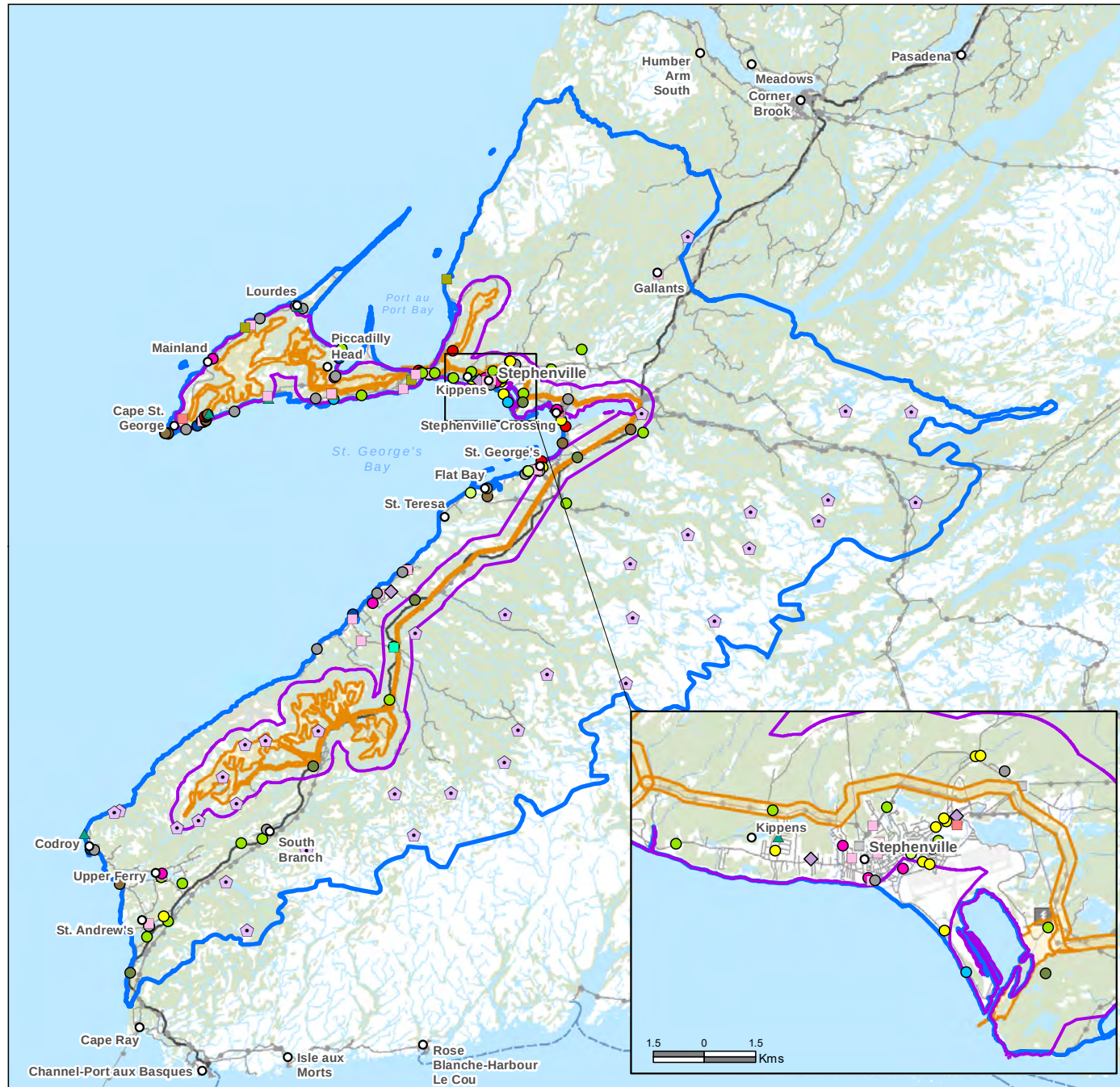
In addition to wooden monopoles found roadside or in populated areas, there are multiple transmission lines found in and around the LAA. These include steel lattice structures (138 kV line) as well as existing lines associated with the Maritime Link. There are several other transmission lines in the LAA, including three 230 kV lines, two 138 kV lines, and a 69 kV line on a variety of pole types including wooden monopole and H-frame structures, as well as lattice structures. The LAA includes substations, a turbine station and a hydro plant.

20.2.2.4 Potentially Affected Receptors

There are several receptors within the RAA that have potential to be affected by nuisance impacts and/or other effects on LRU associated with wind energy development and/or industrial projects in general (Figure 20.10). Details on the potentially affected receptors that are overlapped by the LAA and/or Project Area are provided in the Socio-economic Environment and Land and Resource Use Baseline Study (Appendix BSA-4).

Based on 1:50,000 CanVec data, there are thousands of buildings within the LAA, including several within the Project Area (NRCan 1984). It is possible that many of the buildings within the LAA and the Project Area may be residences. Additional receptors within the Project Area for the two wind farms appear to be seasonal residences (i.e., cabins) that have been identified through satellite imagery, with some locations having been field verified. WEGH2 is committed to confirming locations of seasonal and/or permanent residences and relocating turbines to maintain a minimum 1 km setback.





● Campground	□ Local Assessment Area
● Cemetery	□ Regional Assessment Area
□ Church	□ Project Area
● Community Beach	
■ Community Centre	Other Features
● Cultural Site	— Transmission Line, Existing
● Historic Place	— Trans-Canada Highway
■ Hospital	— Road
● Park	— Ferry Route
● Public Wharf	— Contour (100 m)
● Recreation	— Watercourse
● Scenic Lookout	— Waterbody
● School	— Forested Area
◆ Seniors Residential Facility	
■ Tourism Operator	
● Trail	
▲ Unique Site	
◆ Outfitter Operator	



0 10 20 km
(At original document size of 8.5x11)
1:950,000

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCan CanVec, Openstreetmap, GovNL
3. Background: NRCan CanVec



Project Location: Stephenville, NL
Prepared by MB on 2023-07-10
QR by AW on 2023-07-19
IR by BK on 2023-07-28

Client/Project: World Energy GH2
Project Nujio'qonik
121417233_031d

Figure No.
20.10

Title

Receptors in the Regional Assessment Area

20.3 Assessment Criteria and Methods

This section describes the criteria and methods used to assess Project-related environmental effects on land and resource use.

20.3.1 Residual Effects Characterization

Table 20.1 presents definitions for the predicted environmental effects characterization of the undertaking on land and resource use. The criteria are used to describe the potential residual effects that remain after mitigation measures have been implemented. Quantitative measures have been developed, where possible, to characterize residual effects. Qualitative considerations are used where quantitative measurement is not possible.

Table 20.1 Characterization of Predicted Environmental Effects of the Undertaking on Land and Resource Use

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Nature	The long-term trend of the residual effect	• Neutral – No net change in the measurable parameter(s) for LRU relative to baseline • Positive – A residual effect that moves the measurable parameter(s) in a direction beneficial to LRU relative to baseline • Adverse – A residual effect that moves the measurable parameter(s) in a direction detrimental to LRU relative to baseline
Magnitude	The amount of change in measurable parameter(s) or the VEC relative to existing conditions	• Negligible – No measurable change in current land and resource use capacity • Low – A measurable change in land and resource use capacity that is within the range of historical variability; does not exceed applicable objectives, guidelines, or standards; and allows land and resource use activities to take place at or near current levels within the RAA • Moderate – A measurable change in land and resource use capacity that may exceed the range of historical variability; does not exceed applicable objectives, guidelines, or standards; and allows land and resource use activities to take place at or near current levels within the RAA • High – A measurable change in land and resource use capacity that exceeds the range of historical variability and/or exceeds applicable objectives, guidelines, or standards such that land and resource use activities cannot take place at or near current levels within the RAA



Table 20.1 Characterization of Predicted Environmental Effects of the Undertaking on Land and Resource Use

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Geographic Extent	The geographic area in which a residual effect of a defined magnitude occurs	• Project Area – Residual effect is restricted to the Project Area • LAA – Residual effect extends into the LAA • RAA – Residual effect extends into the RAA
Timing	Considers when the residual environmental effect is expected to occur, where applicable or relevant to the VEC	• No Sensitivity – Timing does not affect land and resource use • Moderate Sensitivity – Timing may affect land and resource use • High Sensitivity – Timing affects land and resource use
Duration	The period of time required until the measurable parameter(s) or the VEC returns to its existing (baseline) condition, or the residual effect can no longer be measured or otherwise perceived	• Short-term – Residual effect is restricted to no more than the duration of the construction phase (4 years) • Medium-term – Residual effect extends through the operation and maintenance phase of the Project (30 years) • Long-term – Residual effect extends beyond the life of the Project (greater than 30 years)
Frequency	Identifies how often the residual effect occurs during the Project, during a specific phase of the Project, or during another specified time period	• Single event – Occurs once • Multiple irregular event – Occurs at no set schedule • Multiple regular event – Occurs at regular intervals • Continuous – Occurs continuously
Reversibility	Describes whether a measurable parameter(s) or the VEC can return to its existing condition after the Project activity ceases, including through active management techniques	• Reversible – Residual effect is likely to be reversed after activity completion and rehabilitation • Irreversible – Residual effect is unlikely to be reversed
Ecological / Socio-economic Context	Existing conditions and trends in the area where the residual effect occurs	• Undisturbed – Area is relatively undisturbed or not adversely affected by human activity • Disturbed – Area has been substantially previously disturbed by human development or human development is still present



20.3.2 Significance Definition

A significant residual adverse effect on land and resource use is defined as a residual Project-related change to the environment that results in any of the following:

- Non-compliance with established municipal, provincial, or federal land use designations, regulations, plans, policies, or by-laws
- A change or disruption that restricts or degrades present land and resource use capacity to a point where activities cannot continue at or near current levels and where compensation is not possible.

20.3.3 Potential Environmental Effects, Project Pathways, and Measurable Parameters

Table 20.2 lists the potential Project effects on land and resource use and provides a summary of the Project effect pathways and measurable parameters and units of measurement to assess potential effects. Potential environmental effects and measurable parameters were selected based on review of recent environmental assessments for large development projects in NL, renewable energy projects in other parts of Canada, comments provided during engagement, and professional judgment.

Table 20.2 Environmental Effects, Effect Pathways, and Measurable Parameters for Land and Resource Use

Environmental Effect(s)	Effect Pathway(s)	Measurable Parameter(s) and Units of Measurement
Change in Designated Land Use	• Project activities and the presence of Project components could be incompatible with designated land uses • Project presence and site activities may affect use / future development • Project activities and components may create disturbance effects to nearby properties / residences (i.e., noise, dust, visual)	• Qualitative description of property development plans and zoning requirements • Qualitative description of activities affecting PPWSA • Extent of current land use sites (including tenured lands) overlapped by the Project • Change / restriction or disruption of land use (ha) • Proximity to land use sites (km)
Change in Commercial / Industrial Resource Use	• Project activities and presence could spatially conflict or may reduce success of productive forest land, mineral/petroleum tenure land activities • Disruption to commercial and industrial resource harvesting (i.e., forestry, mining) due to changes in resource accessibility and availability	• Extent of current resource use sites (including tenured lands overlapped by the Project (e.g., forestry, mining/quarrying, petroleum) • Change or disruption affecting resource use (ha) • Proximity to resource use sites (km)



Table 20.2 Environmental Effects, Effect Pathways, and Measurable Parameters for Land and Resource Use

Environmental Effect(s)	Effect Pathway(s)	Measurable Parameter(s) and Units of Measurement
Change in Recreational / Subsistence Land and Resource Use	• Project clearing may result in the loss of area available for recreational and/or subsistence use and reduce success of recreational and subsistence resource harvesting due to changes in resource accessibility and availability (i.e., behavioural changes / mortality of targeted species) • Project presence and activities may reduce access to or quality of recreational use (i.e., noise, dust, visual) • Project activities and components may create sensory disturbance effects (i.e., noise, dust, visual) to recreational resource users, affecting the quality of outdoor experience	• Attribute data on overlapping uses (e.g., hunting, trapping, angling, outfitting) within area affected (ha) • Qualitative use of area • Access to recreational areas • Proximity to recreation use sites (km)

It is anticipated that the Project has the potential to change land use, recreational activities, and resource use during construction, operation and decommissioning, closure, and rehabilitation phases. Routine Project activities and components may be incompatible with land use designations, and/or affect the viability of, restrict access to, or cause loss of areas used for resource activity and/or recreational use. Resource and recreational users may consequently be displaced to other nearby areas, increasing competition for resource and recreational uses. Decommissioning and rehabilitation activities can reverse adverse effects related to some local use of land and resources and may ultimately restore access.

20.3.4 Project Interactions with Land and Resource Use

Table 20.3 uses checkmarks to indicate the routine Project activities that could interact with the VEC and result in the identified environmental effect(s) to be assessed. Immediately following Table 20.3, environmental effects pathways are briefly described for potential routine Project-related environmental effects and justification is provided in cases where no Project interaction with the VEC (and therefore no potential environmental effect on the VEC) is predicted.



Table 20.3 Project Interactions with Land and Resource Use, Environmental Effects, and Environmental Effect Pathways

Project Activities	Environmental Effect(s) to be Assessed		
	Change in Designated Land use	Change in Commercial / Industrial Resource Use	Change in Recreational / Subistence Land and Resource Use
Construction			
Site Preparation and Civil Works (including turbine foundations, road construction, quarries, clearing, grubbing, blasting, cement production, and watercourse crossings)	✓	✓	✓
Transportation of Resources and Equipment (includes trucking, shipping and barging of materials)	✓	✓	✓
Construction / Installation, Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure	✓	✓	✓
Installation and Commissioning of Wind Turbines	✓	✓	✓
Installation and Commissioning of Collector Systems	✓	✓	✓
Installation and Commissioning of Transmission Lines and Substations (including marine cable crossing)	✓	✓	✓
Installation and Commissioning of Hydrogen / Ammonia Production, and Storage Facilities and Associated Infrastructure (including Industrial water supply infrastructure)	✓	–	–
Restoration of Existing Port Facilities (including pile driving and dredging)	✓	–	–
Emissions, Discharges, and Wastes ¹	✓	✓	✓
Employment and Expenditures ²	✓	✓	✓
Operation and Maintenance			
Presence, Operation, and Maintenance of Wind Farms (including wind turbines, access roads, and collector systems)	✓	✓	✓
Presence, Operation, and Maintenance of Transmission Lines and Substations	✓	✓	✓
Presence, Operation, and Maintenance of Hydrogen / Ammonia Production, and Storage, Facilities and Associated Infrastructure (includes marine discharge from treatment plant)	✓	–	–



Table 20.3 Project Interactions with Land and Resource Use, Environmental Effects, and Environmental Effect Pathways

Project Activities	Environmental Effect(s) to be Assessed		
	Change in Designated Land use	Change in Commercial / Industrial Resource Use	Change in Recreational / Subsistence Land and Resource Use
Presence, Operation, and Maintenance of Port Facilities (includes loading of ammonia and vessel maneuvering within Port)	✓	–	–
Emissions, Discharges, and Wastes ¹	✓	✓	✓
Employment and Expenditures ²	✓	✓	✓
Decommissioning and Rehabilitation			
Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure	✓	✓	✓
Decommissioning and Rehabilitation of Wind Farms (including wind turbines, access roads, and collector systems)	✓	✓	✓
Decommissioning and Rehabilitation of Transmission Lines and Substations	✓	✓	✓
Decommissioning and Rehabilitation of Hydrogen / Ammonia Production, and Storage, Facilities and Associated Infrastructure	✓	–	–
Decommissioning and Rehabilitation of Port Facilities	✓	–	–
Emissions, Discharges, and Wastes ¹	✓	✓	✓
Employment and Expenditures ²	✓	✓	✓
Notes: ✓ = Potential interaction – = No interaction ¹ Emissions (e.g., light, noise, vibration, air contaminants and GHGs), discharges (e.g., wastewater and other liquid effluents), and hazardous and non-hazardous wastes are generated by many Project activities. Rather than acknowledging this by placing a checkmark against each of these activities, “Emissions, Discharges, and Wastes” is listed as a separate item under each phase of the Project. ² Project employment and expenditures are generated by most Project activities and are the main drivers of many potential socio-economic effects. Rather than acknowledging this by placing a checkmark against each of these activities, “Employment and Expenditures” is listed as a separate item under each phase of the Project.			



In the absence of mitigation, the Project may interact with land and resource use in the following ways:

- Project activities during construction are anticipated to result in a change to land use, recreation, and resource use.
- Project activities during operation and maintenance are anticipated to result in a change to land use. Project activities associated with the presence, operation and maintenance of the wind farms, transmission lines and substations are also anticipated to result in a change to recreation and resource use.
- Project activities during decommissioning and rehabilitation are anticipated to result in a change to land use. Project activities during decommissioning and rehabilitation associated with a temporary workforce, removal of the wind farms and transmission lines and substations are anticipated to result in a change to recreation and resource use.
- Many Project activities will generate emissions (e.g., light, noise, vibration), discharges, and hazardous and non-hazardous waste that could potentially affect land, recreation, and resource use during every phase.
- Most Project activities will generate employment and expenditures that could potentially affect land, recreation, and resource during every phase.

The following Project activities are not expected to result in change to recreation and/or resource use:

- Installation and commissioning of the hydrogen ammonia facility and restoration of Port facilities will have no interaction with resource use as these facilities and associated infrastructure will occur within existing developed and industrialized areas, however access to the Joey's Lookout hiking trail will be relocated.
- Presence, operation and maintenance of the hydrogen / ammonia facility and associated infrastructure and the Port facilities will not create additional restrictions for recreation and resource use.
- Decommissioning and rehabilitation of the hydrogen ammonia facility and Port facilities will have no interaction with recreation and resource use given the developed/industrial nature of the areas.

20.3.5 Analytical Assessment Techniques and Level of Knowledge

The assessment of land and resource use relied on spatial analysis to quantify the extent of land and resource use areas available in the Project Area, LAA and RAA, where practicable. Consideration of the nature of Project effects on land and resource use also relied on primary and secondary research, an understanding of Project interactions and mitigation, information collected from other VECs, and professional judgement. The assessment of potential Project effects on land and resource use activities considered the interactions and relationship between land and resource use and other socio-economic and biophysical VECs. For example, residual effects on wildlife and fish species and habitats are important considerations for recreational hunting and fishing activities and commercial harvesting.



The assessment of effects related to sensory disturbance of land and resource users rely on the results of the air quality and noise modelling completed for the Project. Analytical methods for these models are provided in Chapter 6 (Atmospheric Environment) and Chapter 7 (Acoustic Environment). Visual impacts on land and resources users considered light emissions from the Project and change in the viewshed. A viewshed analysis was conducted to illustrate whether Project components would be visible from various viewpoints considered representative of nearby receptor locations (i.e., residences); analytical methods are provided in the Visual Impact Assessment Study (Appendix 19-A).

20.3.5.1 Assumptions and Conservative Approach

In some instances, data limitations necessitated that a conservative approach be taken to accommodate uncertainty for the effects assessment. Conservative assumptions were made with respect to effects on land and resource use with respect to light quality, shadow flicker, ice-throw and effects on hunting and trapping to account for data limitations. The following gaps or limitations in the data for existing conditions were identified in the assessment:

- GIS data is only available regarding the number of buildings in the LAA/RAA but not their occupancy status.
- Undetermined number of inland fish-bearing watercourses / waterbodies
- Undetermined number of inland navigable waterways.

20.4 Mitigation Measures

A series of environmental management plans will be developed by WEGH2 to mitigate the effects of Project development on the environment. A full list of mitigation measures to be applied throughout Project construction, operation and maintenance, and decommissioning and rehabilitation is provided in Section 2.13. Key measures to mitigate the potential effects of the Project on land and resource use are listed in Table 20.4, by category and Project phase. Mitigation measures identified in other VECs will also reduce potential effects on land and resource use (Chapter 6 – Atmospheric Environment; Chapter 7 – Acoustic Environment; Chapter 8 – Groundwater; Chapter 9 – Surface Water; Chapter 10 – Fish and Fish Habitat; Chapter 11 – Marine Environment; Chapter 12 – Vegetation, Wetlands; Chapter 13 – Avifauna; Chapter 15 – Other Wildlife; Chapter 16 – Areas of Conservation Concern; and Chapter 18 – Communities).



Table 20.4 Mitigation Measures: Land and Resource Use

ID #*	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
20	Mitigation	Project footprint and disturbed areas will be limited to the extent practicable.	X	X	X
21	Mitigation	The limits for approved clearing, grubbing and topsoil overburden removal will be clearly identified (flagging/survey stakes) in the field prior to the commencement of work.	X	X	X
22	Mitigation	Project vehicles, heavy equipment, machinery, and associated exhaust systems and mufflers (and/or other appropriate sound attenuation devices) will be regularly inspected and maintained so that they remain operating in accordance with manufacturer's recommendations.	X	X	X
23	Mitigation	Project vehicles, heavy equipment, and machinery will be shut down when stationary for long periods of time. The idling of vehicles and equipment will be avoided whenever practical.	X	X	X
24	Mitigation	Dust from Project activities will be controlled where required by using applications of water or other approved agents. Waste oil will not be used for dust controls.	X	X	X
26	Mitigation	Re-seeding of areas will follow standard methods in compliance with permit conditions. These methods will be included the Project EPP.	-	-	X
27	Mitigation	Specific stockpiles of topsoil, overburden, and other potentially dust-generating materials will be kept covered, where practical, and used as soon as practical, or will be appropriately temporarily vegetated.	X	-	-
28	Mitigation	Nearby residents will be notified prior to blasting.	X	-	-
31	Mitigation	Blasting activities (if required) will be included under a contract service agreement with the explosives supplier and who will have a valid blasters certificate issued by the NLDECC.	X	-	-
33	Mitigation	Areas to be cleared will have sediment and erosion control measures implemented per the site-specific Erosion & Sediment Control Plan prior to the initiation of clearing activities. The sediment and erosion control measures will be adapted to suit the field conditions associated with the specific construction activities as construction proceeds.	X	-	-
34	Mitigation	Construction areas will be routinely monitored to identify areas of potential erosion and to apply appropriate mitigation. Best practice erosion and sediment control measures will be implemented, as required.	X	-	-



Table 20.4 Mitigation Measures: Land and Resource Use

ID #*	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
35	Design	The drainage system for the site will be designed to appropriately manage stormflows considering impacts to on-site downstream watercourses, and coastlines, and infrastructure. Additionally, the site drainage system will consider the variable and seasonal up-stream drainage needs to provide adequate access to downstream watercourses without adverse impact on the plant site or other nearby infrastructure.	X	-	-
46	Mitigation	If complaints are received from land users regarding perceived Project-related impacts, WEGH2 will work with the affected land users to address their concerns through a grievance redress mechanism and the potential implementation of additional mitigation measures as needed.	X	X	X
52	Engagement	WEGH2 will engage with local resource users regarding the overlap of the Project with land use areas in the Project Area. This will include the communication of Project information, updates on ongoing and planned activities, a discussion of issues and concerns, and a potential means of addressing them.	X	X	X
53	Mitigation	Project activities, locations, and timing will continue to be communicated to Indigenous groups, members of the public and government throughout the life of the Project. In particular, and as part of a Traffic Management Plan, WEGH2 will communicate in advance with respect to Project activities that may limit / affect use of access roads (i.e., upgrading activities or transport of large loads or equipment). This information will be communicated through local town councils, local radio stations and social media, as applicable.	X	X	X
63	Mitigation	Adequate safety signage, fencing, guardrails, and/or warning tape will be installed to indicate restricted Project areas to deter members of the public, and sufficient security will be in place to monitor and enforce these restrictions.	X	X	X
64	Mitigation	Safety warning signs will be strategically placed near construction works to inform the public of prohibited activities.	X	-	-
121	Mitigation	If construction activities must be scheduled during commercial fishing seasons and be conducted in the fishing grounds, WEGH2 will continue to manage and reduce adverse conflicts with affected fishers.	X	-	-
160	Mitigation	WEGH2 will enter into a Mutual Use and Mutual Access Agreement with local snowmobile trail association to allow continued snowmobile / ATV use of the Port au Port and Codroy area wind farm sites.	-	X	-



Table 20.4 Mitigation Measures: Land and Resource Use

ID #*	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
178	Mitigation	Project footprint and disturbed areas will be limited to the extent practicable.	X	-	-
179	Mitigation	Clearing and disturbance will be limited to defined rights-of-way and associated access routes.	X	-	-
180	Mitigation	Merchantable timber will be salvaged and used, or it will be made available to local communities for fuelwood, in accordance with any agreed-upon arrangements.	X	-	-
181	Mitigation	Signage will be installed around the turbine sites to alert the public and land users of the presence of the Project and its facilities.	X	X	X
182	Mitigation	Construction activities which have the potential to generate noise and vibration inbuilt-up areas, will be conducted during the hours allowed in the relevant permits and or regulation.	X	-	-
183	Mitigation	Project personnel will not be permitted to hunt / fish / harvest while staying at the workforce accommodation camp(s) and/or performing work on the Project and will not be permitted to bring firearms or angling gear to the workforce accommodation camp(s).	X	-	X
184	Mitigation	Canadian Standard Association stream crossing clearance guidelines will be adhered to for the construction, operation and maintenance of the transmission lines.	X	X	-
185	Mitigation	Where applicable, provisions of the <i>Canadian Navigable Waters Act</i> related to the "Minor Works Order" for classes of work related to Aerial Cables – Power and Telecommunication will be adhered to. WEGH2 will submit the locations of transmission line crossings for review to Transport Canada to determine the effects on navigation.	X	-	-
186	Engagement	WEGH2 will continue to engage with local resource users (i.e., hunters, outfitters, trappers, anglers) regarding the overlap of the Project with hunting, trapping, and fishing areas in the Project Area. This will include the communication of Project information, updates on ongoing and planned activities, a discussion of issues and concerns, and a potential means of addressing them.	X	X	X
187	Mitigation	WEGH2 will work with mining/quarry operators to determine if blasting mats, or other mitigation measures, are required during quarry operations adjacent to the ROW.	X	X	-



Table 20.4 Mitigation Measures: Land and Resource Use

ID #*	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
188	Mitigation	WEGH2 will consult with NLDFFA in advance of construction to incorporate the harvesting of forestry resources in the Project Area as part of site preparation.	X	-	-
190	Mitigation	Locations of domestic wood harvesting blocks will be identified in the EPP for the Project to limit damage from construction activities (e.g., errant construction equipment).	X	-	-
191	Mitigation	Existing access roads, trails or cut lines will be used to the extent possible. Permission to use existing resource roads will be obtained, where applicable.	X	X	X
192	Mitigation	Construction activities and equipment will be managed to avoid damage and disturbance to adjacent properties, structures, and operations.	X	-	-
193	Mitigation	Project activities, locations, and timing will continue to be communicated to affected land and resource users, the provincial government, and local authorities throughout the life of the Project.	X	X	X
194	Mitigation	Desired land and resource end-uses will be considered in the preparation of the Decommissioning and Rehabilitation Plan.	-	-	X
195	Mitigation	WEGH2 will Implement a winter operating protocol as part of an Ice Throw Management Plan to reduce wind turbine ice throw hazards.	-	X	-
196	Mitigation	Project activities in or near watercourses / waterbodies will be conducted in accordance with applicable requirements under the <i>Fisheries Act</i> , the <i>Canadian Navigable Waters Act</i> , and associated regulations.	X	X	X
197	Engagement	WEGH2 will consult with Policy, Planning, and Natural Areas Division (ECC) and Wildlife Division (FFA) in development of an Environmental Effects Mitigation and Monitoring Plan.	X	X	X
198	Mitigation	WEGH2 will site Project components so as to avoid or reduce Project-related construction activities within the portions of the Project Area that overlap the existing T'Railway Provincial Park corridor and the proposed Bras Mort Bog Ecological Reserve.	X	-	-
199	Mitigation	A Traffic Management Plan will be developed to address the access road network, traffic accommodation plans and logistics.	X	X	X
200	Engagement	WEGH2 will enter into a common use agreement with local stakeholders to allow for mutual use of land once construction of the turbines is completed.	-	X	-



Table 20.4 Mitigation Measures: Land and Resource Use

ID #*	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
201	Mitigation	For the protection of public safety, public access to portions of the Project Area related to the temporary workforce accommodation camp(s), the Port au Port wind farm and associated infrastructure, the Codroy wind farm and associated infrastructure, the 230 kV transmission lines and substations, the hydrogen / ammonia production and storage facilities, and the port facilities will be restricted as required while site preparation and construction activities are carried out within those particular areas. During operation, there will be safety-related restrictions to areas such as transformer stations, ammonia plant and the port facilities.	X	X	-
202	Mitigation	During decommissioning, access restrictions will not occur throughout the entire Project Area simultaneously and will, instead, be limited to those segments of the Project Area in which decommissioning and rehabilitation is actively underway.	-	-	X
203	Mitigation	Necessary authorizations will be sought under the CNWA, where applicable, based on final Project design and detailed navigation assessments.	X	-	-
204	Engagement	A Domestic Woodcutting Consultation Plan will be developed to address domestic user concerns with the Project and to identify potential mitigation measures in consultation with NLDFFA.	X	X	X
205	Mitigation	Outfitter Effects Monitoring Program will be implemented to address effects on outfitter operators and their clients.	X	X	X
206	Engagement	Where project activities have the potential to directly affect property owners within the LAA, WEGH2 will continue to engage them, as required.	X	X	X
207	Engagement	WEGH2 will engage with the NLDIET, including the Geoscience division, and local resource stakeholders on associated effects on mineral and petroleum leases, mineral exploration and potential applicable mitigation measures.	X	X	X
208	Mitigation	Where there are known mineral occurrences within the Project Area, WEGH2 will consider siting Project components so as to limit interactions within areas of overlap.	X	-	-
209	Mitigation	Efforts will be made, where practicable, to avoid or reduce the loss of vegetation in key harvesting areas through the micro-siting of Project components during detailed design.	X	-	-



Table 20.4 Mitigation Measures: Land and Resource Use

ID #*	Mitigation Type	Mitigation Measure	Project Phase*		
			C	O	D
320	Mitigation	WEGH2 will establish sufficient setback of wind turbines to mitigate risk to surrounding residences.	X	X	-
347	Mitigation	Efforts will be made to avoid or reduce interactions with sensitive areas such as known recreational / subsistence LRU areas through micro-siting around key Project components during detailed design.	X	-	-
348	Mitigation	WEGH2 will work to confirm the location of receptors (i.e., seasonal cabins) within the Project Area during detailed design.	X	X	X
354	Mitigation	WEGH2 will install a real-time water quality/quantity network as determined by further consultation with the NLDECC Water Resources Management Division to monitor for potential adverse effects to surface and groundwater quality and quantity throughout the Project Area.	X	X	X
365	Mitigation	WEGH2 will limit development in PPWSAs where practical. No development will occur in PPWSAs considered to be High Risk (e.g., Piccadilly Head-Unnamed Brook, Port-au-Port West-Aguathuna-Felix Cove, Jim Rowe's Brook). If Project activities extend into PPWSAs, these activities will be conducted in conjunction with approval from the jurisdictional authority.	X	X	X
366	Mitigation	Permitting requirements under Section 39 of the <i>Water Resources Act</i> will be followed for any development in PPWSAs.	X	X	X
* Note: "ID #" denotes the master identification number for mitigation in Appendix 26-A "C" denotes the construction phase of the Project. "O" denotes the operation and maintenance phase of the Project. "D" denotes the decommissioning and rehabilitation phase of the Project. "X" denotes the relevant Project phase for the mitigation measure					



20.4.1 Application of the Precautionary Principle to Project Mitigation Measures

The assessment used the Precautionary Principle in its approach with respect to the effectiveness of identified Project mitigation measures by assuming credible worst-case scenarios. Mitigation measures were selected that were more than adequate for reducing an effect to acceptable levels.

