

Environmental Setting

## **3.0 ENVIRONMENTAL SETTING**

The Project is located in the Fundy Isles, a collection of islands located at the mouth of the Bay of Fundy in southwest New Brunswick, and lies in the Fundy Coastal Ecodistrict of the Fundy Coast Ecoregion (Figure 3.1). The area consists of significant forest stands, major river systems, wetlands, rural residential areas, and a variety of travel corridors, such as paved and dirt roads, and trails.

The Project is located in an area that spans the traditional territories of the Wolastoqiyik, Mi'kmaq, and Peskotomuhkati. In the past, the Fundy coast supported a highly productive intertidal and tidal zone rich with mollusks, seabirds, sea urchins, and seals. There have been dozens of recorded Pre-Contact archaeological sites identified along the shorelines and interiors of all the islands in the area, including those involved with the Project, demonstrating a history of use of the area by Indigenous populations spanning thousands of years. European explorers visited the area as early as the 16<sup>th</sup> Century, and it is possible that Portuguese and French occupations of these islands took place as well. However, permanent settlement by Euro-Canadians did not occur until the mid to late 18<sup>th</sup> Century, beginning in the decades following the American Revolutionary War as waves of Loyalist groups emigrated from the newly formed United States. What attracted all these diverse groups to the area was undoubtedly its bountiful marine resources which is still reflected today.

This section provides a brief overview of the environmental and socioeconomic setting within which the Project is located. This information is based on information gathered for the environmental assessment including research and field surveys completed in 2016 and 2017. Additional environmental setting information is provided in existing conditions sections for each valued component (VC).