20.5 Residual Environmental Effects

Potential environmental effects on land and resource use were identified in Section 20.3.3. Residual effects (i.e., those remaining following implementation of mitigation) for each Project phase are evaluated below and characterized using the criteria defined in Section 20.3.1. A summary of predicted residual effects is provided in Section 20.5.4.

20.5.1 Change in Designated Land Use

The assessment of change in land use considers Project activities that may be incompatible with designated land use (e.g., applicable land use and development plans, policies, regulations, zoning requirements) in the Project Area and LAA. Wind farm and associated infrastructure site preparation within the Project Area can change the use of lands through the loss of area and the restriction of access to designated lands, including provincial Crown lands and protected areas.

Portions of the Project Area and LAA intersect municipal planning areas for the Town of Cape St. George, the Town of Port au Port West-Aguathuna-Felix Cove, the Town of Port au Port East, the Town of Kippens, the Town of Stephenville, the Town of Stephenville Crossing, and the Town of St. George's.

The Project could adversely affect land use in municipal planning areas. Municipal planning restrictions may have permitting implications for the Project (i.e., if Project activities are incompatible with applicable municipal land use plans, development regulations, and/or zoning).

As summarized in Table 20.5, the Project Area intersects / partially overlaps several municipal boundaries that are subject to municipal development and zoning controls under the URPA.

Portions of the Project Area and LAA (associated with the Port au Port Wind Farm) intersect the municipal planning area for the Town of Cape St. George. This area is subject to municipal planning restrictions that may have permitting implications for the Project (i.e., if Project activities are incompatible with applicable municipal land use plans, development regulations, and/or zoning).

Federal contaminated sites are located on land that is owned or leased by the federal government, or on land where the federal government has accepted responsibility for the contamination (Government of Canada 2022). There are six sites located within the Project Area. Within the Project Area, three of the federal contaminated sites are in Port Harmon at the DFO Stephenville Base, two are located at the Pinetree Radar Site, and one is located at the DFO Gravels site in Port au Port East (Government of Canada 2022).



Table 20.5 Municipal Planning Areas in the LAA and Project Area

Municipality Name	Approximate Size of Municipal Planning Area (MPA)	Approximate Spatial Overlap of MPA and LAA	Approximate Spatial Overlap of MPA and Project Area
Cape St. George	54 km ²	49 km ² (90% of MPA)	12.5 km ² (23% of MPA)
Port au Port West-Aguathuna-Felix Cove	16 km ²	15.8 km ² (96.3% of MPA)	3 km ² (18% of MPA)
Port au Port East	25 km ²	24.9 km ² (99.6% of MPA)	4 km ² (17% of MPA)
Kippens	17 km ²	16.6 km ² (96.5% of MPA)	1 km ² (8% of MPA)
Stephenville	212 km ²	55 km ² (26% of MPA)	6 km ² (3% of MPA)
Stephenville Crossing	152 km ²	97 km ² (64% of MPA)	8 km ² (5% of MPA)
St. George's	109 km ²	50 km ² (46% of MPA)	4 km ² (4% of MPA)

Similarly, portions of the Project Area and LAA (associated with the Port au Port Wind Farm) intersect with proposed ILUC Protected Surfacewater Legal Boundaries, specifically Cape St. George, Rouzes Brook, and Cointres Brook. Some of the activities associated with Project development may be prohibited in PPWSAs. Development activity within PPWSAs is subject to permitting requirements under the *Water Resources Act* by the province's Water Resources Management Division (WRMD).

Applications are to be submitted under the Protected Road Regulations and highway access for the Project if any area is developed or access is required from a provincially maintained road near the Port au Port Highway (Route 460) from its intersection with the Trans-Canada Highway (Route 1) to a point where the eastern municipal planning boundary of the Town of Stephenville crosses the highway. A permit is required from Service NL, Government Service Centre in accordance with the URPA for the construction of an access road in a protected area, or for any access onto a protected road. Any proposed access roads to the site must be approved by the Department of Transportation and Works. The Trans-Canada Highway and Route 460 both intersect with Project Area, for 11 km and 1 km (approx.) respectively.

Portions of the Project Area and LAA (primarily associated with the transmission lines) intersect municipal planning areas for the Town of Cape St. George, the Town of Port au Port West-Aguathuna-Felix Cove, the Town of Port au Port East, the Town of Kippens, the Town of Stephenville, the Town of Stephenville Crossing, and the Town of St. George's. These areas are subject to municipal planning restrictions that may have permitting implications for the Project (i.e., if Project activities are incompatible with applicable municipal land use plans, development regulations, and/or zoning). The Crabbes River Cottage Planning Area overlaps the LAA and Project Area and is subject to surface level restrictions that may restrict development (Government of NL n.d.[a]).



Portions of the Project Area and LAA (associated with the hydrogen / ammonia plant) intersect municipal planning areas for the Town of Cape St. George, the Town of Port au Port West-Aguathuna-Felix Cove, the Town of Port au Port East, the Town of Kippens, the Town of Stephenville, the Town of Stephenville Crossing, and the Town of St. George's. These areas are subject to municipal planning restrictions that may have permitting implications for the Project (i.e., if Project activities are incompatible with applicable municipal land use plans, development regulations, and/or zoning).

The property / lands on which Project activities and components will occur at the Port of Stephenville are privately owned by WEGH2 and the Town of Stephenville, with the exception of certain property / lands which are held by private landowners and the Newfoundland and Labrador Housing Corporation. WEGH2 is in consultation with these property / landowners. This area is subject to municipal planning restrictions that may have permitting implications for the Project (i.e., if Project activities are incompatible with applicable municipal land use plans, development regulations, and/or zoning).

20.5.1.1 Construction

Construction activities, including wind farm site preparation, construction / installation of infrastructure and equipment and the access road upgrade / realignment, may affect sensitive receptors (e.g., residences, cabins) due to sensory disturbances and nuisance effects associated with noise, vibration, and dust emissions from the use of heavy equipment, transport of materials and increased traffic. Sources of noise and vibration within the Project Area are anticipated to be typical of construction activities of this nature and magnitude. The operation of heavy equipment, creation of access and upgrading of the roads and increased traffic during construction may also affect, but will not prohibit, access for occupants of residences near the access road rights-of-way. Project activities and presence of Project components could otherwise affect current and future opportunities for non-Project development and land use activities.

For the protection of public safety, public access to portions of the Project Area related to the temporary workforce accommodation camp(s), the Port au Port Wind Farm and associated infrastructure, the Codroy Wind Farm and associated infrastructure, the 230 kV transmission lines and substations, the hydrogen / ammonia production and storage facilities, and the Port facilities will be temporarily restricted while site preparation and construction activities are carried out within those particular areas. This will temporarily restrict access to those areas for land and resource users during the construction phase. However, these restrictions will not occur throughout the entire Project Area simultaneously and will instead be incremental and limited to those segments of the Project Area in which construction is actively underway. The residual effects considered below are also generally deemed to have no sensitivity with respect to the timing of construction activities, as timing will have no effect on designated land use.



Temporary Workforce Accommodations

During the construction phase, site preparation and construction, and the presence of workers in the two temporary work camps will generate noise disturbance. One temporary worker accommodation camp will be located near the Port of Stephenville, in a vacant industrial area. A separate temporary workforce accommodation camp will be required to house workers near the Codroy Wind Farm. The Codroy area is more remote in nature and the construction of the associated camp and presence of workers may detract from the rural land base. Both of the proposed camp locations are not currently in use.

Various activities during construction of the accommodation camp(s), including the use of construction vehicles and equipment, will generate noise, vibration, dust, and other air emissions that could be perceived by, and cause disturbance to, land and resource users. These emissions will be short-term in duration and are generally anticipated to be similar in nature, magnitude, and extent to the emissions associated with past and present development activities in the surrounding LAA and RAA (e.g., residential development in the Stephenville area and cottage development in the Codroy / Bay St. George South area). Such emissions would not typically be expected to measurably affect the activities of land and resource users, although they may be considered relatively more of a nuisance in Codroy / Bay St. George South than in Stephenville due to the varying ecological / socio-economic contexts in the two areas.

Public access to portions of the Project Area associated with the temporary workforce accommodation camp(s) will be temporarily restricted while site preparation and construction activities are underway within these areas. The temporary workforce accommodation camp(s), once constructed, will be situated on lands currently not in use. These residual adverse effects will be low in magnitude, limited in geographic extent to the Project Area, range in duration from short-term (with respect to temporary disturbance and access restrictions during construction) to medium-term (with respect to the ongoing presence of the temporary workforce accommodation camp[s]), continuous in frequency, and reversible. It is anticipated that the total area to be occupied by the temporary workforce accommodation camp(s) will represent only a small proportion of the total land base area within the surrounding RAA.

There are no residual effects on PPWSAs because of temporary workforce accommodations.

Port au Port and Codroy Wind Farms and Associated Infrastructure

Site clearing and construction activities in the Project Area can change the use of lands through the loss of area and the restriction of access to designated lands. The Port au Port Wind Farm is located on provincially owned Crown land (159 km²).

The Port au Port and Codroy Wind Farms and associated infrastructure will be located principally on provincially owned Crown lands that are within the nominated land areas. There is, however, a potential overlap with federal contaminated land near Port au Port East (i.e., DFO Gravels site). WEGH2 is currently in consultation with federal agencies with respect to including turbines in Port au Port East as part of the Project. WEGH2 will meet applicable federal approval and permitting requirements. Project construction activities will be carried out in accordance with applicable permitting requirements, including Crown land leasing requirements and associated restrictions, and municipal planning restrictions.



The Project Area for Port au Port Wind Farm avoids direct overlap with the proposed Cape St. George Transitional Reserve (it is adjacent to the Project Area). WEGH2 applied an avoidance mitigation measure to this Area of Conservation Concern by adjusting the Project boundary to avoid encroaching on this reserve. The LAA does overlap with the proposed Cape St. George Transitional Reserve. Protection of Cape St. George as a reserve is identified by the Provincial Natural Areas Program as a high-priority action in the Limestone Barrens Species at Risk (SAR) Recovery Plan. The proposed reserve also provides habitat for three Black-legged Kittiwake colonies. Cape St. George Transitional Reserve is the only area proposed for protection in the Port au Port subregion and is therefore integral to the province's overall Protected Areas Plan. WEGH2 will consult with Policy, Planning, and Natural Areas Division (ECC) and Wildlife Division (FFA) in development of an Environmental Effects Mitigation and Monitoring Plan.

The Codroy Wind Farm is located on provincially owned Crown land (147 km²). The Project Area for Codroy Wind Farm also avoids direct overlap with the proposed Cape John Ecological Reserve (it is adjacent to the Project Area). As with the proposed Cape St. George Transitional Reserve, WEGH2 applied an avoidance mitigation measure to this Area of Conservation Concern by adjusting the Project boundary to avoid encroaching on the reserve. The LAA does overlap the proposed Cape John Ecological Reserve. Like the Cape St. George Transitional Reserve, WEGH2 will consult with Policy, Planning, and Natural Areas Division (NLDECC) and Wildlife Division (NLDDFA) on this proposed ecological reserve in the development of an Environmental Effects Mitigation and Monitoring Plan. The Project Area also overlaps approximately 3 km of the T'Railway Provincial Park corridor near the Codroy Wind Farm, along with many other existing roads and transmission lines. WEGH2 will implement mitigation measures to maintain public safety, given the publicly accessible nature of the T'Railway. Given the size of the overlapped area, residual effects to designated protected area lands are anticipated to be low in magnitude.

Clearing and construction activities may affect nearby residences due to sensory disturbances associated with noise from the use of vehicles and other construction equipment. As discussed in Section 20.2.2.1, there is one building located near the hydrogen / ammonia plant that appears to be a residence (based on review of satellite imagery). However, it is located outside of the Project Area in Little Port Harmon. WEGH2 will work to confirm the location of the receptors during the detailed design activities.

Approximately 197 km of new access roads will be required within the boundaries of the Port au Port Wind Farm site; approximately 152 km of new access road will be required within the boundaries of the Codroy Wind Farm site; and approximately 37 km of upgraded access roads will be required to connect the wind farm sites to local highways (i.e., 5 km of road upgrades to connect the Port au Port Wind Farm and 32 km of road upgrades to connect the Codroy Wind Farm). Existing roads within the Project Area (i.e., forestry access roads, cabin roads, trails) were prioritized for access. The spatial extent (i.e., physical footprint) of the access road network will be limited to the minimum required to safely meet its intended purpose and in consideration of other design and construction requirements and constraints, which will be determined in consultation with equipment manufacturers and civil contractors. Based on preliminary design, it is anticipated that the access road network will occupy approximately 377 ha of the 15,863-ha Port au Port Wind Farm footprint and approximately 341 ha of the 14,665-ha Codroy Wind



Farm footprint, or a total of 7.2 km² for both sites thus, the access road network is expected to occupy approximately 2.3% of the total footprint area associated with each wind farm site.

Oversized and overweight Project materials and equipment will be transported to the Project Area during the construction phase. According to the Transportation Impact Study (Appendix 2-D), it is estimated that Project-related wind turbine delivery will require trucks to complete separate daily round trips to the Port au Port Wind Farm (i.e., 6 daily round trips to the west side of the Port au Port Peninsula, west of Route 463 first; 6 daily round trips to the east side of the Port au Port Peninsula, east of Route 463 second; and 6 daily round trips to the north of Stephenville, near Route 462 third, respectively) and finally 6 daily round trips to the Codroy Wind Farm site, occurring sequentially one after the other. It is also estimated that an average of 30 additional round trips will be required daily for the delivery of other construction materials (e.g., transmission line and transformer station components) to the Project Area during these time periods. However, in terms of construction-related vehicles during the peak construction season, the impact to current traffic operation is low (Stantec 2023d). When a truck transporting Project materials and equipment that is crossing Route 463, crossing Aguathuna Road, or making turns at intersections, it is expected that local traffic will need to be stopped for up to five minutes to allow the truck to pass (Stantec 2023d). These temporary delays are not predicted to substantially interfere with access to adjacent land use sites. A Traffic Management Plan will be developed to address the access road network, traffic accommodation plans and logistics, and lessen effects during construction.

WEGH2 will limit development in water supply intake areas, including PPWSAs, where practicable and no development will occur in PPWSAs that are considered High Risk (e.g., Piccadilly Head – Unnamed Brook, Port-au-Port West-Aguathuna-Felix Cove – Jim Rowe's Brook). Two proposed ILUC Protected Surfacewater Legal Boundaries are intersected by the Project Area (i.e., 4.3 km²). WEGH2 have revised Project boundaries in some instances to avoid carrying out Project activities inside the PPWSAs. The presence of new access routes during the construction phase may lead to an increase in traffic and use through PPWSAs and could potentially cause adverse effects on water supplies. Where practical, WEGH2 will limit other motor vehicle access during construction phase for public safety purposes. The limits and additional construction vehicle traffic will be temporary only for the construction phase. WEGH2 will follow the requirements of permitting under section 39 of the *Water Resources Act* for development in public water supply areas and near water intakes and wellheads. With mitigation measures applied, residual effects on PPWSAs are anticipated to be low in magnitude.

Sensory disturbances to land use receptors (i.e., residences) will occur from construction activities at the turbine sites and along the access roads. Within each turbine site, activities such as site preparation and earthworks and construction / installation of infrastructure and equipment, will result in increased sound levels. As assessed in Chapter 7 (Acoustic Environment), in general, the maximum sound pressure levels related to Project construction activities were predicted to be at 141 decibels (dBA) for the wind farm sites. The highest predicted sound pressure levels at the nearest receptors (i.e., the receptors located at Port au Port and Codroy) were 57 dBA and 52 dBA respectively during the day-night, which is higher than Health Canada's regulatory threshold for sound (i.e., 45 dBA). As construction activities will be limited to daytime hours, existing night-time sound levels will not be affected by construction activities. Residual effects during construction are anticipated to be moderate in magnitude.



Heavy vehicle traffic along access roads and blasting associated with wind turbine construction will also cause a temporary increase in vibration emissions. Blasting is expected to be limited to daytime hours and will follow best management practices outlined in guidance documents which will be consulted during blasting design (Chapter 7 [Acoustic Environment]). Vibrations are expected to be generated from the use of vibratory pile driver. It was further determined that a large bulldozer is likely to generate the most vibration emissions during other construction activities. Estimated distances where vibration emissions are likely to be barely perceptible are 430 m (pile driver) and 70 m (bulldozer) respectively. Given that Project construction will result in a relatively small change in vibration emissions, and with the implementation of mitigation measures, residual effects on land use because of sensory disturbances (i.e., vibration) are therefore anticipated to be low in magnitude.

As construction activities will occur mostly during the day, Project-related lighting during the night will be limited. The use of mobile artificial lighting may occur for short periods during the fall and winter when daylight working hours are less. With mitigation, the levels of light trespass and glare from the mobile lighting equipment are expected to be less than the International Commission on Illumination (CIE) guidelines for a dark, rural environmental zone. It is unlikely that sky glow levels will increase to level representative of an urban environment (Chapter 6 – Atmospheric Environment). Project residual effects during construction are anticipated to be low in magnitude.

In consideration of mitigation and management measures described in Section 20.4, Project-related effects on designated land uses from construction of the wind farms and associated infrastructure will be adverse, low to moderate in magnitude, and occur in the PA and LAA, extending to the RAA with no time sensitivity. The effects will be short-term, continuous to irregular, and reversible.

230 kV Transmission Lines and Substations

The proposed 230 kV transmission line route and substations are on provincial Crown land and private land. Portions of the Project Area intersect several municipal planning areas. Project construction activities will be carried out in accordance with applicable permitting requirements, including Crown land leasing requirements and associated restrictions, and municipal planning restrictions. WEGH2 will engage with provincial Crown land use permit holders, municipal authorities, and private landowners to address potential conflict, disturbance, or access restrictions to Crown land use areas, municipal lands, and private lands during the construction phase. Signage will be installed around the turbine sites to alert land users of the presence of the Project and its facilities. Therefore, adverse effects on land use associated with the loss / restriction of access during construction to designated lands are anticipated to be low in magnitude.

The Project Area for the 230 kV transmission lines directly overlap with a portion of the proposed Bras Mort Bog Ecological Reserve, over approximately 0.9 km² of the reserve. The Bras Mort Bog proposed reserve is located east of Stephenville Crossing and is one of the largest undisturbed plateau bogs on the Island of Newfoundland. It is an important area for woodland caribou during the fall and winter. WEGH2 will consult with Policy, Planning, and Natural Areas Division (ECC) and Wildlife Division (FFA) in development of an Environmental Effects Mitigation and Monitoring Plan. The Project Area also overlaps approximately 3 km of the T'Railway Provincial Park corridor near Stephenville Crossing, along with many other existing roads and transmission lines. WEGH2 will implement mitigation measures to maintain



public safety, given the publicly accessible nature of the T'Railway. Given that there is some overlap, residual effects to designated protected area lands are anticipated to be low in magnitude.

There are four intersections of PPWSAs by the transmission line RoW (i.e., Protected Groundwater Zones), at Port au Port East and in the Stephenville area. The total Project Area overlap between the transmission line RoW and PPWSAs is 2.2 km². No Project Road construction is planned for within the transmission line RoW corridor, however. The length of the RoW within PPWSA boundaries is 6.5 km. The effects of Project construction on groundwater supply wells were assessed as part of the groundwater resources assessment (Chapter 8 – Groundwater Resources). With applied mitigation measures, residual effects to PPWSAs are anticipated to low in magnitude.

Sound levels are predicted to increase from construction activities; however, sound levels are not predicted to increase beyond guideline criteria for nuisance or sleep disturbance (Chapter 7 – Acoustic Environment). Occupied residences located within the LAA will, on occasion, experience noise generated by construction activities. Noise levels during the night will remain unchanged from the existing conditions, because construction activities related to assembly and installation of towers will only occur during the day.

The effect is anticipated to be low in magnitude for the Project Area and LAA. The area affected by clearing of the transmission line ROW and construction activities will be continuous for the period of construction and short term in duration. The effects will be reversible once construction has ended.

Hydrogen / Ammonia Production and Storage Facilities

The hydrogen / ammonia plant will be installed in a brownfield site zoned for industrial use at the Port of Stephenville in a combined facility with utility services and support infrastructure (Section 2.3.4). The Project Area for the hydrogen / ammonia production and storage facilities will occupy a total of approximately 1.6 km². The location is already disturbed from previous industrial activity (i.e., brownfield) in terms of Project-related effects on designated land use. There is potential overlap with three federal contaminated sites with the Port facility at the dock site in Port Harmon at the DFO Stephenville Base and two at the Pinetree Radar site in the Project Area. WEGH2 will meet applicable federal approval and permitting requirements. There are no anticipated residual effects on PPWSAs because of construction of the hydrogen / ammonia plant as there are none. The effects will be adverse, low in magnitude, and occur within the Project Area and LAA. The effects will be short-term, irregular, and reversible.

Port Facilities

The Port of Stephenville will be used to support wind farm construction and will include a large central marshalling yard. The electrolyzer and ammonia facilities will be located at the Port of Stephenville, which offers deep-water shipping access to the world. The Project Area for the Port facilities will occupy a total of approximately 0.01 km². To support Project construction, existing Port facilities will require restoration. The Port facilities will likely require upgrades to reinstate the dock to its original load rating and condition. The restoration of existing Port facilities will occur within a site previously used as a Port facility. As noted above, there is a potential overlap with federal contaminated sites in Port Harmon at the DFO



Stephenville Base and at the Pinetree Radar site. WEGH2 will meet applicable federal approval and permitting requirements.

The highest predicted sound pressure levels at the nearest receptors (i.e., the campground located near Port Harmon) was 48 dBA during the day, which is slightly higher than Health Canada's regulatory threshold for sound (i.e., 45 dBA). As construction activities will be limited to daytime hours, existing night-time sound levels will not be affected by construction activities. There are no anticipated residual effects on PPWSAs because of renovation of the port facilities as there are none. The Project-related effects during construction on designated land use therefore will be adverse, low in magnitude, and occur within the Project Area and LAA. The effects will be short-term, irregular, and reversible.

Summary

With the implementation of mitigation and management measures, residual effects from the Project during construction on change in designated land use are anticipated to be low (i.e., a small, measurable change in land and resource use capacity, however activities can take place at or near current levels) to moderate in magnitude (for sound levels). Project effects on land use are expected to occur within the Project Area (from the direct loss of area accessible to land and resource users) and LAA (from indirect sensory disturbances). During construction, residual effects are expected to be adverse, occurring in the Project Area and LAA, extending to the RAA, short-term to medium term, continuous and irregular in frequency, and reversible. Timing (i.e., seasonal aspects) are not considered in the context of designated land use and the effects occur within a relatively disturbed/undisturbed socio-economic context. Based on the information above, a summary of residual effects on change in land use during the construction phase is provided in Table 20.6.

Table 20.6 Summary of Effects by Project Component on Change in Designated Land Use During Construction

Project Site	Summary of Effect during Construction
Temporary Workforce Accommodations	During the construction phase, site preparation and construction, and the presence of workers in the two temporary work camps, will generate noise disturbance located near the Port of Stephenville, in a vacant industrial area, and in the Codroy area which is more remote in nature. The construction of the associated camp and presence of workers may detract from the rural land base. Both proposed camp locations are not currently in use. Public access to portions of the Project Area associated with the temporary workforce accommodation camp(s) will be temporarily restricted while site preparation and construction activities are underway within these areas. The temporary workforce accommodation camp(s), once constructed, will be situated on lands currently not in use. No residual effects on PPWSAs are anticipated. Potential effects will be managed through application of standard mitigation and management measures, as described in Section 20.4.



Table 20.6 Summary of Effects by Project Component on Change in Designated Land Use During Construction

Project Site	Summary of Effect during Construction
Port au Port Wind Farm and Associated Infrastructure	Site clearing and construction activities in the Project Area can change the use of lands through the loss of area and the restriction of access to designated lands. The Port au Port Wind Farm is located on provincially owned Crown land (159 km²) that is within the nominated land areas. There is a potential overlap with federal contaminated land near Port au Port East (i.e., DFO Gravels site). WEGH2 is currently in consultation with federal agencies with respect to including turbines in Port au Port East as part of the Project. Project construction activities will be carried out in accordance with applicable permitting requirements, including Crown land leasing requirements and associated restrictions, and municipal planning restrictions. Based on preliminary design, it is anticipated that the access road network will occupy approximately 377 ha of the 15,863-ha Port au Port Wind Farm footprint. Oversized and overweight Project materials and equipment will be transported to the Project Area during the construction phase. WEGH2 will limit development in water supply intake areas, including PPWSAs, where practicable, and no development will occur in PPWSAs that are considered High Risk, and will limit other motor vehicle access for public safety. Heavy vehicle traffic along access roads and blasting associated with wind turbine construction will also cause a temporary increase in vibration emissions. Blasting is expected to be limited to daytime hours and will follow best management practices. Vibrations are expected to be generated from the use of vibratory pile driver and a large bulldozer. As construction activities will occur mostly during the day, Project-related lighting during the night will be limited. The use of mobile artificial lighting may occur for short periods during the fall and winter when daylight working hours are less. Potential effects will be managed through application of standard mitigation and management measures, as described in Section 20.4.
Codroy Wind Farm and Associated Infrastructure	Site clearing and construction activities in the Project Area can change the use of lands through the loss of area and the restriction of access to designated lands. The Codroy Wind Farm is located on provincially owned Crown land (147 km²) that are within the nominated land areas. Project construction activities will be carried out in accordance with applicable permitting requirements, including Crown land leasing requirements and associated restrictions, and municipal planning restrictions. The Project Area also overlaps approximately 3 km of the T'Railway Provincial Park corridor near the Codroy Wind Farm, along with many other existing roads and transmission lines. Based on preliminary design, the access road network will occupy approximately 341 ha of the 14,665-ha Codroy Wind Farm footprint. Oversized and overweight Project materials and equipment will be transported to the Project Area during the construction phase. Heavy vehicle traffic along access roads and blasting associated with wind turbine construction will also cause a temporary increase in vibration emissions. Blasting is expected to be limited to daytime hours and will follow best management practices. Vibrations are expected to be generated from the use of vibratory pile driver and a large bulldozer. As construction activities will occur mostly during the day, Project-related lighting during the night will be limited. The use of mobile artificial lighting may occur for short periods during the fall and winter when daylight working hours are less. Potential effects will be managed through application of standard mitigation and management measures, as described in Section 20.4.



Table 20.6 Summary of Effects by Project Component on Change in Designated Land Use During Construction

Project Site	Summary of Effect during Construction
230 kV Transmission Lines and Substations	The proposed 230 kV transmission line route and substations are on provincial Crown land and private land. Portions of the Project Area intersect several municipal planning areas. Project construction activities will be carried out in accordance with applicable permitting requirements, including Crown land leasing requirements and associated restrictions, and municipal planning restrictions. The Project Area for the 230 kV transmission lines directly overlap with a portion of the proposed Bras Mort Bog Ecological Reserve, over approximately 0.9 km² of the reserve. The Project Area also overlaps approximately 3 km of the T'Railway Provincial Park corridor near Stephenville Crossing. There are four intersections of PPWSAs by the transmission line RoW. The total Project Area overlap between the transmission line RoW and PPWSAs is 2.2 km². No Project Road construction is planned for within the transmission line RoW corridor, however. The length of the RoW within PPWSA boundaries is 6.5 km. Sound levels are predicted to increase from construction activities; however, sound levels are not predicted to increase beyond guideline criteria for nuisance or sleep disturbance. Potential effects will be managed through application of standard mitigation and management measures, as described in Section 20.4.
Hydrogen / Ammonia Production and Storage Facilities	The hydrogen / ammonia plant will be installed in a brownfield site zoned for industrial use at the Port of Stephenville. The Project Area will occupy a total of approximately 1.6 km². The location is already disturbed from previous industrial activity (i.e., brownfield) in terms of Project-related effects on designated land use. There are no anticipated residual effects on PPWSAs because of construction of the hydrogen / ammonia plant. There is a potential overlap with federal contaminated sites in Port Harmon at the DFO Stephenville Base and at the Pinetree Radar site.
Port Facilities	The restoration of existing Port facilities will occur within a site previously used as a Port facility. There is a potential overlap with federal contaminated sites in Port Harmon at the DFO Stephenville Base and at the Pinetree Radar site. The highest predicted sound pressure levels at the nearest receptors (i.e., the campground located near Port Harmon) was 48 dBA during the day, which is slightly higher than Health Canada's regulatory threshold for sound (i.e., 45 dBA). As construction activities will be limited to daytime hours, existing night-time sound levels will not be affected by construction activities. There are no anticipated residual effects on PPWSAs because of renovation of the Port facilities.



20.5.1.2 Operation and Maintenance

Operation activities will not result in additional loss of area and/or the restriction of access to designated lands beyond that previously incurred during construction.

Like construction activities, Project operation can affect sensitive receptors, such as residences, due to changes in air and sound quality from wind farm operation and operation-related transportation along the access roads and use of the access roads. The development and presence of the wind turbines/towers, collector lines, transmission lines and may affect land use within the LAA through visual disturbance. The residual effects considered below are also generally deemed to have no sensitivity with respect to the timing of construction activities, as timing will have no effect on designated land use.

Temporary Workforce Accommodations

No worker accommodation camps will be required after Project construction. Given the smaller presence of a workforce during the operation and maintenance phase, no further Project-related effects are anticipated.

Port au Port and Codroy Wind Farms and Associated Infrastructure

During operation, no new interactions with designated lands, including those associated with access, are anticipated. Signage will remain around the turbine sites to alert land users of the presence of the Project and its facilities.

Sensory disturbances, as described in the previous section, will continue through operation due to changes in sound quality from on-site operation. At each turbine site, rotation of the wind turbines will generate in increased sound levels. As assessed in Chapter 7 (Acoustic Environment), Project operation activities were predicted to be generally below 45 dbA (background levels). Sound levels from wind farm operation are anticipated to occur day or night. The highest predicted sound pressure levels at the nearest receptors were 40 dBA and 34 dBA during the day-night. Both values are well below regulatory thresholds for noise. Residual effects from the Project during operation and maintenance on change in sound quality are anticipated to be moderate in magnitude. Residual effects from vibration during project operation are predicted to be low in magnitude as vibration will be typically much less than during construction and can be effectively managed through standard operating procedures and best management practices.

The access road network connecting the wind farm sites to the main highways will remain in place for the life of the Project. Normal access road operation and maintenance associated with the turbine sites will be undertaken by WEGH2.

In consideration of the small size of the workforce required for operation and maintenance, and mitigation and management measures, described in Section 20.4, effects from Project operation on designated land uses will be adverse, low to moderate in magnitude, and occur in the LAA and RAA. The effects will be medium-term, continuous, and reversible.



During operation, there will be nighttime safety lighting within the Project Area (i.e., buildings, parking lots, along access roads). The final lighting design will use minimum lighting levels recommended by the Illuminating Engineering Society of North America's Lighting Handbook for outdoor worksite lighting. Light trespass and glare will be reduced using full cut-off luminaires to light in work areas, where possible. With mitigation, the levels of light trespass and glare are expected to be maintained below guidelines for low, sparsely inhabited rural areas (Chapter 6 – Atmospheric Environment). Residual effects are anticipated to be low in magnitude.

Shadow flicker is a temporary condition resulting from the sun casting intermittent shadows from the rotating blades of a wind turbine onto a receptor such as a window in a building. The flicker is due to alternating light intensity between the direct beam of sunlight and the shadow from the turbine blades. Stantec conducted analyses of daytime shadow flicker for the Port au Port and Codroy Wind Farms (Stantec 2023e, 2023f); the results of these shadow flicker studies are provided in Appendix 6-A and 6-B. The shadow flicker assessment considered dwellings located within 1,500 m of the proposed turbine locations for the Port au Port and Codroy Wind Farms. Based on the results of the assessment of shadow flicker levels for the Port au Port Wind Farm (Appendix 6-B), it was determined that 498 of the 790 receptors in or near the Port au Port Wind Farm will experience no shadow flicker, and 292 receptors may be affected by shadow flicker to varying degrees. A similar assessment of shadow flicker levels for the Codroy Wind Farm (Appendix 6-A) determined that seven of the 15 receptors in or near the Codroy Wind Farm will experience no shadow flicker, and eight receptors may be affected by shadow flicker to varying degrees. The expected shadow flicker from the Port au Port wind turbines experienced by the 292 affected receptors and the expected shadow flicker from the Codroy Wind Farm WTGs experienced by the eight affected receptors will be lower than the theoretical maximum values since there will be times when the turbine blades are not spinning, and since clouds, wind direction, trees and obstacles reduce the potential for shadow flicker. Given the conservative assumptions used in the shadow flicker model, it is likely that site-specific conditions will further reduce the amount of shadow flicker that is actually observed throughout the year (Stantec 2023e, 2023f).

A commonly used assessment criterion or allowable limit for shadow flicker is 30 hours per year (Koppen et al 2017). The theoretical maximum for Port au Port Wind Farm receptors does not exceed 30 hours per year at any receptor location. Actual shadow flicker experienced by the receptors is likely to be reduced by the presence of vegetation, which may provide partial screening for the Port au Port turbines during those hours when the sun is low enough to create long shadows. The analysis for the Codroy Wind Farm indicates that the potential for shadow flicker occurrence at the receptors modeled within 1,500 m of the proposed wind turbines are also well below generally accepted levels of 30 hours/year when taking into account cloud cover. Site-specific conditions that may mitigate shadow flicker impact include trees or buildings that block the line of sight to the proposed turbine locations, seasonal or intermittent use, or the absence of windows facing the direction of the wind farm (Stantec 2023e, 2023f). Thus, the resultant residual adverse change in designated land use is predicted to be low in magnitude, to extend into the LAA and RAA, to be medium-term in duration and occur as a continuous event during the operation and maintenance phase, and to be reversible.



An ice throw assessment undertaken for the Port au Port Wind Farm considered 145 wind turbines each with a hub height of 120 m within the wind farm layout. The results of the analysis indicate that 90% of the nearest fragments will land between 0 m to 170 m (defined as the typical range) from the center of the wind turbine. The range extends to 200 m and 235 m for the nearest 95% and 99% of fragments, respectively. The furthest 1% of fragments would land at a distance ranging from 235 m to 290 m (defined as an exceptional range). However, the assessment concluded that it is improbable that a fragment will reach this distance during the life of the Project. The results note that ice throw events are not evenly distributed as a function of distance from the turbine and become much less frequent with distance (DNV Canada Ltd. 2023; Appendix 19-B).

The only turbines deemed to be within a range of a potential risk area are Turbine 6 (near Route 463) and Turbine 18 (near the Cape St. George community pasture). Turbine 18 is over 290 m from the Cape St. George community pasture and is of low risk in terms of potential ice throw in the vicinity of the public given the setback distance is beyond what is termed an “exceptional” distance. DNV Canada defines “exceptional” distance as a distance ranging from 235 m to 290 m (DNV Canada Ltd. 2023). Some conservative assumptions were made to reduce the impact of applicable uncertainties. The effectiveness of an icing operation protocol will have a major impact on end-results. Winter operating protocols and controls for modern turbines seek to reduce unwanted loads from iced blades, as well as reduce the risk of ice fragments striking a person or other structure, by automatically or manually stopping the wind turbine when higher icing risk conditions exist. This type of operational protocol effectively results in the reduction of ice throw hazard. As a result, a substantial proportion of the detached ice is shed locally as it thaws and slips off the blades, with most of the ice fragments dropping in the immediate vicinity of the turbine, rather than being thrown. DNV recommends a minimum safety setback of rotor radius length + 10 m to any sensitive structure or frequently accessed area by the public. No person should encroach this setback during icing conditions, even when the turbine is idle. Implementing stricter ice mitigation protocols on a project depends on the risk to the nearby public, sensitive infrastructure, and non-stationary structures, and should be evaluated on a turbine-by-turbine basis (DNV Canada Ltd. 2023). The resultant residual adverse change in designated land use during Project operation is predicted to be low in magnitude, to extend into the LAA and RAA, to be medium-term in duration and occur as a continuous event during the operation and maintenance phase, and to be reversible.

230 kV Transmission Lines and Substations

Noise emissions are expected from the transmission line substations during Project operations. The noise emissions from Project operations, including noise from substation operation, were assessed as part of the acoustic environment assessment (Chapter 7 – Acoustic Environment). Concerns related to electric and magnetic field (EMF) generation from the transmission lines are addressed in Chapter 19 (Human Health). Levels of EMF outside the ROW are anticipated to be below limits recommended by national and international agencies (Chapter 19 – Human Health). Sound levels are predicted to increase from operations, however sound levels are not predicted to increase beyond guideline criteria for nuisance or sleep disturbance (Chapter 7 – Acoustic Environment). Residual effects from the Project during operation and maintenance are anticipated to be moderate in magnitude.



Where the Project's new transmission lines run adjacent to existing buried infrastructure or overhead transmission or distribution infrastructure, an AC Interference Study will be conducted to limit induced currents and voltages and keep them at acceptable levels (Chapter 18 - Communities).

WEGH2 will continue to engage with property owners within the LAA to discuss their occupancy and potential applicable mitigation measures.

The nature of Project-related effects to PPWSAs during operation are expected to continue from the construction phase due to the presence of the transmission line ROW, but to a lesser degree.

In consideration of the mitigation and management measures described in Section 20.4, the effects on designated land use during Project operation will be adverse, low to moderate in magnitude, and occur in the LAA and RAA. The effects will be medium-term, continuous, and reversible.

Wind Farms and Associated Infrastructure, 230 kV Transmission Lines and Substations

The viewscape can be altered by physical features or works associated with the Project that are visible from outside the Project Area. Visual effects from the development of the windfarms and the 230 kV transmission lines may alter land use within the LAA and result in visual disturbance to sensitive receptors (e.g., residences, outfitters). A visual simulation and analysis were conducted to illustrate the visual appearance of Project features from selected Key Observation Points (i.e., select public accessible locations). The visual analysis simulated representative locations of the Project. This simulation provided a set of images illustrating the existing view and proposed conditions.

Each of the simulated Key Observation Points are graphically presented in the Visual Impact Assessment Study; Appendix 19-A (Stantec 2023g).

As shown in the Visual Impact Assessment Study (Appendix 19-A), some portion of the proposed wind turbines at Port au Port would be visible throughout the Visual Study Area (VSA). As shown in the simulations, it is anticipated that many residents, or those visiting the Peninsula, will mostly encounter views of the turbines within the middleground and background distance zones. Typical views for the general public will occur along Routes 460 and 463 and those along the coastline will have the opportunity to view the turbines along Table Mountain. Views of turbines on Table Mountain are possible from the outskirts of the community of Stephenville or near the Airport. Some portion of the Codroy Wind Farm will be visible along the VSA bisecting the Trans-Canada Highway corridor and northern coastline communities. As illustrated in the simulations (Visual Impact Assessment Study – Appendix 19A), the turbines will appear small, be seen only as a part of the larger landscape and can be affected by atmospheric conditions (e.g., cloud cover). It is possible for travelers along the Trans-Canada Highway to view the proposed turbines and 230 kV transmission line. It is anticipated that many tourists and residents will likely encounter views of the turbines in the middleground and background distance zones. The 230 kV transmission line will often be visible from locations where structures from existing lines are already visible. Views will typically be in the foreground and views for a greater number of the public will generally occur along the Trans-Canada Highway and at Stephenville. This simulation analysis does consider Project appearance, topography, the presence of vegetation, distance, and other factors that may reduce potential visibility. Permanent navigation lighting will likely be installed at each of the turbine



sites. The range of visibility of Project wind turbines across the visual landscape suggests the potential for incompatible views from both near and far. The level of the impact is dependent on viewer sensitivity to visual change among other influencing factors. The 230 kV transmission line will not likely affect the overall aesthetic character of the VSA, given other existing transmission lines. As such, the simple presence of the Port au Port and Codroy Wind Farms and 230 kV transmission line is not anticipated to have a visual impact or a negative effect on the VSA (Stantec 2023g).

Hydrogen / Ammonia Production and Storage Facilities

The hydrogen / ammonia plant will operate in a brownfield site at the Port of Stephenville in a combined facility with utility services and support infrastructure (Section 2.3.4; Figure 2.18). The location is already disturbed and zoned for industrial use. No interaction with designated land use will occur, as no further ground disturbance will be required within the Project Area. Therefore, there is no potential for Project-related effects from operation of the hydrogen / ammonia plant on designated land use.

During operation, there will be nighttime safety lighting within the Project Area (i.e., buildings, parking lots, along access roads). The final lighting design will use minimum lighting levels recommended by the Illuminating Engineering Society of North America's Lighting Handbook for outdoor worksite lighting. Light trespass and glare will be reduced using full cut-off luminaires to light in work areas, where possible. With mitigation, the levels of light trespass and glare are expected to be maintained below guidelines for low, sparsely inhabited rural areas (Chapter 6 – Atmospheric Environment).

Port Facilities

The Port of Stephenville will be used to support wind farm operation with the electrolyzer and ammonia facilities in operation. Once the existing Port facilities are restored, the Port will continue to support Project operation. No further interaction will occur with designated land use, as no further ground disturbance will be required within the PA. As such, there is no potential for Project-related effects from operation of the Port facilities on designated land use. The highest predicted sound pressure levels at the nearest receptors (i.e., the campground located near Port Harmon) from the operation of Port facilities, was 43 dBA during the day-night, which does not exceed Health Canada's regulatory threshold for sound (i.e., 45 dBA).

Summary

With the implementation of mitigation and management measures, residual effects from the Project during operation and maintenance on change in designated land use are anticipated to be low (i.e., a small, measurable change in land and resource use capacity, however activities can take place at or near current levels) to moderate in magnitude (for sound levels). Project effects on land use are expected to occur within the Project Area (from the direct loss of area accessible to land and resource users), LAA (from indirect sensory disturbances) and potentially extend to the RAA with no timing sensitivity. During operation, residual effects are expected to be medium-term in duration and continuous in frequency. Effects will occur within a relatively disturbed/undisturbed socio-economic context. Based on the information above, a summary of residual effects on change in designated land use during the operation and maintenance phase is provided in Table 20.7.



Table 20.7 Summary of Effects by Project Component for Change in Designated Land Use During Operation and Maintenance

Project Site	Summary of Effect during Operation and Maintenance
Temporary Workforce Accommodations	As there are no interactions anticipated between the temporary workforce accommodations and designated land use, no residual effects are anticipated.
Port au Port Wind Farm and Associated Infrastructure	During operation, no new interactions with designated lands, including those associated with access, are anticipated. Signage will remain around the turbine sites to alert land users of the presence of the Project and its facilities. Sensory disturbances, as described in the previous section, will continue through operation due to changes in sound quality from on-site operation. At each turbine site, rotation of the wind turbines will generate in increased sound levels. The access road network connecting the wind farm sites to the main highways will remain in place for the life of the Project. The presence of new access routes may lead to an increase in traffic (i.e., ATVs, snowmobiles) through the PPWSAs and could potentially cause adverse effects on water supplies. During operation, there will be nighttime safety lighting within the Project Area (i.e., buildings, parking lots, along access roads). It was determined that 498 of the 790 receptors in or near the Port au Port Wind Farm will experience no shadow flicker, and 292 receptors may be affected by shadow flicker to varying degrees. An ice throw assessment undertaken for the Port au Port Wind Farm identified two turbines deemed to be within a range of a potential risk area, Turbine 6 (near Route 463) and Turbine 18 (near the Cape St. George community pasture). Turbine 18 near Cape St. George community (i.e., > 290 m) pasture is of low risk in terms of potential ice throw in the vicinity of the public given that the setback distance is beyond what is termed an "exceptional" distance. Some portion of the proposed wind turbines at Port au Port would be visible. It is anticipated that many residents, or those visiting the Peninsula, will mostly encounter views of the turbines within the middleground and background distance zones.
Codroy Wind Farm and Associated Infrastructure	During operation, no new interactions with designated lands, including those associated with access, are anticipated. Signage will remain around the turbine sites to alert land users of the presence of the Project and its facilities. Sensory disturbances, as described in the previous section, will continue through operation due to changes in sound quality from on-site operation. At each turbine site, rotation of the wind turbines will generate in increased sound levels. The access road network connecting the wind farm sites to the main highways will remain in place for the life of the Project. The presence of new access routes may lead to an increase in traffic (i.e., ATVs, snowmobiles) through the PPWSAs and could potentially cause adverse effects on water supplies. During operation, there will be nighttime safety lighting within the Project Area (i.e., buildings, parking lots, along access roads). It was determined that seven of the 15 receptors in or near the Codroy Wind Farm will experience no shadow flicker, and eight receptors may be affected by shadow flicker to varying degrees. Some portion of the Codroy Wind Farm will be visible along the Trans-Canada Highway corridor and northern coastline communities. The turbines will appear small, be seen only as a part of the larger landscape and can be affected by atmospheric conditions (e.g., cloud cover). It is anticipated that many tourists and residents will likely encounter views of the turbines in the middleground and background distance zones.



Table 20.7 Summary of Effects by Project Component for Change in Designated Land Use During Operation and Maintenance

Project Site	Summary of Effect during Operation and Maintenance
230 kV Transmission Lines and Substations	Sound levels are predicted to increase from operations, however sound levels are not predicted to increase beyond guideline criteria for nuisance or sleep disturbance. Where the Project's new transmission lines run adjacent to existing buried infrastructure or overhead transmission or distribution infrastructure, an AC Interference Study will be conducted to limit induced currents and voltages and keep them at acceptable levels. Project-related effects to PPWSAs during operation are expected to continue from the construction phase due to the presence of the access roads and transmission line ROW, but to a lesser degree. It is possible for travelers along the Trans-Canada Highway to view the 230 kV transmission line. The 230 kV transmission line will often be visible from locations where structures from existing lines are already visible. Views will typically be in the foreground and views for a greater number of the public will generally occur along the Trans-Canada Highway and at Stephenville.
Hydrogen / Ammonia Production and Storage Facilities	No interaction with designated land use will occur, as no further ground disturbance will be required within the Project Area. Therefore, there is no potential for Project-related effects from operation of the hydrogen / ammonia plant on designated land use. During operation, there will be nighttime safety lighting within the Project Area (i.e., buildings, parking lots, along access roads).
Port Facilities	No further interaction will occur with designated land use, as no further ground disturbance will be required within the PA. As such, there is no potential for Project-related effects from operation of the Port facilities on designated land use.

20.5.1.3 Decommissioning and Rehabilitation

Decommissioning and rehabilitation activities have the potential to disrupt designated land use similar to construction activities; however, this phase will also allow for the restoration of affected land use and access. The residual effects considered below are also generally deemed to have no sensitivity with respect to the timing of construction activities, as timing will have no effect on designated land use. Noise emissions, vibration, and use of light during decommissioning and rehabilitation are typically much less than during construction and operation and can be effectively managed through standard operating procedures and best management practices.

Temporary Workforce Accommodations

The temporary workforce accommodations will resume operations during the decommissioning and rehabilitation phase of the Project, as they will be used to house Project personnel engaged in decommissioning and rehabilitation activities related to key Project components (i.e., the Port au Port and Codroy Wind Farms and associated infrastructure, the 230 kV transmission lines and substations, hydrogen / ammonia production and storage facilities, and Port facilities). Following the completion of other Project-related decommissioning and rehabilitation activities, the temporary workforce accommodations themselves will be decommissioned and the camp site(s) will be rehabilitated.

Following the completion of decommissioning and rehabilitation, the rehabilitated workforce accommodation camp site(s) will be publicly accessible and available for use.



Port au Port and Codroy Wind Farms and Associated Infrastructure

Decommissioning activities will ultimately lead to the restoration of turbine sites and associated infrastructure, including access, across most of the Project Area and will beneficially affect designated lands through the removal of Project infrastructure and restoration of lands to a natural condition for land use activities. A description of the Waste Management Plan is provided in Section 2.10.2. During rehabilitation activities, waste materials will be removed, equipment and infrastructure cleaned and removed, natural drainage patterns re-established to the extent practicable, and areas graded to promote natural revegetation. The sites will be relinquished to the Crown and private landowners when they are deemed rehabilitated. During decommissioning and rehabilitation, the Project is anticipated to have a low magnitude effect on land use within the LAA.

Use of access roads will increase, from increased vehicle traffic, during decommissioning and rehabilitation in certain areas and isolated instances. Access roads developed for the Project will be removed upon decommissioning and rehabilitation of the wind farm sites and allowed to revegetate. Public access and use may be reconstituted in these areas once decommissioning and rehabilitation activities are complete.

230 kV Transmission Lines and Substations

The decommissioning and rehabilitation of the 230 kV transmission lines and substations will restore the affected lands to pre-disturbance conditions. The ROW will be available to the public for use after final decommissioning and rehabilitation.

Hydrogen / Ammonia Production and Storage Facilities

In the case of the hydrogen / ammonia plant and storage facilities, decommissioning and rehabilitation will return the lands to the industrial land base in an already disturbed environment.

Port Facilities

Decommissioning and rehabilitation of the renovated Port facilities will return the footprint to the existing Port land base in an already disturbed environment.

Summary

During decommissioning and rehabilitation, residual effects are expected to be low magnitude, extend to the Project Area and LAA, with no timing sensitivity, and be short-term, continuous to irregular in frequency, and reversible. The residual effects will be reversible upon Project rehabilitation. Effects will occur within a relatively disturbed/undisturbed socio-economic context. Based on the information above, a summary of residual effects on change in land use during the decommissioning and rehabilitation phase is provided in Table 20.8.



Table 20.8 Summary of Effects by Project Component on Change in Designated Land Use During Decommissioning and Rehabilitation

Project Site	Summary of Effect during Decommissioning and Rehabilitation
Temporary Workforce Accommodations	The temporary workforce accommodations will resume operations during the decommissioning and rehabilitation phase of the Project, as they will be used to house Project personnel engaged in decommissioning and rehabilitation activities. The temporary workforce accommodations themselves will be decommissioned and the camp site(s) will be rehabilitated, and the sites will be publicly accessible and available for use.
Port au Port Wind Farm and Associated Infrastructure	Decommissioning activities will ultimately lead to the restoration of turbine sites and associated infrastructure, including access, across most of the Project Area and will beneficially affect designated lands through the removal of Project infrastructure and restoration of lands to a natural condition for land use activities. Use of access roads will increase in certain areas and isolated instances. Access roads will be removed and allowed to revegetate. Public access and use may be reconstituted in these areas once activities are complete.
Codroy Wind Farm and Associated Infrastructure	Decommissioning activities will ultimately lead to the restoration of turbine sites and associated infrastructure, including access, across most of the Project Area and will beneficially affect designated lands through the removal of Project infrastructure and restoration of lands to a natural condition for land use activities. Use of access roads will increase in certain areas and isolated instances. Access roads will be removed and allowed to revegetate. Public access and use may be reconstituted in these areas once activities are complete.
230 kV Transmission Lines and Substations	The decommissioning and rehabilitation of the 230 kV transmission lines and substations will restore the affected lands to pre-disturbance conditions. The ROW will be available to the public for use.
Hydrogen / Ammonia Production and Storage Facilities	Decommissioning and rehabilitation will return the lands to the industrial land base in an already disturbed environment.
Port Facilities	Decommissioning and rehabilitation will return the footprint to the existing Port land base in an already disturbed environment.

20.5.2 Change in Commercial / Industrial Resource Use

20.5.2.1 Construction

Construction activities may result in the direct loss of local commercial / industrial resource use areas through wind farm site preparation and construction / installation of associated infrastructure and equipment (i.e., collector lines, access roads, 230 kV transmission lines, substations), disturbance and interference with resource extraction activities from the physical footprint of the Project, and indirect loss through reduced and/or disruption of access to resource use areas.

The Project Area and/or LAA overlaps areas that are currently used for various commercial and industrial LRU activities, including:

- tenured Crown lands for mining, quarrying, petroleum development, and associated exploration activities, potentially including mining and petroleum production leases



- commercial forestry lands, including tenured Crown lands held by Corner Brook Pulp and Paper
- agricultural areas of interest on Crown land.

For the protection of public safety, public access to portions of the Project Area related to the temporary workforce accommodation camp(s), the Port au Port Wind Farm and associated infrastructure, the Codroy Wind Farm and associated infrastructure, the 230 kV transmission lines and substations, the hydrogen / ammonia production and storage facilities, and the Port facilities will be temporarily restricted while site preparation and construction activities are carried out within those particular areas. This will temporarily restrict access to those areas by resource users during the construction phase. However, these restrictions will not occur throughout the entire Project Area simultaneously and will instead be incremental and limited to those segments of the Project Area in which construction is actively underway. The residual effects considered below are also generally deemed for the most part to have no sensitivity with respect to the timing of construction activities, as timing will have no effect on most commercial / industrial resource use. There is potential for construction activities to have some effects on agricultural use (e.g., annual cropping, grazing) that is deemed to be of moderate to high sensitivity from a timing perspective.

Temporary Workforce Accommodations

One temporary worker accommodation camp will be located near the Port of Stephenville. A separate temporary workforce accommodation camp will be required to house workers near the Codroy Wind Farm. The Codroy / Bay St. George South area is more remote in nature and the construction of the associated camp and presence of workers may detract from the rural land base. Various activities during construction of the accommodation camp(s), including the use of construction vehicles and equipment, will generate noise, vibration, dust, and other air emissions that could be perceived by, and cause disturbance to resource users. These emissions will be low in magnitude, short-term in duration and are generally anticipated to be similar in nature, magnitude, and extent to the emissions associated with past and present development activities in the surrounding LAA and RAA (e.g., residential development in the Stephenville area and cottage development in the Codroy area). Such emissions would not typically be expected to measurably affect the activities of resource users, although they may be considered relatively more of a nuisance in Bay St. George South / Codroy than in Stephenville due to the varying ecological / socio-economic contexts in the two areas.

Port au Port and Codroy Wind Farms and Associated Infrastructure

Project construction has the potential to interact with mining, quarry, mineral and petroleum exploration activities in the Project Area and LAA by potentially disturbing or interfering with current/future operations/extraction activities.

There are eight quarry sites (commercial permits) in the Port au Port Wind Farm area and along the route for the proposed 230 kV transmission lines comprising 0.2 km². Five are in the vicinity of Aguathuna, two are along Romains Brook Forest Access Road, and one is near South West Brook River Bridge.



As part of a process of soliciting Government Screening Agency Comments on the Project, the Mines Branch indicated that quarry materials (e.g., aggregate, fill, rock, stone, boulders, gravel, sand, clay, borrow material, etc.) required for the Project must be sourced from either: 1) a site covered by a quarry permit or quarry lease, 2) an external source as a byproduct of an approved development, or 3) within the legal boundary of the Project site (e.g., within the legal boundary of the corresponding land title or road right-of-way) provided that their excavation would be in compliance with other permits and understandings). Given the volume of quarry materials that may be required for road construction and upgrading and concrete production and given that there are relatively few active quarry sites located on the Port au Port Peninsula (several, mostly small sites at Aguathuna, another small site near Mainland-Point Les Vaches), the primary source of material will be from road cuts.

There are three mineral tenure impost lands (fee simple mining grant/concession land) comprising 2.6 km², and one petroleum lease located within the Project Area in the vicinity of the Port au Port Wind Farm. In addition, there are 13 staked claims comprising 17.6 km² intersecting the Project Area.

The Department of Industry, Energy and Technology is currently in the process of issuing a mining lease as per section 31 of the *Mineral Act* corresponding to CEMEX's (formerly Atlantic Minerals Ltd.) planned expansion area (eastern half of the mining lease) and the area of potential future additional expansion (western half). As per section 33 of the *Mineral Act*, after the issuance of the mining lease, a surface lease shall be issued to provide the surface rights necessary to site the mining operation and associated infrastructure within and near the area of the mining lease.

WEGH2 considered the potential interaction of CEMEX's mining operation (current and potential future) on the Project. Appropriate minimum setback of Project features from the boundaries of current and planned mining leases, surface leases, and any other features associated with the mining operation will be developed in accordance with applicable site plans prior to the beginning of construction.

Given the number of mineral dispositions and quarry sites affected by the Project (Section 20.2.2.2, Figure 20.5), the effect is anticipated to be low in magnitude for the Project Area.

The Geoscience division expressed no objections to the turbine foundation excavation depth (i.e., 2 to 5 m) or the operational footprint (i.e., 0.4 to 1.2 ha) if a caveat is upheld that WEGH2 will enter into a common use agreement with local stakeholders, which will allow mutual use of land once construction of the turbines is completed. The Geoscience division requested that the proponent relocate turbines 1 – 9 in the Port au Port Wind Farm as they are currently situated on Production Lease 2002-01(A) to Enegi Oil Inc./ Geston Resources Ltd. Section 39 of the Petroleum Regulations provides the lessee with exclusive rights to develop a petroleum pool in and produce petroleum from the area, without interference. The layout of the turbines has subsequently been revised, however turbines 1 – 7 currently remain within the production lease. WEGH2 will work towards final siting of these turbines to avoid conflict and interference with the production lease during the detailed design.

The area affected by the turbine footprints from clearing and construction activities will be continuous for the period of construction and short term in duration. Land clearing for Project features will remove potentially commercially harvestable timber in FMD 14. The Project and features will account for approximately 41 km² of the total area cleared in FMD 14. The Project will result in a decline of 1.4 % of



the total commercial forest area. The removal of forest land from the commercial forest area could affect the determination of annual allowable cut (AAC) levels. The adverse effect on AAC will be a continuous event because the affected productive forest land will remain deforested for the duration of the Project. Commercially harvestable timber is required to be managed as such by WEGH2 under a cutting permit and other authorizations required to be obtained for the component site works. Burning of cleared brush during the forest fire season on forest land or within 300 m of forest land is only allowed with a permit to burn issued by the local Forestry and Wildlife District Office under the Forestry Act. Permit holders are required to conduct burning activity in accordance with strict conditions. WEGH2 will consult with stakeholders and NLDFFA prior to construction activities, and merchantable timber will be salvaged and used, or it will be made available to local communities, if legally permitted, as reflected within the Domestic Woodcutting Consultation Plan (Appendix 4-B). The adverse effect on the commercial forest, therefore, is anticipated to be low in magnitude and restricted to the Project Area. The loss of commercial forest area (i.e., timber cut on Crown land) will only have a small effect on productive forestland.

In consideration of mitigation and management measures described in Section 20.4, Project-related effects from construction of the wind farms and associated infrastructure will be adverse, low in magnitude, and occur in the Project Area and LAA with no timing sensitivity. The effects will be short-term, continuous to irregular, and reversible.

230 kV Transmission Lines and Substations

There are three Agricultural Areas of Interest (AAOIs) available for application that are overlapped by the Project Area (principally for the 230 kV transmission lines) northeast of the Codroy / Bay St. George South area, specifically plots #77 Mitchells Pond (0.6 km²), #80 Middle Brook (0.5 km²), and #84 Fischells (0.6 km²). There are no plots of land designated for agriculture purposes on the Port au Port Peninsula.

Project construction has the potential for agricultural resource area loss and disturbance of the agricultural areas of interest within the Project Area and LAA. Effects can include disturbance to the agricultural resource from the installation of transmission line tower foundations, geotechnical drilling, and substation footprints. There is potential for conflict with agricultural activities during the growing season. Generally, construction in the winter season is beneficial to agricultural activities because of the lower potential for conflict due to decreased intensity and frequency of agricultural activities during this season. WEGH2 will enter into a common use agreement with local stakeholders, which will allow mutual use of land once construction of the transmission towers is completed.

The Project-related effect from construction of the 230 kV transmission lines and substations on commercial/industrial land use is anticipated to be low in magnitude for the Project Area and LAA. The area affected by clearing of the transmission line ROW and construction activities will be continuous for the period of construction and short term in duration. Some effects to agricultural use (e.g., annual cropping, grazing) have moderate to high sensitivity to timing of construction activities. The effects will be reversible once construction has ended.



Hydrogen / Ammonia Production and Storage Facilities

Construction of the hydrogen / ammonia plant will occur within already identified brownfield and disturbed areas zoned for industrial use. There will be negligible adverse Project-related effects on mining, quarry, mineral and petroleum exploration, productive forestry lands of commercial importance, or agricultural areas of interest during the construction phase. The effects will be limited to the Project Area and LAA, short-term, irregular, and reversible.

Port Facilities

Renovations to the Port facilities will occur within already identified brownfield and disturbed areas zoned for industrial use. There will be negligible adverse Project-related effects on mining, quarry, mineral and petroleum exploration, productive forestry lands of commercial importance, or agricultural areas of interest during the construction phase. The effects will be limited to the Project Area and LAA, short-term, irregular, and reversible.

Summary

With the implementation of mitigation and management measures, residual effects from Project construction on a change in commercial / industrial resource use are anticipated to be negligible (for hydrogen / ammonia plant and Port facilities) to low in magnitude for other Project features (wind farms, 230 kV transmission lines). Project construction effects on commercial / industrial resource use are expected to occur within the Project Area (from the direct loss of area) and LAA (from indirect sensory disturbances). During construction, residual effects are expected to be short term and continuous to irregular in frequency. Some effects to agricultural use (e.g., annual cropping, grazing) have moderate to high sensitivity to timing of construction activities. The effects will be reversible once construction has ended. Effects will occur within a relatively disturbed/undisturbed socio-economic context. Based on the information above, a summary of residual effects on change in commercial / industrial resource use during the construction phase is provided in Table 20.9.

Table 20.9 Summary of Effects by Project Component on Change in Resource Use During Construction

Project Site	Summary of Effect during Construction
Temporary Workforce Accommodations	Various activities during construction of the accommodation camp(s), including the use of construction vehicles and equipment, will generate noise, vibration, dust, and other air emissions that could be perceived by, and cause disturbance to resource users. Such emissions would not typically be expected to measurably affect the activities of resource users, although they may be considered relatively more of a nuisance in Codroy Bay St. George South than in Stephenville due to the varying ecological / socio-economic contexts in the two areas.



Table 20.9 Summary of Effects by Project Component on Change in Resource Use During Construction

Project Site	Summary of Effect during Construction
Port au Port Wind Farm and Associated Infrastructure	There are three mineral tenure impost lands (fee simple mining grant/concession land) comprising 2.6 km², and one petroleum lease located within the Project Area in the vicinity of the Port au Port Wind Farm. In addition, there are 13 staked claims comprising 17.6 km² and eight quarry permits comprising 0.2 km² intersecting the Project Area. Turbines are currently situated on a petroleum Production Lease 2002-01(A) and are subject to final siting to avoid conflict/interference during detailed design. Land clearing for Project features will remove potentially commercially harvestable timber in FMD 14. The Project and features will account for approximately 41 km² of the total area cleared in FMD 14. The Project will result in a decline of 1.4 % of the total commercial forest area.
Codroy Wind Farm and Associated Infrastructure	Land clearing for Project features will remove potentially commercially harvestable timber in FMD 14. The Project and features will account for approximately 41 km² of the total area cleared in FMD 14. The Project will result in a decline of 1.4 % of the total commercial forest area.
230 kV Transmission Lines and Substations	There are eight quarry sites (commercial permits) along the route for the proposed 230 kV transmission lines. There are three Agricultural Areas of Interest (AAOIs) that are overlapped by the Project Area (for the 230 kV transmission lines) northeast of the Codroy / Bay St. George South area, specifically plots #77 Mitchells Pond (0.6 km²), #80 Middle Brook (0.5 km²), and #84 Fischells (0.6 km²). Project construction has the potential for agricultural resource area loss and disturbance of the agricultural areas of interest. Effects can include disturbance to the agricultural resource from the installation of transmission line tower foundations, geotechnical drilling, and substation footprints. There is potential for conflict with agricultural activities during the growing season.
Hydrogen / Ammonia Production and Storage Facilities	Construction of the hydrogen / ammonia plant will occur within already identified brownfield and disturbed areas zoned for industrial use. There will be negligible adverse Project-related effects on commercial / industrial resource use.
Port Facilities	Renovations to the Port facilities will occur within already identified brownfield and disturbed areas zoned for industrial use. There will be negligible adverse Project-related effects on commercial / industrial resource use.

20.5.2.2 Operation and Maintenance

The loss of area and/or the temporary restriction of access within the wind farm sites and associated infrastructure and 230 kV transmission lines and substations will be incurred during the construction phase and potentially remain throughout the operation and maintenance phase in cases where public safety concerns exist. Any restrictions would be limited to the immediate vicinity of the infrastructure being serviced. The residual effects considered below are also generally deemed to have no sensitivity with respect to the timing of operation and maintenance activities, as timing will have no effect on commercial / industrial land use.



Temporary Workforce Accommodations

No worker accommodation camps will be required after Project construction. Given the small presence of a workforce during the operation and maintenance phase, no further Project-related effects are anticipated.

Port au Port and Codroy Wind Farms and Associated Infrastructure

During the operation and maintenance phase, there is potential for interference with current or future planned facility operations and the ability to develop mineral areas (e.g., quarry or aggregate deposits) for future commercial extraction from Project presence. Operational limitations for an operator in relation to proximity could result in a reduction of the amount of material excavated due to protection buffers (e.g., setback distance from Project features like turbine towers) implemented by lease holder to protect its infrastructure. Increased access to the turbine sites and along the cleared RoW or other access points could result in increased mineral development activity. However, other factors would contribute to new commercial mineral development, including the nature of the resource itself, market conditions and regulatory controls. An increase in access opportunities is unlikely to affect mineral development.

Except at turbine tower locations and subject to clearance or set-back restrictions and agreement on common use, mining, quarrying, mineral, and petroleum exploration activities will be able to occur adjacent or near the Project Area throughout Project operation. Project-related changes in access would likewise be maintained throughout the Project life.

Previously forested sections within the Project Area will remain cleared and unavailable for commercial forestry throughout Project operation. As the turbine sites will be maintained throughout the life of the Project, forestry uses will be negligible.

In consideration of the small size of the workforce required for operation and maintenance and mitigation and management measures described in Section 20.4, Project-related effects from operation and maintenance of the wind farms and associated infrastructure will be adverse, negligible to low in magnitude, and occur in the LAA. The effects will be medium-term, continuous, and reversible.

230 kV Transmission Lines and Substations

Except at tower locations and subject to clearance or set-back restrictions and agreement on common use, mining, quarrying, mineral, and petroleum exploration activities will be able to occur adjacent or near the Project Area throughout Project operation. Project-related changes in access would likewise be maintained throughout the Project life but would consist of temporary restrictions and be limited to the immediate vicinity of the infrastructure (e.g., transmission lines) being serviced. Components such as transformer stations will be fenced.

Previously forested sections within the Project Area will remain cleared and unavailable for commercial forestry throughout Project operation. As the 230 kV transmission line ROW and substations will be maintained throughout the life of the Project, forestry uses will be negligible.



Except at transmission line tower locations and subject to clearance or set-back restrictions from the transmission line ROW, agricultural activities will be able to occur adjacent or near the Project Area throughout Project operation and maintenance. Project-related changes in access would likewise be maintained throughout the Project life.

In consideration of the mitigation and management measures described in Section 20.4, the Project-related effects from operation and maintenance of the 230 kV transmission lines and substations will be adverse, low in magnitude, and occur in the LAA. The effects will be medium-term, continuous, and reversible.

Hydrogen / Ammonia Production and Storage Facilities

There will be no adverse Project-related effects from operation and maintenance of the hydrogen / ammonia plant on mining, quarry, mineral and petroleum exploration, productive forestry lands of commercial importance, or agricultural areas of interest. Operation of the hydrogen / ammonia plant will occur within an existing disturbed industrial area zoned for that purpose. The hydrogen / ammonia plant will be fenced which will restrict access.

Port Facilities

There will be no adverse Project-related effects from operation and maintenance of the existing Port facilities on mining, quarry, mineral and petroleum exploration, productive forestry lands of commercial importance, or agricultural areas of interest. Operation will occur within an existing Port facility.

Summary

With the implementation of mitigation and management measures, residual effects from the Project on change in commercial / industrial resource use during operation and maintenance are anticipated to be negligible to low in magnitude. Project effects on resource use are expected to occur within the Project Area (from the direct loss of area). During operation, residual effects are expected to be medium-term, continuous in frequency, and reversible upon decommissioning and rehabilitation. The adverse effect on AAC will be continuous and occur over the medium term because the affected forest land will remain deforested for the duration of the Project. Effects are reversible and will occur within a relatively disturbed/undisturbed socio-economic context. Based on the information above, a summary of residual effects on change in commercial / industrial resource use during the operation and maintenance phase is provided in Table 20.10.



Table 20.10 Summary of Effects by Project Component on Change in Resource Use During Operation and Maintenance

Project Site	Summary of Effect during Operation and Maintenance
Temporary Workforce Accommodations	As there are no interactions anticipated between the temporary workforce accommodations and commercial / industrial resource use, no residual effects are anticipated.
Port au Port Wind Farm and Associated Infrastructure	There is potential for interference with current or future planned facility operations and the ability to develop mineral areas (e.g., quarry or aggregate deposits) for future commercial extraction from Project presence. Operator limitations in relation to proximity could result in a reduction of the amount of material excavated due to protection buffers (e.g., setback distance from Project features like turbine towers) implemented by lease holder to protect its infrastructure. Increased access to the turbine sites and along the cleared ROW or other access points could result in increased mineral development activity. However, an increase in access opportunities is unlikely to affect mineral development. Except at turbine tower locations and subject to clearance or set-back restrictions and agreement on common use, mining, quarrying, mineral, and petroleum exploration activities will be able to occur adjacent or near the Project Area throughout Project operation. Project-related changes in access would likewise be maintained throughout the Project life. Previously forested sections within the Project Area will remain cleared and unavailable for commercial forestry throughout Project operation.
Codroy Wind Farm and Associated Infrastructure	There is potential for interference with current or future planned facility operations and the ability to develop mineral areas (e.g., quarry or aggregate deposits) for future commercial extraction from Project presence. Operator limitations in relation to proximity could result in a reduction of the amount of material excavated due to protection buffers (e.g., setback distance from Project features like turbine towers) implemented by lease holder to protect its infrastructure. Increased access to the turbine sites and along the cleared RoW or other access points could result in increased mineral development activity. However, an increase in access opportunities is unlikely to affect mineral development. Except at turbine tower locations and subject to clearance or set-back restrictions and agreement on common use, mining, quarrying, mineral, and petroleum exploration activities will be able to occur adjacent or near the Project Area throughout Project operation. Project-related changes in access would likewise be maintained throughout the Project life. Previously forested sections within the Project Area will remain cleared and unavailable for commercial forestry throughout Project operation.
230 kV Transmission Lines and Substations	Except at tower locations and subject to clearance or set-back restrictions and agreement on common use, and restrictions from the transmission line RoW, mining, quarrying, mineral, and petroleum exploration and agricultural activities will be able to occur adjacent or near the Project Area throughout Project operation and maintenance. Previously forested sections within the Project Area will remain cleared and unavailable for commercial forestry throughout Project operation. Project-related changes in access would likewise be maintained throughout the Project life.
Hydrogen / Ammonia Production and Storage Facilities	As there are no interactions anticipated between the hydrogen / ammonia plant and commercial / industrial resource use, no residual effects are anticipated.
Port Facilities	As there are no interactions anticipated between the Port facilities and commercial / industrial resource use, no residual effects are anticipated.



20.5.2.3 Decommissioning and Rehabilitation

Disturbance (e.g., noise, dust) to commercial / industrial resource users engaged in mining, forestry, and agricultural activities will continue throughout the decommissioning and rehabilitation phase. However, this phase will also allow for the restoration of affected land used for commercial / industrial resource use purposes. The residual effects considered below are also generally deemed to have no sensitivity with respect to the timing of decommissioning and rehabilitation activities, as timing will have no effect on commercial / industrial resource use.

Temporary Workforce Accommodations

The temporary workforce accommodations will resume operations during the decommissioning and rehabilitation phase of the Project, as they will be used to house Project personnel engaged in decommissioning and rehabilitation activities related to key Project components (i.e., the Port au Port and Codroy Wind Farms and associated infrastructure, the 230 kV transmission lines and substations, hydrogen / ammonia production and storage facilities, and Port facilities). Following the completion of other Project-related decommissioning and rehabilitation activities, the temporary workforce accommodations themselves will be decommissioned and the camp site(s) will be rehabilitated.

Following the completion of decommissioning and rehabilitation, the rehabilitated workforce accommodation camp site(s) will be accessible and available for use by commercial / industrial resource users.

Port au Port and Codroy Wind Farms and Associated Infrastructure

Depending on the end use of the wind turbine sites (including collector lines, access roads), once decommissioning and rehabilitation activities are completed, some areas may become accessible again for commercial harvest activities (e.g., mining, forestry, agriculture). The rehabilitated Project Area will likely have a mixture of accessible and inaccessible areas and hence be similar in nature to existing conditions on the sites. During Project decommissioning and rehabilitation, no new residual effects on mining, quarry, mineral and petroleum exploration, or agricultural resource use are expected. As with operation, the residual effect during Project decommissioning and rehabilitation is characterized as being negligible.

Decommissioning and rehabilitation will allow for site rehabilitation and reforestation. Decommissioning and rehabilitation and the resultant reforestation will have a low magnitude effect on productive forest land and AAC levels within the Project Area and FMD 14. Project decommissioning and rehabilitation will occur after 30 years of operation. Most of the Project Area will be rehabilitated and the land base at the end of decommissioning and rehabilitation activities will be returned to approximately pre-development topography after wind turbine infrastructure and equipment is removed. No further residual effect is anticipated.



230 kV Transmission Lines and Substations

The decommissioning and rehabilitation of the 230 kV transmission lines and substations will restore the affected lands to pre-disturbance conditions. Decommissioning and rehabilitation and the resultant reforestation will have a low magnitude effect on productive forest land and AAC levels within the Project Area and FMD 14.

Project decommissioning and rehabilitation will occur after 30 years of operation. Most of the Project Area will be rehabilitated and the land base at the end of decommissioning and rehabilitation activities will be returned to approximately pre-development topography after transmission line infrastructure and station equipment is removed. No further residual effect is anticipated.

Hydrogen / Ammonia Production and Storage Facilities

In the case of the hydrogen / ammonia plant and storage facilities, decommissioning and rehabilitation will simply return the lands to the industrial land base in an already disturbed environment.

Port Facilities

Decommissioning and rehabilitation of the renovated Port facilities will simply return the footprint to the existing Port land base in an already disturbed environment.

Summary

Adverse residual effects from decommissioning and rehabilitation on commercial / industrial resource use are expected to be negligible to low in magnitude, have no timing sensitivity, and extend to the Project Area and LAA. The effects are short-term, continuous to irregular in frequency, and are reversible. Effects will occur within a relatively disturbed/undisturbed socio-economic context. Based on the information above, a summary of residual effects on change in resource use during the decommissioning and rehabilitation phase is provided in Table 20.11.

Table 20.11 Summary of Effects by Project Component on Change in Resource Use During Decommissioning and Rehabilitation

Project Site	Summary of Effect during Decommissioning and Rehabilitation
Temporary Workforce Accommodations	The temporary workforce accommodations will resume operations, as they will be used to house Project personnel engaged in decommissioning and rehabilitation activities. Following the completion of other Project-related decommissioning and rehabilitation activities, the temporary workforce accommodations themselves will be decommissioned and the camp site(s) will be rehabilitated and will be accessible and available for use by commercial / industrial resource users
Port au Port Wind Farm and Associated Infrastructure	Depending on the end use of the wind turbine sites (including collector lines, access roads), once decommissioning and rehabilitation activities are completed, some areas may become accessible again for commercial harvest activities (e.g., mining, forestry, agriculture). The rehabilitated Project Area will likely have a mixture of accessible and inaccessible areas and be similar in nature to existing conditions on the sites. No new residual effects are expected.



Table 20.11 Summary of Effects by Project Component on Change in Resource Use During Decommissioning and Rehabilitation

Project Site	Summary of Effect during Decommissioning and Rehabilitation
Port au Port Wind Farm and Associated Infrastructure (cont'd)	Decommissioning and rehabilitation will allow for site rehabilitation and reforestation. Decommissioning and rehabilitation and the resultant reforestation will have a low magnitude effect on productive forest land and AAC levels within the Project Area and FMD 14. Project decommissioning and rehabilitation will occur after 30 years of operation. Most of the Project Area will be rehabilitated and the land base at the end of decommissioning and rehabilitation activities will be returned to approximately pre-development topography after wind turbine infrastructure and equipment is removed. No further residual effect is anticipated.
Codroy Wind Farm and Associated Infrastructure	Depending on the end use of the wind turbine sites (including collector lines, access roads), once decommissioning and rehabilitation activities are completed, some areas may become accessible again for commercial harvest activities (e.g., mining, forestry, agriculture). The rehabilitated Project Area will likely have a mixture of accessible and inaccessible areas and be similar in nature to existing conditions on the sites. No new residual effects are expected. Decommissioning and rehabilitation will allow for site rehabilitation and reforestation. Decommissioning and rehabilitation and the resultant reforestation will have a low magnitude effect on productive forest land and AAC levels within the Project Area and FMD 14. Project decommissioning and rehabilitation will occur after 30 years of operation. Most of the Project Area will be rehabilitated and the land base at the end of decommissioning and rehabilitation activities will be returned to approximately pre-development topography after wind turbine infrastructure and equipment is removed. No further residual effect is anticipated.
230 kV Transmission Lines and Substations	The decommissioning and rehabilitation of the 230 kV transmission lines and substations will restore the affected lands to pre-disturbance conditions. Decommissioning and rehabilitation and the resultant reforestation will have a low magnitude effect on productive forest land and AAC levels within the Project Area and FMD 14. Project decommissioning and rehabilitation will occur after 30 years of operation. Most of the Project Area will be rehabilitated and the land base will be returned to approximately pre-development topography after transmission line infrastructure and station equipment is removed. No further residual effect is anticipated.
Hydrogen / Ammonia Production and Storage Facilities	As there are no interactions anticipated between the hydrogen / ammonia plant and commercial / industrial resource use, no residual effects are anticipated.
Port Facilities	As there are no interactions anticipated between the Port facilities and commercial / industrial resource use, no residual effects are anticipated.

20.5.3 Change in Recreational / Subsistence Land and Resource Use

20.5.3.1 Construction

Project construction activities could spatially conflict with, restrict access to, and/or physically disturb areas that are used for recreational / subsistence LRU activities, thereby reducing the total land area available for current and future recreational / subsistence LRU. Project-related sensory disturbance and nuisance effects (i.e., noise, vibration, air emissions, and visual impacts) on recreational / subsistence land and resource users could affect the quality of their outdoor experience, change their perception of recreational / subsistence LRU activities, and/or discourage recreational / subsistence LRU activities. Site preparation and Project construction activities could also reduce resource accessibility and/or availability



for recreational / subsistence land and resource users by causing behavioural changes in targeted species, the mortality of targeted species, and/or the physical alteration or loss of lands / resources of recreational / subsistence value (e.g., through the clearing of lands used for domestic wood harvesting and/or the clearing of vegetated areas used for wild berry and/or wild plant harvesting). Project-related population growth associated with the influx of the Project workforce during the construction phase could put increased pressure on recreationally harvested resources (i.e., targeted species) and/or increase competition for the use of lands and resources for recreational / subsistence purposes.

For the protection of public safety, public access to portions of the Project Area related to the temporary workforce accommodation camp(s), the Port au Port Wind Farm and associated infrastructure, the Codroy Wind Farm and associated infrastructure, the 230 kV transmission lines and substations, the hydrogen / ammonia production and storage facilities, and the Port facilities will be temporarily restricted while site preparation and construction activities are carried out within those particular areas. This will temporarily restrict access to those areas by recreational / subsistence land and resource users during the construction phase. However, these restrictions will not occur throughout the entire Project Area simultaneously and will instead be incremental and limited to those segments of the Project Area in which construction is actively underway. The resultant residual adverse change in recreational / subsistence LRU is predicted to be limited in geographic extent to the Project Area, be short-term in duration, occur continuously during the construction phase, and be reversible. The magnitude of this residual adverse change in recreational / subsistence LRU is predicted to range from low to moderate for the following reasons:

- The hydrogen / ammonia production and storage facilities and Port facilities will be located on a privately-owned brownfield site in Stephenville that is zoned for industrial use. Recreational / subsistence LRU activities are generally less likely to occur within this portion of the Project Area than in surrounding areas outside of the Project Area, as well as generally more likely to be subject to access restrictions or other disruptions associated with other (non-Project) industrial activities. The magnitude of the residual effect caused by temporary Project-related access restrictions is therefore predicted to be low in this portion of the Project Area. The Port au Port Wind Farm and associated infrastructure, the Codroy Wind Farm and associated infrastructure, and the 230 kV transmission lines and substations will be located in relatively undisturbed areas where recreational / subsistence LRU activities are generally more likely to occur as well as generally less likely to be subject to access restrictions or other disruptions associated with other (non-Project) industrial activities. The magnitude of the residual effect caused by temporary Project-related access restrictions is therefore predicted to be moderate in these portions of the Project Area.

Project materials and equipment will be transported to the Project Area during the construction phase. As described in Section 20.5.1, it is estimated that the delivery of Project materials and equipment will require trucks to complete up to 30 daily round trips to various parts of the Project Area during the peak Project construction period. In terms of construction-related vehicles during the peak construction season, the impact to current traffic operation is expected to be low (Stantec 2023d). When a truck transporting Project materials and equipment is crossing Route 463, crossing Aguathuna Road, or making turns at intersections, it is estimated that local traffic will need to be stopped for up to five minutes to allow the truck to pass (Stantec 2023d). These temporary delays are not predicted to substantially interfere with



access to recreational / subsistence LRU areas. A Traffic Management Plan (Appendix 2-D) will be developed to address the access road network, traffic accommodation plans and logistics, and lessen effects on land and resource users during construction. Thus, the resultant residual adverse change in recreational / subsistence LRU is predicted to be low in magnitude, to extend into the RAA, to be short-term in duration and occur as a multiple irregular event during the construction phase, and to be reversible.

The Project Area and LAA partially overlap several key areas that are known to be, or have potential to be, used for recreational / subsistence LRU purposes (Table 20.12). However, recreational / subsistence LRU activities are diverse and widespread throughout the RAA and could therefore also occur in other areas, including in other areas that are overlapped by the Project Area and/or LAA. For example, areas of undeveloped land that may be used for the harvesting of wild berries, medicinal plants, or other plants for personal consumption or use are assumed to be present within the Project Area and/or LAA. Similarly, inland navigable waterways that may be used for navigation by various recreational / subsistence land and resource users are also assumed to be present within the Project Area and/or LAA. Additional information regarding the areas identified in Table 20.12 is provided in Section 20.2.2.3 above and in the Socio-economic Environment and Land and Resource Use Baseline Study (Stantec 2023b; Appendix BSA-4), which includes relevant mapping. Additional relevant information is also presented in Section 4.4.2 of the Aquatic Environment Baseline Study (Stantec 2023c; Appendix BSA-2).

Additional construction-related residual effects are described and characterized in the subsections below (under Section 20.5.3.1) for key Project components, with reference to Table 20.12. In general, the residual effects considered below will occur within areas that are relatively undisturbed or not adversely affected by human activity (i.e., for residual effects related to the Port au Port and Codroy Wind Farms and associated infrastructure and the 230 kV transmission lines and substations) as well as within areas that have been substantially previously disturbed by human development or in which human development is still present (i.e., for residual effects related to the hydrogen / ammonia production and storage facilities and the Port facilities). Although it is yet to be determined where exactly the temporary workforce accommodation camp(s) will be in Stephenville and/or Codroy / Bay St. George South, it is assumed that the ecological / socio-economic context of the Stephenville camp site will be relatively disturbed and that the ecological / socio-economic context of the Codroy / Bay St. George South camp site (if required) will be relatively undisturbed. The residual effects considered below are also generally deemed to have high sensitivity with respect to the timing of construction activities, since many recreational / subsistence LRU activities are seasonal in nature (e.g., only permitted to occur during certain hunting / trapping seasons, only permitted to occur during certain fishing seasons, or most likely to occur during certain seasons due to prevailing weather conditions).



Table 20.12 Key Known or Potential Recreational / Subsistence Land and Resource Use Areas Overlapped by the Project Area and/or LAA

Category	Known or Potential Recreational / Subsistence LRU Area (Approximate Size)	Approximate Spatial Overlap of Known or Potential Recreational / Subsistence LRU Area with Project Area	Approximate Spatial Overlap of Known or Potential Recreational / Subsistence LRU Area with LAA	Key Project Component(s) Associated with Spatial Overlap of Project Area and/or LAA with Recreational / Subsistence LRU Area
Provincial Park	Barachois Pond Provincial Park (30 km ²)	Not overlapped by Project Area	7 km ² (24% of park area)	• 230 kV transmission lines and substations
Provincial Park / Multi-Use Trail System	T'Railway Provincial Park (883 km in length)	3 km (0.3% of park area)	33 km (4% of park area)	• Codroy Wind Farm and associated infrastructure • 230 kV transmission lines and substations
Proposed Ecological Reserve	Cape John Ecological Reserve (213 km ²)	Not overlapped by Project Area	78 km ² (37% of reserve area)	• Codroy Wind Farm and associated infrastructure
Proposed Ecological Reserve	Bras Mort Bog Ecological Reserve (36 km ²)	0.9 km ² (2.5% of reserve area)	23 km ² (62% of reserve area)	• 230 kV transmission lines and substations
Proposed Transitional Reserve	Cape St. George Transitional Reserve (18 km ²)	Not overlapped by Project Area	16 km ² (87% of reserve area)	• Port au Port Wind Farm and associated infrastructure
Private Nature Reserve (owned and operated by the Nature Conservancy of Canada)	Barachois Brook Nature Reserve (1 km ²)	Not overlapped by Project Area	1 km ² (100% of nature reserve)	• 230 kV transmission lines and substations
Wildlife Management Area for Hunting / Trapping	Moose and Black Bear Management Area (MBBMA) # 6 – Corner Brook (2,230 km ²)	28 km ² (1% of management area)	213 km ² (10% of management area)	• Port au Port Wind Farm and associated infrastructure • Hydrogen / ammonia production and storage facilities • Port facilities
Wildlife Management Area for Hunting / Trapping	MBBMA # 8 – St. Georges (1,813 km ²)	19.5 km ² (1% of management area)	246 km ² (14% of management area)	• 230 kV transmission lines and substations



Table 20.12 Key Known or Potential Recreational / Subsistence Land and Resource Use Areas Overlapped by the Project Area and/or LAA

Category	Known or Potential Recreational / Subsistence LRU Area (Approximate Size)	Approximate Spatial Overlap of Known or Potential Recreational / Subsistence LRU Area with Project Area	Approximate Spatial Overlap of Known or Potential Recreational / Subsistence LRU Area with LAA	Key Project Component(s) Associated with Spatial Overlap of Project Area and/or LAA with Recreational / Subsistence LRU Area
Wildlife Management Area for Hunting / Trapping	MBBMA # 9 – Anguille Mountains (795 km ²)	107 km ² (13.5% of management area)	351 km ² (44% of management area)	• Codroy Wind Farm and associated infrastructure • 230 kV transmission lines and substations
Wildlife Management Area for Hunting / Trapping	MBBMA # 10 – Port aux Basques (2,975 km ²)	25.5 km ² (1% of management area)	121 km ² (4% of management area)	• Codroy Wind Farm and associated infrastructure • 230 kV transmission lines and substations
Wildlife Management Area for Hunting / Trapping	MBBMA # 43 – Port au Port (368 km ²)	105 km ² (28.5% of management area)	309 km ² (84% of management area)	• Port au Port Wind Farm and associated infrastructure • 230 kV transmission lines and substations
Wildlife Management Area for Hunting / Trapping	Caribou Management Area (CMA) # 61 – La Poile (9,404 km ²)	30 km ² (0.3% of management area)	226 km ² (2% of management area)	• Codroy Wind Farm and associated infrastructure • 230 kV transmission lines and substations
Wildlife Management Area for Hunting / Trapping	CMA # 62 – Buchans Plateau (6,067 km ²)	Not overlapped by Project Area	6 km ² (0.1% of management area)	• 230 kV transmission lines and substations



Table 20.12 Key Known or Potential Recreational / Subsistence Land and Resource Use Areas Overlapped by the Project Area and/or LAA

Category	Known or Potential Recreational / Subsistence LRU Area (Approximate Size)	Approximate Spatial Overlap of Known or Potential Recreational / Subsistence LRU Area with Project Area	Approximate Spatial Overlap of Known or Potential Recreational / Subsistence LRU Area with LAA	Key Project Component(s) Associated with Spatial Overlap of Project Area and/or LAA with Recreational / Subsistence LRU Area
Wildlife Management Area for Hunting / Trapping	Small Game – Willow and Rock Ptarmigan (94,400 km ²)	287 km ² (0.3% of management area)	1,260 km ² (1.3% of management area)	• Port au Port Wind Farm and associated infrastructure • Codroy Wind Farm and associated infrastructure • 230 kV transmission lines and substations • Hydrogen / ammonia production and storage facilities • Port facilities
Wildlife Management Area for Hunting / Trapping	Small Game – Ruffed and Spruce Grouse (109,747 km ²)	287 km ² (0.26% of management area)	1,260 km ² (1% of management area)	• Port au Port Wind Farm and associated infrastructure • Codroy Wind Farm and associated infrastructure • 230 kV transmission lines and substations • Hydrogen / ammonia production and storage facilities • Port facilities
Wildlife Management Area for Hunting / Trapping	Small Game – Snowshoe Hare (94,400 km ²)	287 km ² (0.3% of management area)	1,260 km ² (1.3% of management area)	• Port au Port Wind Farm and associated infrastructure • Codroy Wind Farm and associated infrastructure • 230 kV transmission lines and substations • Hydrogen / ammonia production and storage facilities • Port facilities



Table 20.12 Key Known or Potential Recreational / Subsistence Land and Resource Use Areas Overlapped by the Project Area and/or LAA

Category	Known or Potential Recreational / Subsistence LRU Area (Approximate Size)	Approximate Spatial Overlap of Known or Potential Recreational / Subsistence LRU Area with Project Area	Approximate Spatial Overlap of Known or Potential Recreational / Subsistence LRU Area with LAA	Key Project Component(s) Associated with Spatial Overlap of Project Area and/or LAA with Recreational / Subsistence LRU Area
Wildlife Management Area for Hunting / Trapping	Small Game – Red Squirrel (94,400 km ²)	287 km ² (0.3% of management area)	1,260 km ² (1.3% of management area)	• Port au Port Wind Farm and associated infrastructure • Codroy Wind Farm and associated infrastructure • 230 kV transmission lines and substations • Hydrogen / ammonia production and storage facilities • Port facilities
Wildlife Management Area for Hunting / Trapping	Fur Zone #9 – Codroy Valley (13,901 km ²)	139 km ² (2% of management area)	553 km ² (9% of management area)	• Codroy Wind Farm and associated infrastructure • 230 kV transmission lines and substations
Wildlife Management Area for Hunting / Trapping	Fur Zone #10 – Deer Lake (15,874 km ²)	146 km ² (0.1% of management area)	686 km ² (4% of management area)	• Port au Port Wind Farm and associated infrastructure • 230 kV transmission lines and substations • Hydrogen / ammonia production and storage facilities • Port facilities
Outfitter Lodge / Facility	Outfitter lodge / facility operated by Adventure Quest Outfitters & Tours Ltd. at Southwest Brook	Not overlapped by Project Area	Overlapped by LAA	• 230 kV transmission lines and substations
Outfitter Lodge / Facility	Outfitter lodge / facility operated by Moosehill Cabins Ltd. at South Branch	Overlapped by Project Area	Overlapped by LAA	• Codroy Wind Farm and associated infrastructure



Table 20.12 Key Known or Potential Recreational / Subsistence Land and Resource Use Areas Overlapped by the Project Area and/or LAA

Category	Known or Potential Recreational / Subsistence LRU Area (Approximate Size)	Approximate Spatial Overlap of Known or Potential Recreational / Subsistence LRU Area with Project Area	Approximate Spatial Overlap of Known or Potential Recreational / Subsistence LRU Area with LAA	Key Project Component(s) Associated with Spatial Overlap of Project Area and/or LAA with Recreational / Subsistence LRU Area
Outfitter Lodge / Facility	Outfitter lodge / facility operated by Moosehill Cabins Ltd. at South Branch	Overlapped by Project Area	Overlapped by LAA	Codroy Wind Farm and associated infrastructure
Outfitter Lodge / Facility	Outfitter lodge / facility operated by Moosehill Cabins Ltd. at Morris Brook	Not overlapped by Project Area	Overlapped by LAA	Codroy Wind Farm and associated infrastructure
Outfitter Lodge / Facility	Outfitter lodge / facility operated by Northside Outfitting & Adventures Ltd. at Wedding Pond	Not overlapped by Project Area	Overlapped by LAA	Codroy Wind Farm and associated infrastructure
Domestic Wood Harvest Block	C1401 Port au Port	104.1 km ² (31.5% of block)	292.0 km ² (88.3% of block)	- Port au Port Wind Farm and associated infrastructure 230 kV transmission lines and substations
Domestic Wood Harvest Block	C1402 Point au Mal	5.3 km ² (6.0% of block)	48.8 km ² (55.7% of block)	- Port au Port Wind Farm and associated infrastructure 230 kV transmission lines and substations
Domestic Wood Harvest Block	C1403 Stephenville	0.6 km ² (2.4% of block)	6.5 km ² (27.0% of block)	230 kV transmission lines and substations
Domestic Wood Harvest Block	C1404 Stephenville Crossing	1.2 km ² (2.9% of block)	15.4 km ² (37.8% of block)	230 kV transmission lines and substations - Hydrogen / ammonia production and storage facilities - Port facilities



Table 20.12 Key Known or Potential Recreational / Subsistence Land and Resource Use Areas Overlapped by the Project Area and/or LAA

Category	Known or Potential Recreational / Subsistence LRU Area (Approximate Size)	Approximate Spatial Overlap of Known or Potential Recreational / Subsistence LRU Area with Project Area	Approximate Spatial Overlap of Known or Potential Recreational / Subsistence LRU Area with LAA	Key Project Component(s) Associated with Spatial Overlap of Project Area and/or LAA with Recreational / Subsistence LRU Area
Domestic Wood Harvest Block	C1406 Main Gut	3.2 km ² (8.9% of block)	26.8 km ² (73.9% of block)	• 230 kV transmission lines and substations
Domestic Wood Harvest Block	C1410 St. George's	1.8 km ² (5.6% of block)	11.2 km ² (35.8% of block)	• 230 kV transmission lines and substations
Domestic Wood Harvest Block	C1415 Flat Bay	4.0 km ² (4.3% of block)	36.8 km ² (39.6% of block)	• 230 kV transmission lines and substations
Domestic Wood Harvest Block	C1416 Heatherton	1.9 km ² (3.6% of block)	25.4 km ² (48.3% of block)	• 230 kV transmission lines and substations
Domestic Wood Harvest Block	C1418 Mine Road	0.4 km ² (1.9% of block)	4.0 km ² (19.1% of block)	• 230 kV transmission lines and substations
Domestic Wood Harvest Block	K1449 Round Valley	40.3 km ² (25.5% of block)	119.6 km ² (75.6% of block)	• Codroy Wind Farm and associated infrastructure
Domestic Wood Harvest Block	K1450 Morris Brook	35.0 km ² (36.6% of block)	89.4 km ² (93.4% of block)	• 230 kV transmission lines and substations • Codroy Wind Farm and associated infrastructure
Domestic Wood Harvest Block	K1451 Bauld Mountain	24.3 km ² (8.6% of block)	109.1 km ² (38.9% of block)	• 230 kV transmission lines and substations • Codroy Wind Farm and associated infrastructure
Domestic Wood Harvest Block	K1459 White's Road	3.1 km ² (2.5% of block)	12.1 km ² (9.8% of block)	• 230 kV transmission lines and substations



Table 20.12 Key Known or Potential Recreational / Subsistence Land and Resource Use Areas Overlapped by the Project Area and/or LAA

Category	Known or Potential Recreational / Subsistence LRU Area (Approximate Size)	Approximate Spatial Overlap of Known or Potential Recreational / Subsistence LRU Area with Project Area	Approximate Spatial Overlap of Known or Potential Recreational / Subsistence LRU Area with LAA	Key Project Component(s) Associated with Spatial Overlap of Project Area and/or LAA with Recreational / Subsistence LRU Area
Inland Fish-Bearing Watercourse / Waterbody	Up to 53 inland watercourse / waterbody crossings by access road ROWs are fish-bearing (Stantec 2023b) and therefore have potential to be fished for recreational / subsistence purposes ¹	These 53 waterbody crossings are overlapped by the Project Area.	These 53 waterbody crossings are overlapped by the LAA. An undetermined number of other inland fish-bearing watercourses / waterbodies could also be overlapped by the LAA.	Port au Port Wind Farm and associated infrastructure
Inland Fish-Bearing Watercourse / Waterbody Crossings	Up to 72 inland watercourse / waterbody crossings by access road ROWs are fish-bearing (Stantec 2023b) and therefore have potential to be fished for recreational / subsistence purposes ¹	These 72 watercourses / waterbody crossings are overlapped by the Project Area.	These 72 waterbody crossings are overlapped by the LAA. An undetermined number of other inland fish-bearing watercourses / waterbodies could also be overlapped by the LAA.	Codroy Wind Farm and associated infrastructure
Inland Fish-Bearing Watercourse / Waterbody	Up to 102 inland watercourse / waterbody crossings by transmission line ROWs are fish-bearing (Stantec 2023b) and therefore have potential to be fished for recreational / subsistence purposes ¹	These 102 watercourse / waterbody crossings are at least partially overlapped by the Project Area.	These 102 waterbody crossings are overlapped by the LAA. An undetermined number of other inland fish-bearing watercourses / waterbodies could also be overlapped by the LAA.	230 kV transmission lines and substations
Inland Fish-Bearing Watercourse / Waterbody	Muddy Pond ²	Not overlapped by the Project Area	Overlapped entirely by LAA	- Hydrogen / ammonia production and storage facilities - Port facilities



Table 20.12 Key Known or Potential Recreational / Subsistence Land and Resource Use Areas Overlapped by the Project Area and/or LAA

Category	Known or Potential Recreational / Subsistence LRU Area (Approximate Size)	Approximate Spatial Overlap of Known or Potential Recreational / Subsistence LRU Area with Project Area	Approximate Spatial Overlap of Known or Potential Recreational / Subsistence LRU Area with LAA	Key Project Component(s) Associated with Spatial Overlap of Project Area and/or LAA with Recreational / Subsistence LRU Area
Inland Fish-Bearing Watercourse / Waterbody	Noels Pond ²	Not overlapped by the Project Area	Overlapped entirely by LAA	- Hydrogen / ammonia production and storage facilities - Port facilities
Inland Fish-Bearing Watercourse / Waterbody	Gull (Mine) Pond ²	Not overlapped by the Project Area	Overlapped entirely by LAA	- Hydrogen / ammonia production and storage facilities - Port facilities
Trail	Walk-A-Ways Nature Trail	Not overlapped by Project Area	Overlapped by LAA	- Hydrogen / ammonia production and storage facilities - Port facilities
Trail	The Gravels Walking Trail	Not overlapped by Project Area	Overlapped by LAA	- Port au Port Wind Farm and associated infrastructure 230 kV transmission lines and substations
Trail	Pine Tree Trail	Not overlapped by Project Area	Overlapped by LAA	230 kV transmission lines and substations
Trail	Top of Whaleback Trail	Overlapped by Project Area	Overlapped by LAA	230 kV transmission lines and substations
Trail	Ice Caves	Not overlapped by Project Area	Overlapped by LAA	- Port au Port Wind Farm and associated infrastructure 230 kV transmission lines and substations
Trail	Danny's Walking Trail	Not overlapped by Project Area	Overlapped by LAA	230 kV transmission lines and substations
Trail	Joey's Lookout Trail	Overlapped by Project Area	Overlapped by LAA	- Hydrogen / ammonia production and storage facilities - Port facilities



Table 20.12 Key Known or Potential Recreational / Subsistence Land and Resource Use Areas Overlapped by the Project Area and/or LAA

Category	Known or Potential Recreational / Subsistence LRU Area (Approximate Size)	Approximate Spatial Overlap of Known or Potential Recreational / Subsistence LRU Area with Project Area	Approximate Spatial Overlap of Known or Potential Recreational / Subsistence LRU Area with LAA	Key Project Component(s) Associated with Spatial Overlap of Project Area and/or LAA with Recreational / Subsistence LRU Area
Trail	Lewis Hills International Appalachian Trail	Not overlapped by Project Area	Overlapped by LAA	Port au Port Wind Farm and associated infrastructure
Trail	Snowmobiling Trail (NL Snowmobile Federation)	Overlapped by Project Area	Overlapped by LAA	230 kV transmission lines and substations - Hydrogen / ammonia production and storage facilities - Port facilities
Unique Site	The Gravels	Not overlapped by Project Area	Overlapped by LAA	230 kV transmission lines and substations
Unique Site	Cape St. George Community Pasture	Not overlapped by Project Area	Overlapped by LAA	Port au Port Wind Farm and associated infrastructure
Unique Site	Hidden Falls	Not overlapped by Project Area	Overlapped by LAA	Port au Port Wind Farm and associated infrastructure
Unique Site	Kippens Community Garden	Not overlapped by Project Area	Overlapped by LAA	230 kV transmission lines and substations
Notes: ¹ The Project will require up to 360 watercourse crossings, including up to 125 crossings associated with the ROWs for the Port au Port Wind Farm access roads, up to 95 crossings associated with the ROWs for the Codroy Wind Farm, and up to 140 crossings associated with the transmission line ROWs. Based on apparent connectivity with downstream watercourses / waterbodies, 227 of the inland watercourses / waterbodies in which Project-related crossings could occur are assumed to be fish-bearing (Stantec 2023b). To support a conservative assessment (i.e., an assessment that is more likely to overestimate than underestimate potential effects), it is therefore assumed that these 227 watercourses / waterbodies have potential to be fished for recreational / subsistence purposes. ² Muddy Pond, Noels Pond, and Gull (Mine) Pond were determined to contain fish habitat (Stantec 2023b). To support a conservative assessment (i.e., an assessment that is more likely to overestimate than underestimate potential effects), it is therefore assumed that these three waterbodies have potential to be fished for recreational / subsistence purposes.				



Temporary Workforce Accommodations

Temporary workforce accommodations will be constructed in support of the Project and will be operational during the construction phase of the Project.

Project-related site preparation (e.g., clearing) and camp construction activities may reduce the quantity / quality of lands and resources available for recreational / subsistence LRU activities. The resulting residual adverse change in recreational / subsistence LRU is predicted to be low in magnitude, limited in geographic extent to the Project Area, medium-term in duration (since the temporary workforce accommodation camp[s] will be present during every phase of the Project, although only operational during the construction and decommissioning phases), continuous in frequency, and reversible. It is anticipated that the area(s) to be occupied by the temporary workforce accommodation camp(s) will represent only a small proportion of the total area available for recreational / subsistence LRU activities within the surrounding LAA and RAA.

Various activities during construction of the accommodation camp(s), including the use of construction vehicles and equipment, will generate noise, vibration, dust, and other air emissions that could be perceived by, and cause disturbance to, recreational / subsistence land and resource users and/or targeted species. However, these emissions will be short-term in duration and are generally anticipated to be similar in nature, magnitude, and extent to the emissions associated with past and present development activities in the surrounding LAA and RAA (e.g., residential development in the Stephenville area and cottage development in the Codroy / Bay St. George South area). Such emissions would not typically be expected to measurably affect the activities of recreational / subsistence land and resource users or the success of those activities, although they may be considered relatively more of a nuisance in Codroy than in Stephenville due to the varying ecological / socio-economic contexts in the two areas. The resulting residual adverse change in recreational / subsistence LRU is predicted to range from negligible (in the Stephenville area) to low (in the Codroy area) in magnitude and be geographically limited to the LAA.

Project construction activities, such as clearing, grubbing, and excavation, will result in the loss of trees and other vegetation within the Project Area, potentially including species of value to domestic wood harvesters and other recreational / subsistence land and resource users (e.g., wild berry and/or wild plant harvesters). However, alternative harvesting areas are available outside of the Project Area and efforts will be made, where practicable, to avoid or reduce the loss of vegetation in key harvesting areas through the micro-siting of Project components during detailed design. Various Project construction activities could also result in incidental wildlife mortality, including the mortality of wildlife species of value to recreational / subsistence land and resource users, due to physical interactions with Project vehicles and equipment. The residual adverse change in LRU associated with the mortality of targeted vegetation and wildlife species is predicted to be low in magnitude, geographically limited to the Project Area, short-term in duration and occurring as a single event (for the mortality of cleared vegetation) or multiple irregular event (for incidental wildlife mortality) during the construction phase, and reversible.



Approximately 1200-1,500 Project personnel will be housed at a temporary workforce accommodation camp in Stephenville during the construction phase of the Project, and an additional 500 Project personnel may be housed at a separate temporary workforce accommodation camp near the Codroy Wind Farm. As indicated in Table 20.4, hunting, fishing, and the harvesting of wildlife, fish, and plant resources will be strictly prohibited on Project work sites; Project personnel will not be permitted to hunt / fish / harvest while staying at the workforce accommodation camp(s); and Project personnel will not be permitted to bring firearms or angling gear to the workforce accommodation camp(s). Thus, the resulting residual adverse change in recreational / subsistence LRU associated with increased pressure on recreationally harvested resources (i.e., targeted species) and/or increase competition for the use of lands and resources for recreational / subsistence purposes is predicted to be low in magnitude but could extend to the RAA.

The presence of Project personnel at the camp site(s) and operation and maintenance of the camp(s) (which will occur during the construction phase of the Project) will be associated with temporary and localized noise emissions and other potential nuisance impacts that could adversely affect recreational / subsistence land and resource users and/or targeted species in proximity to the accommodations camp(s). The resulting change in recreational / subsistence LRU is predicted to be low in magnitude, limited to the LAA, short-term in duration, continuous during the construction phase, and reversible.

Port au Port and Codroy Wind Farms and Associated Infrastructure

The Project Area for the Port au Port Wind Farm and associated infrastructure will occupy a total of approximately 117.6 km² of which approximately 104.2 km² will be located on the Port au Port Peninsula and approximately 13.4 km² will be located northeast of the Port au Port isthmus. The Project Area for the Codroy Wind Farm and associated infrastructure will occupy a total of approximately 121.1 km².

The Project Area and LAA in the vicinity of the Port au Port and Codroy Wind Farms partially overlap several key areas that are known to be, or have potential to be, used for recreational / subsistence LRU purposes (Table 20.12). However, recreational / subsistence LRU activities are diverse and widespread throughout the RAA and could therefore also occur in other areas that are not identified in Table 20.12, including in other areas that are overlapped by the Project Area and/or LAA; Table 20.12 is not intended to be exhaustive. Areas of undeveloped land that may be used for the harvesting of wild berries, medicinal plants, or other plants for personal consumption or use are also assumed to be present within the Project Area and/or LAA but are not identified or quantified in Table 20.12. Similarly, inland navigable waterways that may be used for navigation by various recreational / subsistence land and resource users are also assumed to be present within the Project Area and/or LAA but are not identified or quantified in Table 20.12.



Construction of the Port au Port and Codroy Wind Farms and associated infrastructure, in combination with the construction of other Project components, could result in the direct alteration / disturbance or loss of lands and resources in the following key recreational / subsistence LRU areas that are identified in Table 20.12:

- **Key recreational / subsistence land and resource use areas that are located within the Project Area in the vicinity of the Port au Port Wind Farm (alteration or loss effects):**
 - Up to approximately 1% of the total land area associated with MBBMA #6
 - Up to approximately 28.5% of the total land area associated with MBBMA #43
 - Up to approximately 0.3% of the total land area associated with small game areas for willow and rock ptarmigan, ruffed and spruce grouse, snowshoe hare, and red squirrel
 - Up to approximately 0.1% of the total land area associated with Fur Zone #10
 - Up to approximately 26.1% of the total land area associated with domestic wood harvest blocks (i.e., C1401, C1402)
 - An unquantified amount of undeveloped land that may be used for the harvesting of wild blueberries, medicinal plants, or other plants for personal consumption or use
- **Key recreational / subsistence land and resource use areas that are located within the Project Area in the vicinity of the Codroy Wind Farm (alteration or loss effects):**
 - Up to approximately 0.3% of the total land area associated with T'Railway Provincial Park
 - Up to approximately 13.5% of the total land area associated with MBBMA #9
 - Up to approximately 1% of the total land area associated with MBBMA #10
 - Up to approximately 0.3% of the total land area associated with CMA #61
 - Up to approximately 0.3% of the total land area associated with small game areas for willow and rock ptarmigan, ruffed and spruce grouse, snowshoe hare, and red squirrel
 - Up to approximately 2% of the total land area associated with Fur Zone #9
 - Up to approximately 18.6% of the total land area associated with domestic wood harvest blocks (i.e., K1449, K1450, K1451)
 - An unquantified amount of undeveloped land that may be used for the harvesting of wild blueberries, medicinal plants, or other plants for personal consumption or use

The amount of Project Area overlap with the key recreational / subsistence LRU areas identified above and in Table 20.12 represents a relatively small proportion of the total amount of comparable lands that are available for recreational / subsistence LRU activities outside of the Project Area (e.g., within the surrounding RAA). For example, although the Project Area overlaps up to approximately 28.5% of MBBMA #43, the RAA encompasses a total of eight MBBMAs that collectively occupy approximately 15,663 km². Therefore, the entire Project Area (for every Project component) only overlaps approximately 285 km² (or less than 2%) of the total extent of MBBMA lands within the RAA.



Project-related construction activities, including site preparation (e.g., clearing), could occur anywhere within the Project Area. The actual Project footprint (i.e., cleared area) represents approximately 14.6% (41 km²) of the total Project Area (281.5 km²). The Project Area includes a buffer of up to 175 m (350-m ROW) around key Project components to allow for micro-siting during detailed design and mitigation to avoid or reduce interactions with sensitive areas such as known recreational / subsistence LRU areas. It is therefore anticipated that some of the direct physical impacts to the recreational / subsistence LRU areas identified above can be avoided or reduced through design refinements as Project planning progresses. The residual adverse change in recreational / subsistence LRU associated with the direct alteration / disturbance or loss of the key areas identified above and in Table 20.12 is predicted to be moderate in magnitude, geographically limited to the Project Area, short-term in duration, occurring as a single event during the construction phase, and reversible.

Project construction activities, such as clearing, grubbing, and excavation, will result in the loss of trees and other vegetation within the Project Area, potentially including species of value to domestic wood harvesters and other recreational / subsistence land and resource users (e.g., wild berry and/or wild plant harvesters). However, alternative harvesting areas are available outside of the Project Area and efforts will be made, where practicable, to avoid or reduce the loss of vegetation in key harvesting areas through the micro-siting of Project components during detailed design. Various Project construction activities could also result in incidental wildlife mortality, including the mortality of wildlife species of value to recreational / subsistence land and resource users, due to physical interactions with Project vehicles and equipment. The residual adverse change in LRU associated with the mortality of targeted vegetation and wildlife species is predicted to be low in magnitude, geographically limited to the Project Area, short-term in duration, occurring as a single event (for the mortality of cleared vegetation) or multiple irregular event (for incidental wildlife mortality) during the construction phase, and reversible.

The EIS Guidelines require the proponent to develop a Domestic Woodcutting Consultation Plan (Appendix 4-B) with domestic users on the Port au Port Peninsula to determine any concerns with the Project and to develop appropriate mitigation measures. This Domestic Woodcutting Consultation Plan will be submitted to the NLDFFA for review and approval.

The construction of watercourse crossings associated with wind farm access roads will result in an interaction with the following potential recreational / subsistence LRU areas that are located within the Project Area in the vicinity of the Port au Port and Codroy Wind Farms and are identified in Table 20.12:

- Up to 53 fish-bearing inland watercourse / waterbody crossings that have potential to be fished for recreational / subsistence purposes, as well as an unquantified number of inland navigable waterways that have potential to be used for navigation by various recreational / subsistence land and resource users, in the vicinity of the Port au Port Wind Farm.
- Up to 72 fish-bearing inland watercourse / waterbody crossings that have potential to be fished for recreational / subsistence purposes, as well as an unquantified number of inland navigable waterways that have potential to be used for navigation by various recreational / subsistence land and resource users, in the vicinity of the Codroy Wind Farm.



Section 10.5 predicts that the residual adverse effects of Project construction on fish habitat quantity, fish habitat quality, and fish health and survival will be low to moderate in magnitude and concludes that Project construction is not predicted to cause significant residual adverse effects on fish and fish habitat, including with respect to targeted recreational / subsistence fishery resources. Project activities will be conducted in accordance with applicable requirements under the *Fisheries Act*, CNWA, and associated regulations, which are protective of recreational / subsistence fishery resources and navigation activities, respectively. Construction of the Port au Port and Codroy Wind Farms and associated infrastructure is therefore not expected to substantially interfere with recreational / subsistence fishing or navigation beyond the temporary access restrictions that will be implemented for public safety in portions of the Project Area where construction activities are underway. The residual adverse change in recreational / subsistence LRU associated with the interaction of fishing and navigation areas is predicted to be low in magnitude, geographically limited to the Project Area, short-term in duration, occurring as a single event during the construction phase, and reversible. Alternative recreational / subsistence fishing and navigation areas are available outside of the Project Area.

Construction-related drilling / blasting and the operation of Project construction vehicles and equipment at the Port au Port and Codroy Wind Farm sites will generate noise, vibration, fugitive dust, and other air emissions. Project construction activities will also result in visual impacts from artificial night lighting and changes to the visual landscape. These emissions and visual impacts will extend into the LAA. Construction of the Port au Port and Codroy Wind Farms and associated infrastructure, in combination with the construction of other Project components, could therefore result in sensory disturbance and associated nuisance impacts / behavioural effects to recreational / subsistence land and resource users and/or targeted species in the following key recreational / subsistence land and resource use areas that are identified in Table 20.12:

- **Key recreational / subsistence land and resource use areas that are located within the LAA in the vicinity of the Port au Port Wind Farm (sensory disturbance/nuisance effects):**
 - Approximately 87% of the total land area associated with the proposed Cape St. George Transitional Reserve
 - Approximately 10% of the total land area associated with MBBMA #6
 - Approximately 84% of the total land area associated with MBBMA #43
 - Approximately 1% of the total land area associated with the small game area for ruffed and spruce grouse
 - Approximately 1.3% of the total land area associated with small game areas for willow and rock ptarmigan, snowshoe hare, and red squirrel
 - Approximately 4% of the total land area associated with Fur Zone #10
 - Approximately 81% of the total land area associated with domestic wood harvest blocks (i.e., C1401, C1402)
 - Five trails and unique sites (i.e., The Gravels Walking Trail, Ice Caves, Lewis Hills International Appalachian Trail, Cape St. George Community Pasture, and Hidden Falls)



- An unquantified amount of undeveloped land that may be used for the harvesting of wild blueberries, medicinal plants, or other plants for personal consumption or use
- An unquantified number of fish-bearing inland watercourses / waterbodies that have potential to be fished for recreational / subsistence purposes
- An unquantified amount of inland navigable waterways that have potential to be used for navigation by various recreational / subsistence land and resource users
- **Key recreational / subsistence land and resource use areas that are located within the LAA in the vicinity of the Codroy Wind Farm (sensory disturbance/nuisance effects):**
 - Approximately 4% of the total land area associated with T'Railway Provincial Park
 - Approximately 37% of the total land area associated with the proposed Cape John Ecological Reserve
 - Approximately 44% of the total land area associated with MBBMA #9
 - Approximately 4% of the total land area associated with MBBMA #10
 - Approximately 2% of the total land area associated with CMA #61
 - Approximately 1% of the total land area associated with the small game area for ruffed and spruce grouse
 - Approximately 1.3% of the total land area associated with small game areas for willow and rock ptarmigan, snowshoe hare, and red squirrel
 - Approximately 9% of the total land area associated with Fur Zone #9
 - Approximately 59% of the total land area associated with domestic wood harvest blocks (i.e., K1449, K1450, K1451)
 - An unquantified amount of undeveloped land that may be used for the harvesting of wild blueberries, medicinal plants, or other plants for personal consumption or use
 - An unquantified number of inland fish-bearing watercourses / waterbodies that have potential to be fished for recreational / subsistence purposes
 - An unquantified number of inland navigable waterways that have potential to be used for navigation by various recreational / subsistence land and resource users

The Cape St. George Transitional Reserve is the only area proposed for protection in the Port au Port subregion and is therefore integral to the province's overall Protected Areas Plan. WEGH2 will consult with Policy, Planning, and Natural Areas Division of the NLDECC) and Wildlife Division of the NLDFFA in development of an Environmental Effects Mitigation and Monitoring Plan.

As with Cape St. George Transitional Reserve, WEGH2 will consult with Policy, Planning, and Natural Areas Division (NLDECC) and Wildlife Division (NLDFFA) on the proposed Cape John Ecological Reserve in the development of an Environmental Effects Mitigation and Monitoring Plan.

The residual adverse effects of Project construction on air quality, noise, and vibration are predicted to be low to moderate in magnitude. Construction-related residual air emissions (primarily from dust and equipment combustion gases) can temporarily decrease air quality; however, the change in air quality is



not expected to be substantive (Chapter 6 – Atmospheric Environment). Construction-related residual noise emissions are not expected to exceed applicable regulatory thresholds (Chapter 7 – Acoustic Environment). Vibration emissions from blasting will follow best management practices for carrying out blasting to reduce vibration emissions (Chapter 7 – Acoustic Environment). The residual adverse change in recreational / subsistence LRU associated with sensory disturbance and nuisance impacts / behavioural effects in the key areas identified above and in Table 20.12 is predicted to be low to moderate in magnitude, geographically limited to the LAA, short-term in duration, continuous during the construction phase, and reversible.

Although there are no known outfitter lodges / facilities in the vicinity of the Port au Port Wind Farm, outfitter operators from other areas could conduct recreational / subsistence LRU activities in this area. Two outfitter lodges / facilities in the vicinity of the Codroy Wind Farm are overlapped by the Project Area and two additional outfitter lodges / facilities in the vicinity of the Codroy Wind Farm are overlapped by the LAA. It is expected that recreational / subsistence LRU activities conducted by outfitter operators and clients within the Project Area and/or LAA would be adversely affected by the direct alteration / disturbance or loss of recreational / subsistence LRU areas in the Project Area and/or by construction-related sensory disturbance and nuisance impacts in the LAA. However, alternative recreational / subsistence LRU areas are available for use by outfitter operators and clients outside of the Project Area and LAA. Residual effects on outfitter operators and their clients will be confirmed through implementation of the Outfitter Effects Monitoring Program for the Project (refer to Section 20.8).

As described in Section 1.3.1, the Government of NL issued a Call for Land Bids in mid-December 2022, which was a competitive process to award Crown land leases for wind development, within nominated Crown land areas, through a defined evaluation process. The Port au Port and Codroy Wind Farms and associated infrastructure will be located principally on provincially owned Crown lands that are within the nominated land areas. There is, however, a potential overlap with federal contaminated land near Port au Port East (i.e., DFO Gravels site). WEGH2 is currently in consultation with federal agencies with respect to including turbines in Port au Port East as part of the Project. WEGH2 will meet applicable federal approval and permitting requirements. Project construction activities will be carried out in accordance with applicable permitting requirements, including Crown land leasing requirements and associated restrictions. The Government of NL completed a detailed review and analysis of the nominated land areas, including a review of the proposed use of the land, existing land uses, and engagement with communities and Indigenous partners (NLDIET 2023).

230 kV Transmission Lines and Substations

The Project Area for the 230 kV transmission lines and substations will occupy a total of approximately 52.6 to 55.2 km² (excluding the subsea portion of the transmission line) and overlap several key areas that are known to be, or have potential to be, used for recreational / subsistence LRU purposes (Table 20.12). However, as noted above, recreational / subsistence LRU activities are diverse and widespread throughout the RAA and could therefore also occur in other areas that are not identified in Table 20.12, including in other areas that are overlapped by the Project Area and/or LAA; Table 20.12 is not intended to be exhaustive.



Construction of the 230 kV transmission lines and substations, in combination with the construction of other Project components, could result in the direct alteration / disturbance or loss of lands and resources in the following key recreational / subsistence LRU areas that are located within the Project Area in the vicinity of the 230 kV transmission lines and substations and are identified in Table 20.12:

- **Key recreational / subsistence land and resource use areas that are located within the Project Area in the vicinity of the 230 kV transmission lines and substations (alteration or loss effects):**

- Up to approximately 2.5% of the total land area associated with the proposed Bras Mort Bog Ecological Reserve
- Up to approximately 0.3% of the total land area associated with T'Railway Provincial Park
- Up to approximately 1% of the total land area associated with MBBMA #8
- Up to approximately 13.5% of the total land area associated with MBBMA #9
- Up to approximately 1% of the total land area associated with MBBMA #10
- Up to approximately 28.5% of the total land area associated with MBBMA #43
- Up to approximately 0.3% of the total land area associated with CMA #61
- Up to approximately 0.3% of the total land area associated with small game areas for willow and rock ptarmigan, ruffed and spruce grouse, snowshoe hare, and red squirrel
- Up to approximately 2% of the total land area associated with Fur Zone #9
- Up to approximately 0.1% of the total land area associated with Fur Zone #10
- Up to approximately 15% of the total land area associated with domestic wood harvest blocks (i.e., C1401, C1402, C1403, C1404, C1406, C1410, C1415, C1416, C1418, K1450, K1451, K1459)
- An unquantified amount of undeveloped land that may be used for the harvesting of wild blueberries, medicinal plants, or other plants for personal consumption or use
- Two trails (i.e., Top of Whaleback Trail and the NL Snowmobile Federation's Snowmobiling Trail)

The amount of Project Area overlap with the key recreational / subsistence LRU areas identified above and in Table 20.12 represents a relatively small proportion of the total amount of comparable lands that are available for recreational / subsistence LRU activities outside of the Project Area (e.g., within the surrounding RAA). For example, although the Project Area overlaps up to approximately 28.5% of MBBMA #43, the RAA encompasses a total of eight MBBMAs that collectively occupy approximately 15,663 km²; the entire Project Area (for every Project component) only overlaps approximately 285 km² (or less than 2%) of the total extent of MBBMA lands within the RAA.

Project-related construction activities, including site preparation (e.g., clearing), could occur anywhere within the Project Area. However, construction of the 230 kV transmission lines and substations will only result in the direct alteration / disturbance or loss of approximately 4% (11.4 km²) of the Project Area. The Project Area includes a buffer of up to 175 m (350-m ROW) around key Project components to allow for micro-siting during detailed design and mitigation to avoid or reduce interactions with sensitive areas such



as known recreational / subsistence LRU areas. It is therefore anticipated that some of the direct physical impacts to the recreational / subsistence LRU areas identified above can be avoided or reduced through design refinements as Project planning progresses. For example, to the extent practicable, Project components will be sited so as to avoid or reduce Project-related construction activities within the portions of the Project Area that overlap the existing T'Railway Provincial Park corridor and the proposed Bras Mort Bog Ecological Reserve. The residual adverse change in recreational / subsistence LRU associated with the direct alteration / disturbance or loss of the key areas identified above and in Table 20.12 is predicted to be low in magnitude, geographically limited to the Project Area, short-term in duration, occurring as a single event during the construction phase, and reversible.

Project construction activities, such as clearing, grubbing, and excavation, will result in the loss of trees and other vegetation within the Project Area, potentially including species of value to domestic wood harvesters and other recreational / subsistence land and resource users (e.g., wild berry and/or wild plant harvesters). However, alternative harvesting areas are available outside of the Project Area and efforts will be made, where practicable, to avoid or reduce the loss of vegetation in key harvesting areas through the micro-siting of Project components during detailed design. Various Project construction activities could also result in incidental wildlife mortality, including the mortality of wildlife species of value to recreational / subsistence land and resource users, due to physical interactions with Project vehicles and equipment (Chapter 15 – Other Wildlife). The residual adverse change in LRU associated with the mortality of targeted vegetation and wildlife species is predicted to be low in magnitude, geographically limited to the Project Area, short-term in duration, occurring as a single event (for the mortality of cleared vegetation) or multiple irregular event (for incidental wildlife mortality) during the construction phase, and reversible.

The construction of watercourse crossings associated with the 230 kV transmission lines will result in the direct alteration / disturbance up to 102 fish-bearing inland watercourse / waterbody crossings that have potential to be fished for recreational / subsistence purposes as well as an unquantified number of inland navigable waterways that have potential to be used for navigation by various recreational / subsistence land and resource users. Section 10.5 predicts that the residual adverse effects of Project construction on fish habitat quantity, fish habitat quality, and fish health and survival will be low to moderate in magnitude and concludes that Project construction is not predicted to cause significant residual adverse effects on fish and fish habitat, including with respect to targeted recreational / subsistence fishery resources. Project activities will be conducted in accordance with applicable requirements under the *Fisheries Act*, CNWA, and associated regulations, which are protective of recreational / subsistence fishery resources and navigation activities, respectively. Construction of the transmission lines and substations is therefore not expected to substantially interfere with recreational / subsistence fishing or navigation beyond the temporary access restrictions that will be implemented for public safety in portions of the Project Area where construction activities are underway. The residual adverse change in recreational / subsistence LRU associated with the direct physical alteration / disturbance of fishing and navigation areas is predicted to be low in magnitude, geographically limited to the Project Area, short-term in duration, occurring as a single event during the construction phase, and reversible. Alternative recreational / subsistence fishing and navigation areas are available outside of the Project Area.



The operation of Project construction vehicles and equipment will generate noise, vibration, fugitive dust, and other air emissions. Project construction activities will also result in visual impacts from artificial night lighting and changes to the visual landscape. These emissions and visual impacts will extend into the LAA. Construction of the 230 kV transmission lines and substations, in combination with the construction of other Project components, could therefore result in sensory disturbance and associated nuisance impacts / behavioural effects to recreational / subsistence land and resource users and/or targeted species in the following key areas that are located within the LAA in the vicinity of the 230 kV transmission lines and substations and are identified in Table 20.12:

- **Key recreational / subsistence land and resource use areas that are located within the LAA in the vicinity of the 230 kV transmission lines and substations (sensory disturbance/nuisance effects)**
 - Approximately 24% of the total land area associated with Barachois Pond Provincial Park
 - Approximately 4% of the total land area associated with T'Railway Provincial Park
 - Approximately 62% of the total land area associated with the proposed Bras Mort Bog Ecological Reserve
 - 100% of the total land area associated with the private Barachois Brook Nature Reserve
 - Approximately 14% of the total land area associated with MBBMA #8
 - Approximately 44% of the total land area associated with MBBMA #9
 - Approximately 4% of the total land area associated with MBBMA #10
 - Approximately 84% of the total land area associated with MBBMA #43
 - Approximately 2% of the total land area associated with CMA #61
 - Up to approximately 0.1% of the total land area associated with CMA #62
 - Approximately 1% of the total land area associated with the small game areas for ruffed and spruce grouse
 - Approximately 1.3% of the total land area associated with small game areas for willow and rock ptarmigan, snowshoe hare, and red squirrel
 - Approximately 9% of the total land area associated with Fur Zone #9
 - Approximately 4% of the total land area associated with Fur Zone #10
 - Approximately 56% of the total land area associated with domestic wood harvest blocks (i.e., C1401, C1402, C1403, C1404, C1406, C1410, C1415, C1416, C1418, K1450, K1451, K1459)
 - Eight trails and unique sites (i.e., The Gravels Walking Trail, Pine Tree Trail, Top of Whaleback Trail, Ice Caves, Danny's Walking Trail, the NL Snowmobile Federation's Snowmobiling Trail, The Gravels, and Kippens Community Garden)
 - An unquantified amount of undeveloped land that may be used for the harvesting of wild blueberries, medicinal plants, or other plants for personal consumption or use



- An unquantified number of inland fish-bearing watercourses / waterbodies that have potential to be fished for recreational / subsistence purposes
- An unquantified number of inland navigable waterways that have potential to be used for navigation by various recreational / subsistence land and resource users

The Bras Mort Bog proposed reserve is located east of Stephenville Crossing and is one of the largest undisturbed plateau bogs on the Island of Newfoundland. It is an important area for woodland caribou during the fall and winter. WEGH2 will consult with Policy, Planning, and Natural Areas Division (NLDECC) and Wildlife Division (NLDFFA) in development of an Environmental Effects Mitigation and Monitoring Plan.

The residual adverse effects of Project construction on air quality, noise, and vibration are predicted to be low to moderate in magnitude. Construction-related residual noise emissions are not expected to exceed applicable regulatory thresholds (Chapter 7 – Acoustic Environment). Construction-related residual air emissions (primarily from dust and equipment combustion gases) can temporarily decrease air quality; however, the change in air quality is not expected to be substantive (Chapter 6 – Atmospheric Environment). Vibration emissions from blasting will follow best management practices for carrying out blasting to reduce vibration emissions (Chapter 7 – Acoustic Environment). The residual adverse change in recreational / subsistence LRU associated with sensory disturbance and nuisance impacts in the key areas identified above and in Table 20.12 is predicted to be low to moderate in magnitude, geographically limited to the LAA, short-term in duration, continuous during the construction phase, and reversible.

One outfitter lodge / facility in the vicinity of the transmission line ROW is overlapped by the LAA. Outfitter operators from other areas (i.e., outside of the Project Area and LAA) could also conduct recreational / subsistence LRU activities within the Project Area and LAA. It is expected that outfitter operators and their clients will experience a residual adverse change in recreational / subsistence LRU associated with the direct alteration / disturbance or loss of recreational / subsistence LRU areas in the Project Area and/or with sensory disturbance and nuisance impacts in the LAA. Alternative recreational / subsistence LRU areas are available for use by outfitter operators and their clients outside of the Project Area and LAA. Residual effects on outfitter operators and their clients will be confirmed through implementation of the Outfitter Effects Monitoring Program for the Project (refer to Section 20.8).

Hydrogen / Ammonia Production and Storage Facilities and Port Facilities

The portion of the Project Area for the hydrogen / ammonia production and storage facilities and Port facilities will occupy a combined total of approximately 2 km² and overlap several key areas that are known to be, or have potential to be, used for recreational / subsistence LRU purposes (Table 20.12). However, as noted above, recreational / subsistence LRU activities are diverse and widespread throughout the RAA and therefore could also occur in other areas that are not identified in Table 20.12, including in other areas that are overlapped by the Project Area and/or LAA; Table 20.12 is not intended to be exhaustive.



Construction of the hydrogen / ammonia production and storage facilities and Port facilities, in combination with the construction of other Project components, could result in the direct alteration / disturbance or loss of lands and resources in the following key recreational / subsistence LRU areas that are located within the Project Area in the vicinity of the hydrogen / ammonia production and storage facilities and Port facilities and are identified in Table 20.12:

- **Key recreational / subsistence land and resource use areas that are located within the Project Area in the vicinity of the hydrogen / ammonia production and storage and Port facilities (alteration or loss effects):**
 - Up to approximately 1% of the total land area associated with MBBMA #6
 - Up to approximately 0.3% of the total land area associated with small game areas for willow and rock ptarmigan, ruffed and spruce grouse, snowshoe hare, and red squirrel
 - Up to approximately 0.1% of the total land area associated with Fur Zone #10
 - Two trails (i.e., Joey's Lookout Trail and the NL Snowmobile Federation's Snowmobiling Trail)
 - An unquantified amount of undeveloped land that may be used for the harvesting of wild blueberries, medicinal plants, or other plants for personal consumption or use

The amount of Project Area overlap with the key recreational / subsistence LRU areas identified above and in Table 20.12 represents a relatively small proportion of the total amount of comparable lands that are available for recreational / subsistence LRU activities outside of the Project Area (e.g., within the surrounding RAA).

Project-related construction activities, including site preparation (e.g., clearing), could occur anywhere within the Project Area. However, construction of the hydrogen / ammonia production and storage facilities and Port facilities will only result in the direct alteration / disturbance or loss of approximately 0.6% (1.6 km²) of the Project Area. The Project Area includes a buffer of up to 175 m (350-m ROW) around key Project components to allow for micro-siting during detailed design and mitigation to avoid or reduce interactions with sensitive areas such as known recreational / subsistence LRU areas. It is therefore anticipated that some of the direct physical impacts to the recreational / subsistence LRU areas identified above can be avoided or reduced through design refinements as Project planning progresses. Although recreational and subsistence activities are known to take place in and around Stephenville, they are considered unlikely to occur within the portion of the Project Area associated with the proposed hydrogen / ammonia production and storage facilities and Port facilities, which is a privately-owned brownfield site in Stephenville that is zoned for industrial use. The residual adverse change in recreational / subsistence LRU associated with the direct alteration / disturbance or loss of lands and resources in the key areas identified above and in Table 20.12 is predicted to range from negligible to low in magnitude, to be geographically limited to the Project Area, to be short-term in duration and occur as a single event during the construction phase, and to be reversible.

Project construction activities, such as clearing, grubbing, and excavation, will result in the loss of vegetation within the Project Area, potentially including species of value to recreational / subsistence land and resource users (e.g., wild berry and/or wild plant harvesters). However, the Project Area for the hydrogen / ammonia production and storage facilities and Port facilities does not overlap any domestic



wood harvesting blocks, and wild berry / wild plant harvesting is unlikely to occur in this portion of the Project Area due to the presence of areas with known contamination and remediation requirements. Alternative harvesting areas are available outside of the Project Area. Various Project construction activities could also result in incidental wildlife mortality, including the mortality of wildlife species of value to recreational / subsistence land and resource users, due to physical interactions with Project vehicles and equipment (Chapter 13 – Avifauna; Chapter 15 – Other Wildlife). The residual adverse change in LRU associated with the mortality of targeted vegetation and wildlife species is predicted to be negligible to low in magnitude, geographically limited to the Project Area, short-term in duration, occurring as a single event (for the mortality of cleared vegetation) or multiple irregular event (for incidental wildlife mortality) during the construction phase, and reversible.

Construction of the hydrogen / ammonia production and storage facilities will include the installation of industrial water supply intake pipes in Gull (Mine) Pond and Muddy Pond. As described in Section 10.5, these construction activities will result in direct residual adverse environmental effects on Gull (Mine) Pond and Muddy Pond, as well as indirect residual adverse environmental effects on Noels Pond, which is hydrologically connected to Muddy Pond via two large culverts. Gull (Mine) Pond, Muddy Pond, and Noels Pond are fish-bearing waterbodies that have potential to be fished for recreational / subsistence purposes as well as to be used for navigation by recreational / subsistence land and resource users. Section 10.5 predicts that the residual adverse effects of Project construction on fish habitat quantity, fish habitat quality, and fish health and survival will be low to moderate in magnitude and concludes that Project construction is not predicted to cause significant residual adverse effects on fish and fish habitat, including with respect to targeted recreational / subsistence fishery resources. Project activities will be conducted in accordance with applicable requirements under the *Fisheries Act*, CNWA, and associated regulations, which are protective of recreational / subsistence fishery resources and navigation activities, respectively. Construction of the hydrogen / ammonia production and storage facilities is therefore not expected to substantially interfere with recreational / subsistence fishing or navigation beyond the temporary access restrictions that will be implemented for public safety in portions of the Project Area where construction activities are underway. The residual adverse change in recreational / subsistence LRU associated with the direct physical alteration / disturbance of fishing and navigation areas is predicted to range from negligible to low in magnitude, to be geographically limited to the Project Area, to be short-term in duration, occurring as a single event during the construction phase, and to be reversible. Alternative recreational / subsistence fishing and navigation areas are available outside of the Project Area.

The operation of Project construction vehicles and equipment will generate noise, vibration, fugitive dust, and other air emissions. Project construction activities will also result in visual impacts from artificial night lighting and changes to the visual landscape. These emissions and visual impacts will extend into the LAA. Construction of the hydrogen / ammonia production and storage facilities and Port facilities, in combination with the construction of other Project components², could therefore result in sensory

² The LAA collectively encompasses the areas in which Project-related environmental effects (direct or indirect) can be predicted or measured for assessment in relation to construction, operation and maintenance, and decommissioning and rehabilitation of the following Project components: the Port au Port wind farm and associated



disturbance and associated nuisance impacts / behavioural effects to recreational / subsistence land and resource users and/or targeted species in the following key areas that are located within the LAA in the vicinity of the hydrogen / ammonia production and storage facilities and Port facilities and are identified in Table 20.12:

- **Key recreational / subsistence land and resource use areas that are located within the LAA in the vicinity of the hydrogen / ammonia production and storage and Port facilities (sensory disturbance/nuisance effects):**
 - Approximately 10% of the total land area associated with MBBMA #6
 - Approximately 1% of the total land area associated with the small game areas for ruffed and spruce grouse
 - Approximately 1.3% of the total land area associated with small game areas for willow and rock ptarmigan, snowshoe hare, and red squirrel
 - Approximately 4% of the total land area associated with Fur Zone #10
 - An unquantified amount of undeveloped land that may be used for the harvesting of wild blueberries, medicinal plants, or other plants for personal consumption or use
 - An unquantified number of inland fish-bearing watercourses / waterbodies that have potential to be fished for recreational / subsistence purposes
 - An unquantified number of inland navigable waterways that have potential to be used for navigation by various recreational / subsistence land and resource users
 - A seasonal campground (i.e., Harmon Seaside Park) in the Stephenville area near the existing Port facilities
 - Three trails (i.e., Walk-A-Ways Nature Trail, Joey's Lookout Trail, and the NL Snowmobile Federation's Snowmobiling Trail)

As noted above, although recreational / subsistence activities are known to take place in and around Stephenville, they are considered unlikely to occur within the portion of the Project Area associated with the proposed hydrogen / ammonia production and storage facilities and Port facilities, which is a privately-owned brownfield site in Stephenville that is zoned for industrial use. The residual adverse effects of Project construction on air quality, noise, and vibration are predicted to be low to moderate in magnitude. Construction-related residual noise emissions are not expected to exceed applicable regulatory thresholds (Chapter 7 – Acoustic Environment). Construction-related residual air emissions (primarily from dust and equipment combustion gases) can temporarily decrease air quality; however, the change in air quality is not expected to be substantive (Chapter 6 – Atmospheric Environment). Vibration emissions from blasting will follow best management practices for carrying out blasting to reduce vibration emissions (Chapter 7 – Acoustic Environment). The residual adverse change in recreational / subsistence LRU

infrastructure, the Codroy wind farm and associated infrastructure, the 230 kV transmission lines and substations, the hydrogen / ammonia production and storage facilities, and the port facilities. Many of the spatial overlap metrics provided in Table 20.12 are reflective of portions of the LAA associated with two or more Project components. It is therefore expected that the actual amount of spatial overlap with the LAA that is specifically attributable to the hydrogen / ammonia production and storage facilities and port facilities will be less than is represented here.



associated with sensory disturbance and nuisance impacts in the key areas identified above and in Table 20.12 is predicted to range in magnitude from low (during most construction activities) to moderate (during potential pile driving), to be geographically limited to the LAA, to be short-term in duration and occur continuously during the construction phase, and to be reversible.

Although there are no known outfitter lodges / facilities in the vicinity of the hydrogen / ammonia production and storage facilities or Port facilities, outfitter operators from other areas could conduct recreational / subsistence LRU activities within this portion of the Project Area / LAA. In such cases, it is expected that outfitter operators and their clients would experience a residual adverse change in recreational / subsistence LRU associated with the direct alteration / disturbance or loss of recreational / subsistence LRU areas in the Project Area and/or with sensory disturbance and nuisance impacts in the LAA. Residual effects on outfitter operators and their clients will be confirmed through implementation of the Outfitter Effects Monitoring Program for the Project (refer to Section 20.8).

Summary

With implementation of the mitigation measures prescribed in Section 20.4, the construction phase of the Project is anticipated to result in a residual adverse change in recreational / subsistence LRU that ranges in magnitude from negligible (i.e., no measurable change in current LRU capacity) to moderate (i.e., a measurable change in LRU capacity that may exceed the range of historical variability; does not exceed applicable objectives, guidelines, or standards; and allows land and resource use activities to take place at or near current levels within the RAA). Construction-related residual noise emissions are not expected to exceed applicable regulatory thresholds. The Project-related residual adverse change in recreational / subsistence LRU during the construction phase is generally expected to be geographically limited to the Project Area (from the alteration or loss of lands and resources of value for recreational / subsistence LRU purposes) and LAA (from indirect sensory disturbance to recreational / subsistence LRU users and/or targeted species). However, the increased pressure on recreationally harvested resources (i.e., targeted species) and/or increase competition for the use of lands and resources for recreational / subsistence purposes associated with the influx of Project personnel could extend to the RAA. The residual adverse change in recreational / subsistence LRU is generally expected to be short-term in duration (except medium-term in duration with respect to the presence of the temporary workforce accommodation camp[s]) and to range in frequency from a single event to continuous during the construction phase. Based on the information above (in Section 20.5.3.1), a summary of the characteristics of the predicted residual change in recreational / subsistence LRU during the construction phase is provided in Table 20.13.



Table 20.13 Summary of Residual Effects by Project Component on Change in Recreational/Subsistence Use During Construction

Project Site	Summary of Residual Effect during Construction
Temporary Workforce Accommodations	Temporary workforce accommodations will be constructed in support of the Project and will be operational during the construction phase of the Project. Construction of the accommodation camp(s), including the use of vehicles and equipment, will generate noise, vibration, dust, and other air emissions that could be perceived by, and cause disturbance to, recreational / subsistence land and resource users and/or targeted species. Such emissions may be considered relatively more of a nuisance in Codroy than in Stephenville due to the varying ecological / socio-economic contexts in the two areas. Project construction activities will result in the loss of trees and other vegetation within the Project Area, potentially including species of value to domestic wood harvesters and other recreational / subsistence land and resource users (e.g., wild berry and/or wild plant harvesters). Various Project construction activities could also result in incidental mortality of wildlife species of value to recreational / subsistence land and resource users, due to physical interactions with Project vehicles and equipment. The presence of Project personnel at the camp site(s) and operation and maintenance of the camp(s) will be associated with temporary and localized noise emissions and other potential nuisance impacts that could adversely affect recreational / subsistence land and resource users and/or targeted species in proximity to the accommodations camp(s).
Port au Port Wind Farm and Associated Infrastructure	The Project Area for the Port au Port Wind Farm and associated infrastructure will occupy a total of approximately 117.6 km², of which approximately 104.2 km² will be located on the Port au Port Peninsula and approximately 13.4 km² will be located northeast of the Port au Port isthmus. Construction of the Port au Port Wind Farm and associated infrastructure will only result in the direct alteration / disturbance or loss of approximately 9.6% (29.3 km²) of the Project Area. Project construction activities will result in the loss of trees and other vegetation within the Project Area, potentially including species of value to domestic wood harvesters and other recreational / subsistence land and resource users (e.g., wild berry and/or wild plant harvesters). Various Project construction activities could also result in incidental mortality of wildlife species of value to recreational / subsistence land and resource users, due to physical interactions with Project vehicles and equipment. Up to 53 fish-bearing inland watercourse / waterbody crossings that have potential to be fished for recreational / subsistence purposes, as well as an unquantified number of inland navigable waterways that have potential to be used for navigation by various recreational / subsistence land and resource users, in the vicinity of the Port au Port Wind Farm. Construction of the Port au Port Wind Farm and associated infrastructure is not expected to substantially interfere with recreational / subsistence fishing or navigation beyond the temporary access restrictions that will be implemented for public safety in portions of the Project Area where construction activities are underway.



Table 20.13 Summary of Residual Effects by Project Component on Change in Recreational/Subsistence Use During Construction

Project Site	Summary of Residual Effect during Construction
Port au Port Wind Farm and Associated Infrastructure (cont'd)	Construction-related drilling / blasting and the operation of Project construction vehicles and equipment at the Port au Port Wind Farm sites will generate noise, vibration, fugitive dust, and other air emissions. Project construction activities will also result in visual impacts from artificial night lighting and changes to the visual landscape. Construction of the Port au Port Wind Farm and associated infrastructure could result in sensory disturbance and associated nuisance impacts / behavioural effects to recreational / subsistence land and resource users and/or targeted species in key recreational / subsistence land and resource use areas (Table 20.12). There is also a potential overlap with federal contaminated land near Port au Port East (DFO Gravels site).
Codroy Wind Farm and Associated Infrastructure	The Project Area for the Codroy Wind Farm and associated infrastructure will occupy a total of approximately 121.1 km². Construction of the Codroy Wind Farm and associated infrastructure will only result in the direct alteration / disturbance or loss of approximately 9.6% (29.3 km²) of the Project Area. Project construction activities will result in the loss of trees and other vegetation within the Project Area, potentially including species of value to domestic wood harvesters and other recreational / subsistence land and resource users (e.g., wild berry and/or wild plant harvesters). Various Project construction activities could also result in incidental mortality of wildlife species of value to recreational / subsistence land and resource users, due to physical interactions with Project vehicles and equipment. Up to 72 fish-bearing inland watercourse / waterbody crossings that have potential to be fished for recreational / subsistence purposes, as well as an unquantified number of inland navigable waterways that have potential to be used for navigation by various recreational / subsistence land and resource users, in the vicinity of the Codroy Wind Farm. Construction of the Codroy Wind Farm and associated infrastructure is not expected to substantially interfere with recreational / subsistence fishing or navigation beyond the temporary access restrictions that will be implemented for public safety in portions of the Project Area where construction activities are underway. Construction-related drilling / blasting and the operation of Project construction vehicles and equipment at the Codroy Wind Farm site will generate noise, vibration, fugitive dust, and other air emissions. Project construction activities will also result in visual impacts from artificial night lighting and changes to the visual landscape. Construction of the Codroy Wind Farm and associated infrastructure could result in sensory disturbance and associated nuisance impacts / behavioural effects to recreational / subsistence land and resource users and/or targeted species in key recreational / subsistence land and resource use areas (Table 20.12). Two outfitter lodges / facilities in the vicinity of the Codroy Wind Farm are overlapped by the Project Area.



Table 20.13 Summary of Residual Effects by Project Component on Change in Recreational/Subsistence Use During Construction

Project Site	Summary of Residual Effect during Construction
230 kV Transmission Lines and Substations	The Project Area for the 230 kV transmission lines and substations will occupy a total of approximately 52.6 to 55.2 km² and overlap several key areas that are known to be, or have potential to be, used for recreational / subsistence LRU purposes (Table 20.12). Construction of the 230 kV transmission lines and substations will only result in the direct alteration / disturbance or loss of approximately 4% (11.4 km²) of the Project Area. Project construction activities, such as clearing, grubbing, and excavation, will result in the loss of trees and other vegetation within the Project Area, potentially including species of value to domestic wood harvesters and other recreational / subsistence land and resource users (e.g., wild berry and/or wild plant harvesters). Various Project construction activities could also result in incidental mortality of wildlife species of value to recreational / subsistence land and resource users, due to physical interactions with Project vehicles and equipment. The construction of watercourse crossings associated with the 230 kV transmission lines will result in the direct alteration / disturbance up to 102 fish-bearing inland watercourse / waterbody crossings that have potential to be fished for recreational / subsistence purposes as well as an unquantified number of inland navigable waterways that have potential to be used for navigation by various recreational / subsistence land and resource users. Construction of the transmission lines and substations is not expected to substantially interfere with recreational / subsistence fishing or navigation beyond the temporary access restrictions that will be implemented for public safety in portions of the Project Area where construction activities are underway. The operation of Project construction vehicles and equipment will generate noise, vibration, fugitive dust, and other air emissions. Project construction activities will also result in visual impacts from artificial night lighting and changes to the visual landscape. Construction of the 230 kV transmission lines and substations could therefore result in sensory disturbance and associated nuisance impacts / behavioural effects to recreational / subsistence land and resource users and/or targeted species in key areas that are located within the LAA in the vicinity of the 230 kV transmission lines and substations (Table 20.12).
Hydrogen / Ammonia Production and Storage Facilities	The portion of the Project Area for the hydrogen / ammonia plant will overlap several key areas that are known to be, or have potential to be, used for recreational / subsistence LRU purposes (Table 20.12). Although recreational and subsistence activities are known to take place in and around Stephenville, they are considered unlikely to occur within the portion of the Project Area associated with the proposed hydrogen / ammonia plant, which is a privately-owned brownfield site in Stephenville that is zoned for industrial use. The Project Area does not overlap any domestic wood harvesting blocks, and wild berry / wild plant harvesting is unlikely to occur in this portion of the Project Area due to the presence of areas with known contamination and remediation requirements. Various Project construction activities could also result in incidental mortality of wildlife species of value to recreational / subsistence land and resource users, due to physical interactions with Project vehicles and equipment.



Table 20.13 Summary of Residual Effects by Project Component on Change in Recreational/Subsistence Use During Construction

Project Site	Summary of Residual Effect during Construction
Hydrogen / Ammonia Production and Storage Facilities (cont'd)	Construction of the hydrogen / ammonia plant will include the installation of industrial water supply intake pipes in Gull (Mine) Pond and Muddy Pond. These construction activities will result in direct residual adverse environmental effects on Gull (Mine) Pond and Muddy Pond (i.e., some loss of fish habitat from in-water works associated with upgraded industrial water supply intakes), as well as indirect residual adverse environmental effects on Noels Pond. Gull (Mine) Pond, Muddy Pond, and Noels Pond are fish-bearing waterbodies that have potential to be fished for recreational / subsistence purposes as well as to be used for navigation by recreational / subsistence land and resource users. Project construction vehicles and equipment will generate noise, vibration, fugitive dust, and other air emissions. Project construction activities will also result in visual impacts from artificial night lighting and changes to the visual landscape. Construction of the hydrogen / ammonia plant could therefore result in sensory disturbance and associated nuisance impacts / behavioural effects to recreational / subsistence land and resource users and/or targeted species that are located within the LAA in the vicinity of the hydrogen / ammonia plant.
Port Facilities	• The portion of the Project Area for the Port facilities will overlap several key areas that are known to be, or have potential to be, used for recreational / subsistence LRU purposes (Table 20.12). • Although recreational and subsistence activities are known to take place in and around Stephenville, they are considered unlikely to occur within the portion of the Project Area associated with the Port facilities, which is a privately-owned brownfield site in Stephenville that is zoned for industrial use. • The Project Area does not overlap any domestic wood harvesting blocks, and wild berry / wild plant harvesting is unlikely to occur in this portion of the Project Area due to the presence of areas with known contamination and remediation requirements. • Various Project construction activities could also result in incidental mortality of wildlife species of value to recreational / subsistence land and resource users, due to physical interactions with Project vehicles and equipment. • The operation of Project construction vehicles and equipment will generate noise, vibration, fugitive dust, and other air emissions. Project construction activities will also result in visual impacts from artificial night lighting and changes to the visual landscape. • Construction at the Port facilities could therefore result in sensory disturbance and associated nuisance impacts / behavioural effects to recreational / subsistence land and resource users and/or targeted species that are located within the LAA in the vicinity of the Port facilities.



20.5.3.2 Operation and Maintenance

Project operation and maintenance activities will reduce the total land area available for current and future recreational / subsistence LRU activities and may also change perception of recreational / subsistence LRU activities and/or discourage recreational / subsistence LRU activities. Access will not be restricted in areas which may previously have been used for recreational purposes during the operation phase, other than in specific areas that will be fenced off for public safety (e.g., substations). There are risks from ice throw from turbines to winter users utilizing access roads for snowmobiling. Appropriate signage will be posted on the access roads to advise users of the risk. However, Project operation and maintenance will not result in additional ground disturbance or clearing, and therefore this loss of access will primarily occur in the context of the construction phase.

The presence of Project infrastructure could spatially conflict with areas that are used for recreational / subsistence LRU activities, thereby reducing the total land area available for current and future recreational / subsistence LRU. Access will be increased at the wind farm sites, although there will be some restrictions around substation sites (i.e., fencing) for public safety. There also risks to winter users (e.g., snowmobiling) on access roads from winter ice throw from the turbines. Project-related sensory disturbance and nuisance effects (i.e., noise, vibration, air emissions, and visual impacts) on recreational / subsistence land and resource users could affect the quality of their outdoor experience, change their perception of recreational / subsistence LRU activities, and/or discourage recreational / subsistence LRU activities. The presence, operation, and maintenance of Project components could also reduce resource accessibility and/or availability for recreational / subsistence land and resource users by causing behavioural changes in targeted species or the mortality of targeted species.

During operation and maintenance, the physical presence of the Project will continue to affect recreational use and visual aesthetic values (e.g., recreational users' quality of experience). Sound emitted from the wind turbines, substations, and operational activities at the hydrogen / ammonia production and storage facilities and Port facilities, will result in a change in sound pressure levels. The presence of the wind turbines/towers, collector lines, transmission lines, and substations could affect recreational use (e.g., hiking / kayaking) through visual disturbance effects.

Residual effects related to operation and maintenance of the Project are described and characterized in the subsections below (under Section 20.5.3.2) for key Project components. In general, the Project-related residual effects considered below will occur within areas that are relatively undisturbed or not adversely affected by human activity (i.e., for residual effects related to the Port au Port and Codroy Wind Farms and associated infrastructure and the 230 kV transmission lines and substations) as well as within areas that have been substantially previously disturbed by human development or in which human development is still present (i.e., for residual effects related to the hydrogen / ammonia production and storage facilities and the Port facilities). Although it is yet to be determined exactly where the temporary workforce accommodation camp(s) will be located in Stephenville and/or Codroy / Bay St. George South, it is assumed that the ecological / socio-economic context of the Stephenville camp site will be relatively disturbed and that the ecological / socio-economic context of the Codroy camp site (if required) will be relatively undisturbed. The residual effects considered below are also generally deemed to have high sensitivity with respect to the timing of Project operation and maintenance activities, since many



recreational / subsistence LRU activities are seasonal in nature (e.g., only permitted to occur during certain hunting / trapping seasons, only permitted to occur during certain fishing seasons, or most likely to occur during certain seasons due to prevailing weather conditions).

Temporary Workforce Accommodations

The temporary workforce accommodation camp(s) will not be used to house Project personnel during the operation and maintenance phase of the Project and will remain vacant from the completion of the construction phase until the commencement of the decommissioning and rehabilitation phase. Minor maintenance activities (e.g., vegetation management) may be required on-site during the operation and maintenance phase of the Project, but are not predicted to measurably affect recreational / subsistence LRU activities since they will occur within an area that has already been cleared (i.e., during previously completed site preparation and construction activities) and associated air and noise emissions are expected to be low (vibration emissions) to moderate (air emissions, sound quality).

As described in Section 20.5.3.1, construction of the temporary workforce accommodation camp(s) may reduce the quantity / quality of lands and resources area available for recreational / subsistence LRU activities for the Codroy camp site. The reduction in the total land area available for recreational / subsistence LRU activities will persist during the operation and maintenance phase of the Project due to the ongoing presence of the camp(s). The resultant residual adverse change in recreational / subsistence LRU is predicted to be low in magnitude, limited in geographic extent to the Project Area, medium-term in duration (since the temporary workforce accommodation camp[s] will be present during every phase of the Project, although only operational during the construction and decommissioning phases), continuous in frequency, and reversible. It is anticipated that the area(s) to be occupied by the temporary workforce accommodation camp(s) will represent only a small proportion of the total area available for recreational / subsistence LRU activities within the surrounding LAA and RAA.

Port au Port and Codroy Wind Farms and Associated Infrastructure

As described in Section 20.5.3.1, construction of the Port au Port and Codroy Wind Farms and associated infrastructure will result in the direct alteration / disturbance of lands and resources in various known and potential key recreational / subsistence LRU areas within the Project Area (Table 20.12). The Project-related reduction in the quality of land and resources available for certain recreational / subsistence LRU activities (e.g., domestic wood harvesting and wild berry and/or wild plant harvesting) will persist during the operation and maintenance phase of the Project due to the altered / disturbed nature of the approximately 29.3 km² of lands within the Project Area that will have been cleared, grubbed, excavated, and/or otherwise physically modified during construction of the Port au Port and Codroy Wind Farms and associated infrastructure. The resultant residual adverse change in recreational / subsistence LRU is predicted to be moderate in magnitude, geographically limited to the Project Area, medium-term in duration, continuous during the operation and maintenance phase, and reversible. The amount of Project Area overlap with the key recreational / subsistence LRU areas identified in Section 20.5.3.1 and in Table 20.12 represents a relatively small proportion (3.8%) of the total amount of comparable lands that are available for recreational / subsistence LRU activities outside of the Project Area (e.g., within the surrounding RAA).



The EIS Guidelines require the proponent to develop a Domestic Woodcutting Consultation Plan (Appendix 4-B) with domestic users on the Port au Port Peninsula to determine any concerns with the Project and to develop appropriate mitigation measures. This Domestic Woodcutting Consultation Plan will be submitted to the NLDFFA for review and approval.

The presence and operation of up to 164 wind turbines at the Port au Port Wind Farm and up to 164 wind turbines at the Codroy Wind Farm may result in visual impacts related to shadow flicker, artificial night lighting, and aesthetic changes to the landscape. Operation of the wind turbines may also generate noise and vibration, although not at levels expected to exceed applicable regulatory thresholds (Chapter 7 – Acoustic Environment), while operation of the wind farm access roads may generate fugitive dust emissions. Project vehicles and equipment engaged in maintenance activities will generate noise and combustion-related air emissions. The visual impacts and emissions from operation and maintenance of the Port au Port and Codroy Wind Farms and associated infrastructure could cause sensory disturbance due to the range in visibility of wind turbines and associated nuisance impacts / behavioural effects to recreational / subsistence land and resource users and/or targeted species. The results of the Visual Quality Assessment Study are provided in Appendix 19-A. These effects will extend into the LAA, including within the key recreational / subsistence land and resource use areas that are overlapped by the LAA and are located in the vicinity of the Port au Port and Codroy Wind Farms, as identified in Table 20.12 and Section 20.5.3.1. During operation, there will be nighttime safety lighting within the Project Area (i.e., buildings, parking lots, along access roads). Light trespass and glare will be reduced using full cut-off luminaires to light in work areas, where possible. With mitigation, the levels of light trespass and glare are expected to be maintained below guidelines for low, sparsely inhabited rural areas (Chapter 6 – Atmospheric Environment).

Shadow flicker is a temporary condition resulting from the sun casting intermittent shadows from the rotating blades of a wind turbine onto a receptor such as a window in a building. The flicker is due to alternating light intensity between the direct beam of sunlight and the shadow from the turbine blades. Stantec conducted analyses of daytime shadow flicker for the Port au Port and Codroy Wind Farms (Stantec 2023e, 2023f); the results of these shadow flicker studies are provided in Appendix 6-A and 6-B. As summarized in Section 20.5.1.2, shadow flicker from the wind turbines at the Port au Port and Codroy Wind Farms are not anticipated to exceed the allowable limit of 30 hours per year at the modelled receptor locations. Given the conservative assumptions used in the shadow flicker model, it is likely that site-specific conditions will further reduce the amount of shadow flicker that is actually observed throughout the year (Stantec 2023e, 2023f).

The residual adverse change in LRU associated with sensory disturbance from operation of the wind farms is predicted to be moderate in magnitude, medium-term in duration, continuous during the operation and maintenance phase, and reversible. The amount of LAA overlap with the key recreational / subsistence LRU areas identified in Section 20.5.3.1 and in Table 20.12 represents a relatively small proportion of the total amount of comparable lands that are available for recreational / subsistence LRU activities outside of the LAA (e.g., within the surrounding RAA).



The presence, operation, and maintenance of wind farm infrastructure could also result in incidental wildlife mortality, including the mortality of wildlife species of value to recreational / subsistence land and resource users, due to collisions with Project vehicles, equipment, and wind turbines. The residual adverse change in recreational / subsistence LRU associated with the mortality of targeted wildlife species is predicted to be negligible to low in magnitude, geographically limited to the Project Area, medium-term in duration, occurring as a multiple irregular event during the operation and maintenance phase, and reversible.

For the protection of public safety, safety signage will be posted on access roads (e.g., to advise the public regarding the risk of ice throw), access to the Project Area may be restricted during ice events, and site security may be present to monitor the Project Area. However, following the completion of Project construction, the majority of the Project Area in the vicinity of the Port au Port and Codroy Wind Farms will remain accessible to the public, including recreational / subsistence land and resource users, throughout the operation and maintenance phase of the Project. The residual adverse change in LRU associated with recreational / subsistence LRU access or use restrictions in the Project Area during the operation and maintenance phase is predicted to be negligible to low in magnitude, geographically limited to the Project Area, medium-term in duration, continuous, and reversible. The introduction of networks of new access roads in support of the Project is anticipated to improve access to certain areas for recreational / subsistence LRU purposes.

230 kV Transmission Lines and Substations

As described in Section 20.5.3.1, construction of the 230 kV transmission lines and substations will result in the direct alteration / disturbance of lands and resources in various known and potential key recreational / subsistence LRU areas within the Project Area (Table 20.12). The Project-related reduction in the quality of land and resources available for certain recreational / subsistence LRU activities (e.g., domestic wood harvesting and wild berry and/or wild plant harvesting) will persist during the operation and maintenance phase of the Project due to vegetation management requirements within the 350-m transmission line ROW and the altered / disturbed nature of the approximately 11.4 km² of lands within the Project Area that will have been cleared, grubbed, excavated, and/or otherwise physically modified during construction of the substations. The residual adverse change in recreational / subsistence LRU is predicted to be low in magnitude, geographically limited to the Project Area, medium-term in duration, continuous during the operation and maintenance phase, and reversible. The amount of Project Area overlap with the key recreational / subsistence LRU areas identified in Section 20.5.3.1 and in Table 20.12 represents a relatively small proportion (3.8%) of the total amount of comparable lands that are available for recreational / subsistence LRU activities outside of the Project Area (e.g., within the surrounding RAA).

The EIS Guidelines require the proponent to develop a Domestic Woodcutting Consultation Plan (Appendix 4-B) with domestic users on the Port au Port Peninsula to determine any concerns with the Project and to develop appropriate mitigation measures. This Domestic Woodcutting Consultation Plan will be submitted to the NLDFFA for review and approval.



The presence and operation of the 230 kV transmission lines and substations will result in visual impacts related to aesthetic changes to the landscape, while operation of the substations will also generate noise emissions. Project vehicles and equipment engaged in maintenance activities will generate noise and combustion-related air emissions. The visual impacts and emissions from operation and maintenance of the 230 kV transmission lines and substations could cause sensory disturbance and associated nuisance impacts / behavioural effects to recreational / subsistence land and resource users and/or targeted species. These effects will extend into the LAA, including within the key recreational / subsistence land and resource use areas that are overlapped by the LAA and are located in the vicinity of the 230 kV transmission lines and substations, as identified in Table 20.12 and Section 20.5.3.1. The resultant residual adverse change in LRU is predicted to range in magnitude from low (for the transmission lines) to moderate (for the substations), medium-term in duration, continuous during the operation and maintenance phase, and reversible. The amount of LAA overlap with the key recreational / subsistence LRU areas identified in Section 20.5.3.1 and in Table 20.12 represents a small proportion (16.5%) of the total amount of comparable lands that is available for recreational / subsistence LRU activities outside of the LAA (e.g., within the surrounding RAA).

The presence, operation, and maintenance of the 230 kV transmission lines and substations could also result in incidental wildlife mortality, including the mortality of wildlife species of value to recreational / subsistence land and resource users, due to collisions with Project vehicles, equipment, and infrastructure. The residual adverse change in recreational / subsistence LRU associated with the mortality of targeted wildlife species is predicted to be negligible to low in magnitude, geographically limited to the Project Area, medium-term in duration, occurring as a multiple irregular event during the operation and maintenance phase, and reversible.

For the protection of public safety, fencing / gates will be installed to restrict access to substations and other electrical components. However, following the completion of Project construction, the majority of the Project Area in the vicinity of the 230 kV transmission lines will remain accessible to the public, including recreational / subsistence land and resource users, throughout the operation and maintenance phase of the Project. The residual adverse change in LRU associated with recreational / subsistence LRU access restrictions in the Project Area during the operation and maintenance phase is predicted to be low in magnitude, geographically limited to the Project Area, medium-term in duration, continuous, and reversible.

Hydrogen / Ammonia Production and Storage Facilities and Port Facilities

As described in Section 20.5.3.1, construction of the hydrogen / ammonia production and storage facilities and Port facilities will result in the direct alteration / disturbance or loss of lands and resources in various known and potential key recreational / subsistence LRU areas within the Project Area (Table 20.12). The Project-related reduction in the quality of land and resources available for certain recreational / subsistence LRU activities will persist during the operation and maintenance phase of the Project due to the altered / disturbed nature of the approximately 1.6 km² of lands within the Project Area that will have been otherwise physically modified during construction of the hydrogen / ammonia production and storage facilities and Port facilities. However, given that the hydrogen / ammonia production and storage facilities and Port facilities will be located on a brownfield site in Stephenville that is zoned for industrial use, recreational / subsistence LRU activities are considered unlikely to occur within the portion of the Project Area associated with the proposed hydrogen / ammonia production and



storage facilities and Port facilities. The resultant residual adverse change in recreational / subsistence LRU is predicted to be negligible to low in magnitude, geographically limited to the Project Area, medium-term in duration, continuous during the operation and maintenance phase, and reversible. The amount of Project Area overlap with the key recreational / subsistence LRU areas identified in Section 20.5.3.1 and in Table 20.12 represents a relatively small proportion of the total amount of comparable lands that are available for recreational / subsistence LRU activities outside of the Project Area (e.g., within the surrounding RAA).

The presence and operation of the hydrogen / ammonia production and storage facilities and Port facilities will result in visual impacts related to artificial night lighting, non-routine flaring events, and aesthetic changes to the landscape. Operation and maintenance of these facilities (including non-routine venting / flaring events at the hydrogen / ammonia production facilities and the idling of Project-related ammonia carrier ships berthed at the Port facilities) will also generate noise and air emissions. Air emission concentrations are expected to remain below applicable air quality criteria (Chapter 6- Atmospheric Environment). During operation, there will be nighttime safety lighting within the Project Area (i.e., buildings, parking lots, along access roads). The final lighting design will use minimum lighting levels recommended by the Illuminating Engineering Society of North America's Lighting Handbook for outdoor worksite lighting. Light trespass and glare will be reduced using full cut-off luminaires to light in work areas, where possible. With mitigation, the levels of light trespass and glare are expected to be maintained below guidelines for low, sparsely inhabited rural areas (Chapter 6 – Atmospheric Environment). The visual impacts and emissions from operation and maintenance of the hydrogen / ammonia production and storage facilities and Port facilities could cause sensory disturbance and associated nuisance impacts / behavioural effects to recreational / subsistence land and resource users and/or targeted species. The predicted operation-related daytime and nighttime sound levels for a receptor near Port Harmon (i.e., campground) do not exceed Health Canada's sleep disturbance criteria (i.e., 45 dBA) (Chapter 7 – Acoustic environment). These effects will extend into the LAA, including within the key recreational / subsistence land and resource use areas that are overlapped by the LAA and are located in the vicinity of the hydrogen / ammonia production and storage facilities and Port facilities, as identified in Table 20.12 and Section 20.5.3.1. The resultant residual adverse change in LRU is predicted to be low to moderate in magnitude, medium-term in duration, continuous during the operation and maintenance phase, and reversible. The amount of LAA overlap with the key recreational / subsistence LRU areas identified in Section 20.5.3.1 and in Table 20.12 represents a relatively small proportion of the total amount of comparable lands that are available for recreational / subsistence LRU activities outside of the LAA (e.g., within the surrounding RAA).

The presence, operation, and maintenance of hydrogen / ammonia production and storage facilities could also result in incidental bird mortality, including the mortality of bird species of value to recreational / subsistence land and resource users, during flaring events (Chapter 13 – Avifauna). The residual adverse change in recreational / subsistence LRU associated with the mortality of targeted bird species is predicted to be low in magnitude, geographically limited to the Project Area, medium-term in duration, occurring as a multiple irregular event during the operation and maintenance phase, and reversible.



For the protection of public safety, public access to the hydrogen / ammonia production and storage facilities and Port facilities will be restricted through a combination of signage, fencing / gates, and site security. The residual adverse change in LRU associated with recreational / subsistence LRU access or use restrictions in the Project Area during the operation and maintenance phase is predicted to be low in magnitude, geographically limited to the Project Area, medium-term in duration, continuous, and reversible.

Summary

With implementation of the mitigation measures prescribed in Section 20.4, the operation and maintenance phase of the Project is anticipated to result in a residual adverse change in recreational / subsistence LRU that ranges in magnitude from negligible to low (i.e., no measurable change in current LRU capacity) to moderate (i.e., a measurable change in LRU capacity that may exceed the range of historical variability; does not exceed applicable objectives, guidelines, or standards; and allows land and resource use activities to take place at or near current levels within the RAA). Residual noise and air emissions associated with Project operation and maintenance are not expected to exceed applicable regulatory thresholds. The Project-related residual adverse change in recreational / subsistence LRU during the operation and maintenance phase is generally expected to be geographically limited to the Project Area (from the alteration / disturbance or loss of lands and resources of value for recreational / subsistence LRU purposes) and LAA (from indirect sensory disturbance to recreational / subsistence LRU users and/or targeted species). The residual adverse change in recreational / subsistence LRU is generally expected to be medium-term in duration and continuous in frequency during the operation and maintenance phase (except for the residual change in recreational / subsistence LRU associated with the incidental mortality of targeted wildlife species, which is expected to occur as a multiple irregular event). Based on the information above (in Section 20.5.3.2), a summary of the characteristics of the predicted residual change in recreational / subsistence LRU during the operation and maintenance phase is provided in Table 20.14.

Table 20.14 Summary of Residual Effects by Project Component on Change in Recreational/Subsistence Use During Operation and Maintenance

Project Component	Summary of Residual Effect during Operation and Maintenance
Temporary Workforce Accommodations	The temporary workforce accommodation camp(s) will not be used to house Project personnel during the operation and maintenance phase of the Project and will remain vacant from the completion of the construction phase until the commencement of the decommissioning and rehabilitation phase. Minor maintenance activities (e.g., vegetation management) may be required on-site during the operation and maintenance phase of the Project, but they will occur within an area that has already been cleared. Construction of the temporary workforce accommodation camp(s) may reduce the quantity / quality of lands and resources area available for recreational / subsistence LRU activities for the Codroy camp site.



Table 20.14 Summary of Residual Effects by Project Component on Change in Recreational/Subsistence Use During Operation and Maintenance

Project Component	Summary of Residual Effect during Operation and Maintenance
Port au Port Wind Farm and Associated Infrastructure	The Project-related reduction in the quality of land and resources available (e.g., domestic wood harvesting and wild berry and/or wild plant harvesting) will persist due to the altered / disturbed nature of the approximately 29.3 km² of lands within the Project Area. The amount of Project Area overlap with the key recreational / subsistence LRU areas represents a relatively small proportion (3.8%) of the total amount of comparable lands that are available for recreational / subsistence LRU activities outside of the Project Area (e.g., within the surrounding RAA). The presence and operation of up to 164 wind turbines at the Port au Port Wind Farm may result in visual impacts related to shadow flicker, artificial night lighting, and aesthetic changes to the landscape. Operation of the wind turbines may also generate noise and vibration while operation of the wind farm access roads may generate fugitive dust emissions. Project vehicles and equipment engaged in maintenance activities will generate noise and combustion-related air emissions. The visual impacts and emissions from operation and maintenance of the Port au Port Wind Farm and associated infrastructure could cause sensory disturbance due to the range in visibility of wind turbines and associated nuisance impacts / behavioural effects to recreational / subsistence land and resource users and/or targeted species. During operation, there will be nighttime safety lighting within the Project Area (i.e., buildings, parking lots, along access roads). Shadow flicker from the wind turbines at the Port au Port Wind Farm is not anticipated to exceed the allowable limit of 30 hours per year at the modelled receptor locations. The presence, operation, and maintenance of wind farm infrastructure could also result in incidental mortality of wildlife species of value to recreational / subsistence land and resource users, due to collisions with Project vehicles, equipment, and wind turbines. For the protection of public safety, safety signage will be posted on access roads (e.g., to advise the public regarding the risk of ice throw), access to the Project Area may be restricted during ice events. The majority of the Project Area in the vicinity of the Port au Port Wind Farm will remain accessible to the public, including recreational / subsistence land and resource users.
Codroy Wind Farm and Associated Infrastructure	The Project-related reduction in the quality of land and resources available (e.g., domestic wood harvesting and wild berry and/or wild plant harvesting) will persist due to the altered / disturbed nature of the approximately 29.3 km² of lands within the Project Area. The amount of Project Area overlap with the key recreational / subsistence LRU areas represents a relatively small proportion (3.8%) of the total amount of comparable lands that are available for recreational / subsistence LRU activities outside of the Project Area (e.g., within the surrounding RAA). The presence and operation of up to 164 wind turbines at the Codroy Wind Farm may result in visual impacts related to shadow flicker, artificial night lighting, and aesthetic changes to the landscape. Operation of the wind turbines may also generate noise and vibration while operation of the wind farm access roads may generate fugitive dust emissions. Project vehicles and equipment engaged in maintenance activities will generate noise and combustion-related air emissions. The visual impacts and emissions from operation and maintenance of the Codroy Wind Farm and associated infrastructure could cause sensory disturbance due to the range in visibility of wind turbines and associated nuisance impacts / behavioural effects to recreational / subsistence land and resource users and/or targeted species. During operation, there will be nighttime safety lighting within the Project Area (i.e., buildings, parking lots, along access roads).



Table 20.14 Summary of Residual Effects by Project Component on Change in Recreational/Subsistence Use During Operation and Maintenance

Project Component	Summary of Residual Effect during Operation and Maintenance
Codroy Wind Farm and Associated Infrastructure (cont'd)	Shadow flicker from the wind turbines at the Codroy Wind Farm is not anticipated to exceed the allowable limit of 30 hours per year at the modelled receptor locations. The presence, operation, and maintenance of wind farm infrastructure could also result in incidental mortality of wildlife species of value to recreational / subsistence land and resource users, due to collisions with Project vehicles, equipment, and wind turbines. For the protection of public safety, safety signage will be posted on access roads (e.g., to advise the public regarding the risk of ice throw), access to the Project Area may be restricted during ice events. The majority of the Project Area in the vicinity of the Codroy Wind Farm will remain accessible to the public, including recreational / subsistence land and resource users.
230 kV Transmission Lines and Substations	The Project-related reduction in the quality of land and resources (e.g., domestic wood harvesting and wild berry and/or wild plant harvesting) will persist during the operation and maintenance phase of the Project due to vegetation management requirements within the 350-m transmission line ROW and the altered / disturbed nature of the approximately 11.4 km² of lands within the Project Area that will have been cleared, grubbed, excavated, and/or otherwise physically modified during construction of the substations. The amount of Project Area overlap represents a relatively small proportion (3.8%) of the total amount of comparable lands that are available for recreational / subsistence LRU activities outside of the Project Area (e.g., within the surrounding RAA). The presence and operation of the 230 kV transmission lines and substations will result in visual impacts related to aesthetic changes to the landscape, while operation of the substations will also generate noise emissions. Project vehicles and equipment engaged in maintenance activities will generate noise and combustion-related air emissions. The visual impacts and emissions from operation and maintenance of the 230 kV transmission lines and substations could cause sensory disturbance and associated nuisance impacts / behavioural effects to recreational / subsistence land and resource users and/or targeted species. The amount of LAA overlap represents a small proportion (16.5%) of the total amount of comparable lands that is available for recreational / subsistence LRU activities outside of the LAA (e.g., within the surrounding RAA). The presence, operation, and maintenance of the 230 kV transmission lines and substations could also result in incidental mortality of wildlife species of value to recreational / subsistence land and resource users, due to collisions with Project vehicles, equipment, and infrastructure. Following completion of Project construction, the majority of the Project Area in the vicinity of the 230 kV transmission lines will remain accessible to the public, including recreational / subsistence land and resource users.
Hydrogen / Ammonia Production and Storage Facilities	As the hydrogen / ammonia production and storage facilities and Port facilities will be located on a brownfield site in Stephenville that is zoned for industrial use, recreational / subsistence LRU activities are considered unlikely to occur within the portion of the Project Area associated with the proposed hydrogen / ammonia production and storage facilities and Port facilities. The presence and operation of the hydrogen / ammonia production and storage facilities and Port facilities will result in visual impacts related to artificial night lighting, non-routine flaring events, and aesthetic changes to the landscape. Operation and maintenance of these facilities (including non-routine venting / flaring events at the hydrogen / ammonia production facilities and the idling of Project-related ammonia carrier ships berthed at the Port facilities) will also generate noise and air emissions.



Table 20.14 Summary of Residual Effects by Project Component on Change in Recreational/Subsistence Use During Operation and Maintenance

Project Component	Summary of Residual Effect during Operation and Maintenance
Hydrogen / Ammonia Production and Storage Facilities (cont'd)	The visual impacts and emissions from operation and maintenance of the hydrogen / ammonia production and storage facilities and Port facilities could cause sensory disturbance and associated nuisance impacts / behavioural effects to recreational / subsistence land and resource users and/or targeted species, extending to the LAA. The presence, operation, and maintenance of hydrogen / ammonia production and storage facilities could also result in incidental bird mortality, including the mortality of bird species of value to recreational / subsistence land and resource users, during flaring events.
Port Facilities	As the hydrogen / ammonia production and storage facilities and Port facilities will be located on a brownfield site in Stephenville that is zoned for industrial use, recreational / subsistence LRU activities are considered unlikely to occur within the portion of the Project Area associated with the proposed hydrogen / ammonia production and storage facilities and Port facilities. The presence and operation of the hydrogen / ammonia production and storage facilities and Port facilities will result in visual impacts related to artificial night lighting, non-routine flaring events, and aesthetic changes to the landscape. Operation and maintenance of these facilities (including non-routine venting / flaring events at the hydrogen / ammonia production facilities and the idling of Project-related ammonia carrier ships berthed at the Port facilities) will also generate noise and air emissions. The visual impacts and emissions from operation and maintenance of the hydrogen / ammonia production and storage facilities and Port facilities could cause sensory disturbance and associated nuisance impacts / behavioural effects to recreational / subsistence land and resource users and/or targeted species, extending to the LAA.

20.5.3.3 Decommissioning and Rehabilitation

Project-related access restrictions will remain in place during decommissioning and rehabilitation. Sensory disturbances to recreational / subsistence LRU users are also expected to continue throughout decommissioning and rehabilitation. Areas disturbed during the construction phase will be restored and reincorporated into the land base. Rehabilitation will be undertaken to achieve desired end land use.

Residual Effects

For the protection of public safety, public access to portions of the Project Area related to the temporary workforce accommodation camp(s), the Port au Port Wind Farm and associated infrastructure, the Codroy Wind Farm and associated infrastructure, the 230 kV transmission lines and substations, the hydrogen / ammonia production and storage facilities, and the Port facilities will be temporarily restricted while decommissioning and rehabilitation activities are carried out within those particular areas. This will temporarily restrict access to those areas by recreational / subsistence land and resource users during the decommissioning and rehabilitation phase. However, these restrictions will not occur throughout the entire Project Area simultaneously and will instead be incremental and limited to those segments of the Project Area in which decommissioning and rehabilitation is actively underway. The resultant residual adverse change in recreational / subsistence LRU is predicted to be limited in geographic extent to the Project Area, be short-term in duration, occur as a multiple irregular event during the decommissioning



and rehabilitation phase, and be reversible. The magnitude of this residual adverse change in recreational / subsistence LRU is predicted to range from low to moderate for the following reasons:

- The hydrogen / ammonia production and storage facilities and Port facilities will be located on a privately-owned brownfield site in Stephenville that is zoned for industrial use. Recreational / subsistence LRU activities are generally less likely to occur within this portion of the Project Area than in surrounding areas outside of the Project Area, as well as generally more likely to be subject to access restrictions or other disruptions associated with other (non-Project) industrial activities. The magnitude of the residual effect caused by temporary Project-related access restrictions is therefore predicted to be low in this portion of the Project Area. The Port au Port Wind Farm and associated infrastructure, the Codroy Wind Farm and associated infrastructure, and the 230 kV transmission lines and substations will be located in relatively undisturbed areas where recreational / subsistence LRU activities are generally more likely to occur as well as generally less likely to be subject to access restrictions or other disruptions associated with other (non-Project) industrial activities. The magnitude of the residual effect caused by temporary Project-related access restrictions is therefore predicted to be moderate in this portion of the Project Area.

Oversized and overweight Project materials and equipment will be removed and transported away from the Project Area (e.g., for recycling or disposal, as appropriate) during the decommissioning and rehabilitation phase. Based on extrapolation of the results of the Transportation Impact Study that was conducted for the construction phase of the Project (Stantec 2023d; Appendix 2-E), it is assumed that Project-related wind turbine removal will require trucks to undertake separate daily round trips from the Port au Port Wind Farm (i.e., 6 daily round trips each from the west side of the Port au Port Peninsula, west of Route 463 first; from the east side of the Port au Port Peninsula, east of Route 463 second; and from the north of Stephenville, near Route 462 third, respectively) and 6 daily round trips from the Codroy Wind Farm site, to occur in a sequential fashion one after the other. It is acknowledged that the daily round trips would not likely be equivalent to the construction phase, as much of the components for the wind turbines will be broken down into smaller elements for transportability. It is also assumed that an average of 30 additional round trips will be required daily for the removal of other Project components (e.g., transmission line and transformer station components) from the Project Area during these time periods. The Transportation Impact Study concluded that, in terms of Project-related vehicles during peak construction, the impact to current traffic operation is expected to be low (Stantec 2023d). This conclusion is assumed to also be applicable to Project-related vehicles during peak decommissioning and rehabilitation activities. When a truck transporting Project materials and equipment is crossing Route 463, crossing Aguathuna Road, or making turns at intersections, it is assumed, based on extrapolation of the results of the Traffic Impact Study for the construction phase (Stantec 2023d), that local traffic will need to be stopped for up to five minutes to allow the truck to pass. These temporary delays are not predicted to substantially interfere with access to recreational / subsistence LRU areas. A Traffic Management Plan will be developed to address the access road network, traffic accommodation plans and logistics, and lessen effects on land and resource users during decommissioning and rehabilitation. Thus, the resultant residual adverse change in recreational / subsistence LRU is predicted to be low in magnitude, to extend into the RAA, to be short-term in duration and occur as a multiple irregular event during the decommissioning and rehabilitation phase, and to be reversible.



Additional residual effects related to decommissioning and rehabilitation are described and characterized below for key Project components. In general, the Project-related residual effects considered below (under Section 20.5.3.3) will occur within areas that are relatively undisturbed or not adversely affected by human activity (i.e., for residual effects related to the Port au Port and Codroy Wind Farms and associated infrastructure and the 230 kV transmission lines and substations) as well as within areas that have been substantially previously disturbed by human development or in which human development is still present (i.e., for residual effects related to the hydrogen / ammonia production and storage facilities and the Port facilities). Although it is yet to be determined exactly where the temporary workforce accommodation camp(s) will be located in Stephenville and/or Codroy, it is assumed that the ecological / socio-economic context of the Stephenville camp site will be relatively disturbed and that the ecological / socio-economic context of the Codroy camp site (if required) will be relatively undisturbed. The residual effects considered below are also generally deemed to have high sensitivity with respect to the timing of Project decommissioning and rehabilitation activities, since many recreational / subsistence LRU activities are seasonal in nature (e.g., only permitted to occur during certain hunting / trapping seasons, only permitted to occur during certain fishing seasons, or most likely to occur during certain seasons due to prevailing weather conditions).

Temporary Workforce Accommodations

The temporary workforce accommodation camp(s) will resume operations during the decommissioning and rehabilitation phase of the Project, as they will be used to house Project personnel engaged in decommissioning and rehabilitation activities related to key Project components (i.e., the Port au Port and Codroy Wind Farms and associated infrastructure, the 230 kV transmission lines and substations, hydrogen / ammonia production and storage facilities, and Port facilities). Following the completion of other Project-related decommissioning and rehabilitation activities, the temporary workforce accommodations themselves will be decommissioned and the camp site(s) will be rehabilitated.

Approximately 250 Project personnel will be housed at a temporary workforce accommodation camp in Stephenville during the decommissioning and rehabilitation phase of the Project, and an additional 100 Project personnel may be housed at a separate temporary workforce accommodation camp near the Codroy Wind Farm. As indicated in Table 20.4, hunting, fishing, and the harvesting of wildlife, fish, and plant resources will be strictly prohibited on Project work sites; Project personnel will not be permitted to hunt / fish / harvest while staying at the workforce accommodation camp(s); and Project personnel will not be permitted to bring firearms or angling gear to the workforce accommodation camp(s). Thus, the resultant residual adverse change in recreational / subsistence LRU associated with increased pressure on recreationally harvested resources (i.e., targeted species) and/or increase competition for the use of lands and resources for recreational / subsistence purposes is predicted to be negligible to low in magnitude but could extend to the RAA.

Various activities during decommissioning and rehabilitation of the accommodation camp site(s), including the use of construction vehicles and equipment, will generate noise, vibration, dust, and other air emissions that could be perceived by land and resource users. However, these emissions will be short-term in duration and are generally anticipated to be similar in nature, magnitude, and extent to the emissions associated with past and present development activities in the surrounding LAA and/or RAA



(e.g., residential development in the Stephenville area and cottage development in the Codroy area). Such emissions would not typically be expected to measurably affect the activities of land and resource users, although they may be considered relatively more of a nuisance in Codroy than in Stephenville due to the varying ecological / socio-economic contexts in the two areas. Air, light, and noise emissions would be typically much less than during the construction and operation phases. The resultant residual adverse change in recreational / subsistence LRU is predicted to range from negligible (in the Stephenville area) to low (in the Codroy area) in magnitude and be geographically limited to the LAA.

Various camp decommissioning and rehabilitation activities could also result in incidental wildlife mortality, including the mortality of wildlife species of value to recreational / subsistence land and resource users, due to physical interactions with Project vehicles and equipment (Chapter 13 – Avifauna; Chapter 15 – Other Wildlife). The residual adverse change in LRU associated with the mortality of targeted vegetation and wildlife species is predicted to be low in magnitude, geographically limited to the Project Area, short-term in duration, occurring as a multiple irregular event during the decommissioning and rehabilitation phase, and reversible.

Following the completion of Project decommissioning and rehabilitation, the rehabilitated workforce accommodation camp site(s) will be publicly accessible and available for use by recreational / subsistence land and resource users.

Port au Port and Codroy Wind Farms and Associated Infrastructure, 230 kV Transmission Lines and Substations, Hydrogen / Ammonia Production and Storage Facilities, and Port Facilities

Similar to the construction phase of the Project, decommissioning and rehabilitation of the Port au Port and Codroy Wind Farms and associated infrastructure, 230 kV transmission lines and substations, hydrogen / ammonia production and storage facilities, and Port facilities will result in the direct alteration / disturbance or loss of lands and resources in various known and potential key recreational / subsistence land and resource use areas within the Project Area (Table 20.12). However, it is anticipated that the portions of the Project Area to be altered during the decommissioning and rehabilitation phase will be primarily or entirely limited to those that were previously disturbed by Project construction and maintenance activities. The resultant residual change in recreational / subsistence LRU is predicted to be low to moderate in magnitude, geographically limited to the Project Area, short-term in duration, occurring as a single event during the decommissioning and rehabilitation phase, and reversible. The amount of Project Area overlap with the key recreational / subsistence LRU areas identified in Section 20.5.3.1 and in Table 20.12 represents a relatively small proportion of the total amount of comparable lands that are available for recreational / subsistence LRU activities outside of the Project Area (e.g., within the surrounding RAA).

Also similar to the construction phase of the Project, decommissioning and rehabilitation activities will result in noise, vibration, dust, and other air emissions, as well as visual impacts. These effects will extend into the LAA, including within the key recreational / subsistence land and resource use areas that are overlapped by the LAA and are located in the vicinity of the Port au Port and Codroy Wind Farms, 230 kV transmission lines and substations, hydrogen / ammonia production and storage facilities, and Port facilities, respectively, as identified in Table 20.12 and Section 20.5.3.1. The resultant residual



adverse change in LRU is predicted to be moderate in magnitude, short-term in duration, continuous during the decommissioning and rehabilitation phase, and reversible. The amount of LAA overlap with the key recreational / subsistence LRU areas identified in Section 20.5.3.1 and in Table 20.12 represents a relatively small proportion of the total amount of comparable lands that are available for recreational / subsistence LRU activities outside of the LAA (e.g., within the surrounding RAA).

Various decommissioning and rehabilitation activities could also result in incidental wildlife mortality, including the mortality of wildlife species of value to recreational / subsistence land and resource users, due to physical interactions with Project vehicles and equipment. The residual adverse change in LRU associated with the mortality of targeted wildlife species is predicted to be low in magnitude, geographically limited to the Project Area, short-term in duration, occurring as a multiple irregular event during the decommissioning and rehabilitation phase, and reversible.

Following the completion of Project decommissioning and rehabilitation, the rehabilitated the Port au Port and Codroy Wind Farm sites and 230 kV transmission line and substation sites will be publicly accessible and available for use by recreational / subsistence land and resource users.

Summary

With implementation of the mitigation measures prescribed in Section 20.4, the decommissioning and rehabilitation phase of the Project is anticipated to result in a residual adverse change in recreational / subsistence LRU that ranges in magnitude from negligible (i.e., no measurable change in current LRU capacity) to moderate (i.e., a measurable change in LRU capacity that may exceed the range of historical variability; does not exceed applicable objectives, guidelines, or standards; and allows land and resource use activities to take place at or near current levels within the RAA). Residual air emissions will be effectively managed through the use of standard operating procedures and best management practices to control emissions of dust to avoid adverse effects. Residual noise and vibration emissions associated with Project decommissioning and rehabilitation are not expected to exceed applicable regulatory thresholds. The Project-related residual adverse change in recreational / subsistence LRU during the decommissioning and rehabilitation phase is generally expected to be geographically limited to the Project Area (from the alteration or loss of lands and resources of value for recreational / subsistence LRU purposes) and LAA (from indirect sensory disturbance to recreational / subsistence LRU users and/or targeted species). However, the increased pressure on recreationally harvested resources (i.e., targeted species) and/or increase competition for the use of lands and resources for recreational / subsistence purposes associated with the influx of Project personnel could extend to the RAA. The residual adverse change in recreational / subsistence LRU is generally expected to be short-term in duration and range in frequency from a single event to continuous during the decommissioning and rehabilitation phase. Based on the information above (in Section 20.5.3.3), a summary of the characteristics of the predicted residual change in recreational / subsistence LRU during the decommissioning and rehabilitation phase is provided in Table 20.15.



Table 20.15 Summary of Residual Effects by Project Component on Change in Recreational/Subsistence Use During Decommissioning and Rehabilitation

Project Component	Summary of Residual Effect during Decommissioning and Rehabilitation
Temporary Workforce Accommodation	Various activities during decommissioning and rehabilitation of the accommodation camp site(s), including the use of construction vehicles and equipment, will generate noise, vibration, dust, and other air emissions that could be perceived by land and resource users. Such emissions would not typically be expected to measurably affect the activities of land and resource users, although they may be considered relatively more of a nuisance in Codroy than in Stephenville due to the varying ecological / socio-economic contexts in the two areas. Air, light, and noise emissions would be typically much less than during the construction and operation phases. Various camp decommissioning and rehabilitation activities could also result in incidental wildlife mortality, including the mortality of wildlife species of value to recreational / subsistence land and resource users, due to physical interactions with Project vehicles and equipment. Following the completion of Project decommissioning and rehabilitation, the rehabilitated workforce accommodation camp site(s) will be publicly accessible and available for use by recreational / subsistence land and resource users.
Port au Port Wind Farm and Associated Infrastructure	Decommissioning and rehabilitation of the Port au Port Wind Farm and associated infrastructure will result in the direct alteration / disturbance or loss of lands and resources in various known and potential key recreational / subsistence land and resource use areas within the Project Area. However, it is anticipated that the portions of the Project Area to be altered during the decommissioning and rehabilitation phase will be primarily or entirely limited to those that were previously disturbed by Project construction and maintenance activities. Activities will result in noise, vibration, dust, and other air emissions, as well as visual impacts. These effects will extend into the LAA, including within the key recreational / subsistence land and resource use areas that are overlapped by the LAA and are in the vicinity of the Port au Port Wind Farm. Various activities could also result in incidental mortality of wildlife species of value to recreational / subsistence land and resource users, due to physical interactions with Project vehicles and equipment. Following the completion of Project decommissioning and rehabilitation, the rehabilitated the Port au Port Wind Farm sites will be publicly accessible and available for use by recreational / subsistence land and resource users.
Codroy Wind Farm and Associated Infrastructure	Decommissioning and rehabilitation of the Codroy Wind Farm and associated infrastructure will result in the direct alteration / disturbance or loss of lands and resources in various known and potential key recreational / subsistence land and resource use areas within the Project Area. However, it is anticipated that the portions of the Project Area to be altered during the decommissioning and rehabilitation phase will be primarily or entirely limited to those that were previously disturbed by Project construction and maintenance activities. Activities will result in noise, vibration, dust, and other air emissions, as well as visual impacts. These effects will extend into the LAA, including within the key recreational / subsistence land and resource use areas that are overlapped by the LAA and are in the vicinity of the Codroy Wind Farm. Various activities could also result in incidental mortality of wildlife species of value to recreational / subsistence land and resource users, due to physical interactions with Project vehicles and equipment.



Table 20.15 Summary of Residual Effects by Project Component on Change in Recreational/Subsistence Use During Decommissioning and Rehabilitation

Project Component	Summary of Residual Effect during Decommissioning and Rehabilitation
Codroy Wind Farm and Associated Infrastructure (cont'd)	Following the completion of Project decommissioning and rehabilitation, the rehabilitated the Codroy Wind Farm sites will be publicly accessible and available for use by recreational / subsistence land and resource users
230 kV Transmission Lines and Substations	Decommissioning and rehabilitation of the 230 kV transmission lines and substations will result in the direct alteration / disturbance or loss of lands and resources in various known and potential key recreational / subsistence land and resource use areas within the Project Area. However, it is anticipated that the portions of the Project Area to be altered during the decommissioning and rehabilitation phase will be primarily or entirely limited to those that were previously disturbed by Project construction and maintenance activities. Activities will result in noise, vibration, dust, and other air emissions, as well as visual impacts. These effects will extend into the LAA, including within the key recreational / subsistence land and resource use areas that are overlapped by the LAA and are in the vicinity of the 230 kV transmission lines and substations. Various decommissioning and rehabilitation activities could also result in incidental mortality of wildlife species of value to recreational / subsistence land and resource users, due to physical interactions with Project vehicles and equipment. Following the completion of Project decommissioning and rehabilitation, the rehabilitated 230 kV transmission line and substation sites will be publicly accessible and available for use by recreational / subsistence land and resource users.
Hydrogen / Ammonia Production and Storage Facilities	Decommissioning and rehabilitation of hydrogen / ammonia plant will result in the direct alteration / disturbance or loss of lands and resources in various known and potential key recreational / subsistence land and resource use areas within the Project Area. However, it is anticipated that the portions of the Project Area to be altered during the decommissioning and rehabilitation phase will be primarily or entirely limited to those that were previously disturbed by Project construction and maintenance activities. Activities will result in noise, vibration, dust, and other air emissions, as well as visual impacts. These effects will extend into the LAA, including within the key recreational / subsistence land and resource use areas that are overlapped by the LAA and are in the vicinity of the hydrogen / ammonia plant.
Port Facilities	Decommissioning and rehabilitation of the Port facilities will result in the direct alteration / disturbance or loss of lands and resources in various known and potential key recreational / subsistence land and resource use areas within the Project Area. However, it is anticipated that the portions of the Project Area to be altered during the decommissioning and rehabilitation phase will be primarily or entirely limited to those that were previously disturbed by Project construction and maintenance activities. Activities will result in noise, vibration, dust, and other air emissions, as well as visual impacts. These effects will extend into the LAA, including within the key recreational / subsistence land and resource use areas that are overlapped by the LAA and are in the vicinity of the Port facilities



20.5.4 Residual Environmental Effects Summary

20.5.4.1 Residual Environmental Effects Characterization

Table 20.16 summarizes the predicted environmental effects (residual effects) of the undertaking on land and resource use.

Table 20.16 Summary of Predicted Environmental Effects of the Undertaking on Land and Resource Use

Residual Effect	Residual Effects Characterization							
	Nature	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological and Socio-economic Context
Construction								
Change in Designated Land Use	A	L/M	PA/LAA/RAA	NS	ST/MT	C/IR	R	D/U
Change in Commercial / Industrial Resource Use	A	N/L	PA/LAA	NS/MS/HS	ST	C/IR	R	D/U
Change in Recreation / Subsistence Use	A	N/L/M	PA/LAA/RAA	HS	ST/MT	S/C	R	D/U
Operation and Maintenance								
Change in Designated Land Use	A	L/M	PA/LAA/RAA	NS	MT	C	R	D/U
Change in Commercial / Industrial Resource Use	A	N/L	PA/LAA	NS	MT	C	R	D/U
Change in Recreation / Subsistence Use	A	N/L/M	PA/LAA	HS	MT	IR/C	R	D/U



Table 20.16 Summary of Predicted Environmental Effects of the Undertaking on Land and Resource Use

Residual Effect	Residual Effects Characterization							
	Nature	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility	Ecological and Socio-economic Context
Decommissioning and Rehabilitation								
Change in Designated Land Use	A	L	PA/LAA	NS	ST	C/IR	R	D/U
Change in Commercial / Industrial Resource Use	A	N/L	PA/LAA	NS	ST	C/IR	R	D/U
Change in Recreation / Subsistence Use	A	N/L/M	PA/LAA/RAA	HS	ST	S/C	R	D/U
KEY: Nature: <i>P: Positive</i> <i>A: Adverse</i> <i>N: Neutral</i> Magnitude: <i>N: Negligible</i> <i>L: Low</i> <i>M: Moderate</i> <i>H: High</i> Geographic Extent: <i>PA: Project Area</i> <i>LAA: Local Assessment Area</i> <i>RAA: Regional Assessment Area</i> Duration: <i>ST: Short-term</i> <i>MT: Medium-term</i> <i>LT: Long-term</i> Timing: <i>NS: No Sensitivity</i> <i>MS: Moderate Sensitivity</i> <i>HS: High Sensitivity</i> Frequency: <i>S: Single Event</i> <i>IR: Irregular Event</i> <i>R: Regular Event</i> <i>C: Continuous</i> Reversibility: <i>R: Reversible</i> <i>I: Irreversible</i> Ecological / Socio-Economic Context: <i>D: Disturbed</i> <i>U: Undisturbed</i>								



20.5.4.2 Summary of Predicted Environmental Effects

Project effects on designated land use (e.g., proposed ecological reserves, high risk PPWSAs) have been considered, and avoided or reduced, where possible. Overall, with the implementation of mitigation measures, residual effects from the Project on land and resource use are anticipated to be negligible to low to moderate in magnitude. The residual effects are limited to the Project Area (direct loss of area) and LAA (sensory disturbances). Effects range in duration from short-term (e.g., sensory disturbance due to during construction activities) to medium term (e.g., visual impacts associated with Project operation) and are anticipated to occur at irregular and continuous frequencies. Effects are predicted to be mostly reversible upon Project rehabilitation. Land and resource use within the RAA is considered to occur within a disturbed / undisturbed context, including from predicted Project-related effects. Existing land and resource use levels within the LAA are low, and there is capacity within the RAA to accommodate land and resource users displaced from the LAA.

20.6 Determination of Significance

A significant residual adverse effect on land and resource use is one that results in non-compliance with established municipal, provincial, or federal land use designations, regulations, plans, policies, or by-laws and where a change or disruption that restricts or degrades present land and resource use capacity to a point where activities cannot continue at or near current levels and where compensation is not possible.

While Project activities and components will result in adverse effects to land and resource use during each phase of the Project, these effects are anticipated to be mainly negligible to moderate in magnitude. The Project does not conflict with established federal, provincial, or municipal land use designations, policies, or by-laws. Areas subject to municipal planning restrictions may have permitting processes to follow to obtain Municipal approval prior to permit issuance for the Project. Land and resource uses are anticipated to continue to occur at or near current levels over the long term, given the level of activity occurring in the area and the alternative land available for resource and recreational pursuits. Project activities and components will not disrupt, restrict, or degrade land and resource use to a point where they cannot continue at or near current levels. With mitigation and environmental protection measures, the residual environmental effects on land and resource use are predicted to be not significant. The Project has been designed to avoid adverse impacts to AoCC through careful planning of the placement of infrastructure and shifting locations of activities away from AoCC boundaries. Where avoidance was not feasible, the application of best practices in accordance with the Project construction EPP and other standard mitigation measures will be employed to reduce the potential for effects and thus maintain the integrity of AoCCs (e.g., Bras Mort Bog). In consideration of the VEC-specific significance criteria defined above, the residual effect(s) of routine Project activities with mitigation measures on land and resource use (i.e., change in designated land use, change in commercial / industrial resource use, and change in recreational / subsistence land and resource use) are predicted to be not significant. The level of confidence in this prediction is discussed in Section 20.7.



20.7 Prediction Confidence

The level of confidence in the predictions for Project-related residual effects on land and resource use is moderate to high. This is based on information collected as part of desktop data compilation and understanding of current existing conditions, GIS data analyses, understanding of Project activities, locations and described interactions, the known effectiveness of mitigation measures, and experience of the assessment team. A moderate level of confidence was given because some of the desktop data were limited in terms of availability (e.g., inland waters navigability) or scale (e.g., number of inland fish-bearing watercourse / waterbody crossings that have potential to be fished for recreational / subsistence purposes); however, environmental effects mechanisms are well-understood. The degree to which outfitters need to adjust existing operations in response to Project-related changes in land and resource use is also unknown and not easily measured. Many of the mitigation measures identified in Section 20.4 are standard practice and have been successfully implemented in previous power projects, further increasing confidence.

20.8 Follow-Up and Monitoring

A dedicated follow-up and monitoring plan is not proposed for the land and resource use VEC. WEGH2 will develop Project-specific Environmental Effects Monitoring Programs, including an Outfitter Effects Monitoring Program, where mitigation measures will be stipulated for the construction, operation and decommissioning and rehabilitation activities. These measures will be subject to regular review as to their effectiveness as part of a process of adaptive management related to Project monitoring and follow-up.

Land and resource use activities within the RAA are the subject of ongoing planning, management, regulatory enforcement, and monitoring by the federal, provincial, and municipal governments. This includes monitoring and the collection of information on, for example, municipal land use, hunting and angling activity and development for the purpose of licensing, enforcement, and resource management. WEGH2 has provided and will continue to provide Project information to relevant agencies and organizations as required and requested. Potential follow-up related to land and resource use may involve flagging potentially affected receptors (e.g., residences, outfitter locations). Potentially affected receptors for land and resource are identified in the Socio-economic Environment and Land and Resource Use Baseline Study (Stantec 2023b).

The EIS Guidelines require the proponent to develop a Domestic Woodcutting Consultation Plan with domestic users on the Port au Port Peninsula to determine any concerns with the Project and to develop appropriate mitigation measures. This Domestic Woodcutting Consultation Plan will be submitted to the NLDDFA for review and approval.

Further site-specific engagement and management plans will be prepared by WEGH2 for Project development. An Environmental Effects Mitigation and Monitoring Plan will be submitted to the Environmental Effects Policy, Planning, and Natural Areas Division (NLDECC) and Wildlife Division (NLDDFA) for review and approval to manage potential effects to proposed ecological reserves. An Ice Throw Management Plan and a Traffic Management Plan will also be prepared for review approval by the relevant regulatory authorities to manage ice throw and traffic conditions respectively.



20.9 Capacity of Renewable Resources and Effects on Biological Diversity

The potential environmental effects of the Project on land and resource use were thoroughly assessed. The assessment concluded that routine Project activities are not likely to result in significant residual adverse effects on land and resource use. Therefore, adverse Project-related effects on the capacity of renewable resources to meet the needs of the present and those of the future are not anticipated with respect to land and resource use.

20.10 Predicted Future Environmental Conditions if the Project Does Not Proceed

The predicted future condition of the environment for land and resource use if the Project does not proceed is not expected to differ markedly from the current condition. The future condition of land and resource use is largely influenced by the availability of potable water supplies and commercial resources (i.e., productive forest, minerals, petroleum), availability of harvested species and the nature of the economy, both local and international (e.g., outfitting). A discussion of population trends for harvested species is provided in Chapters 13 to 15.

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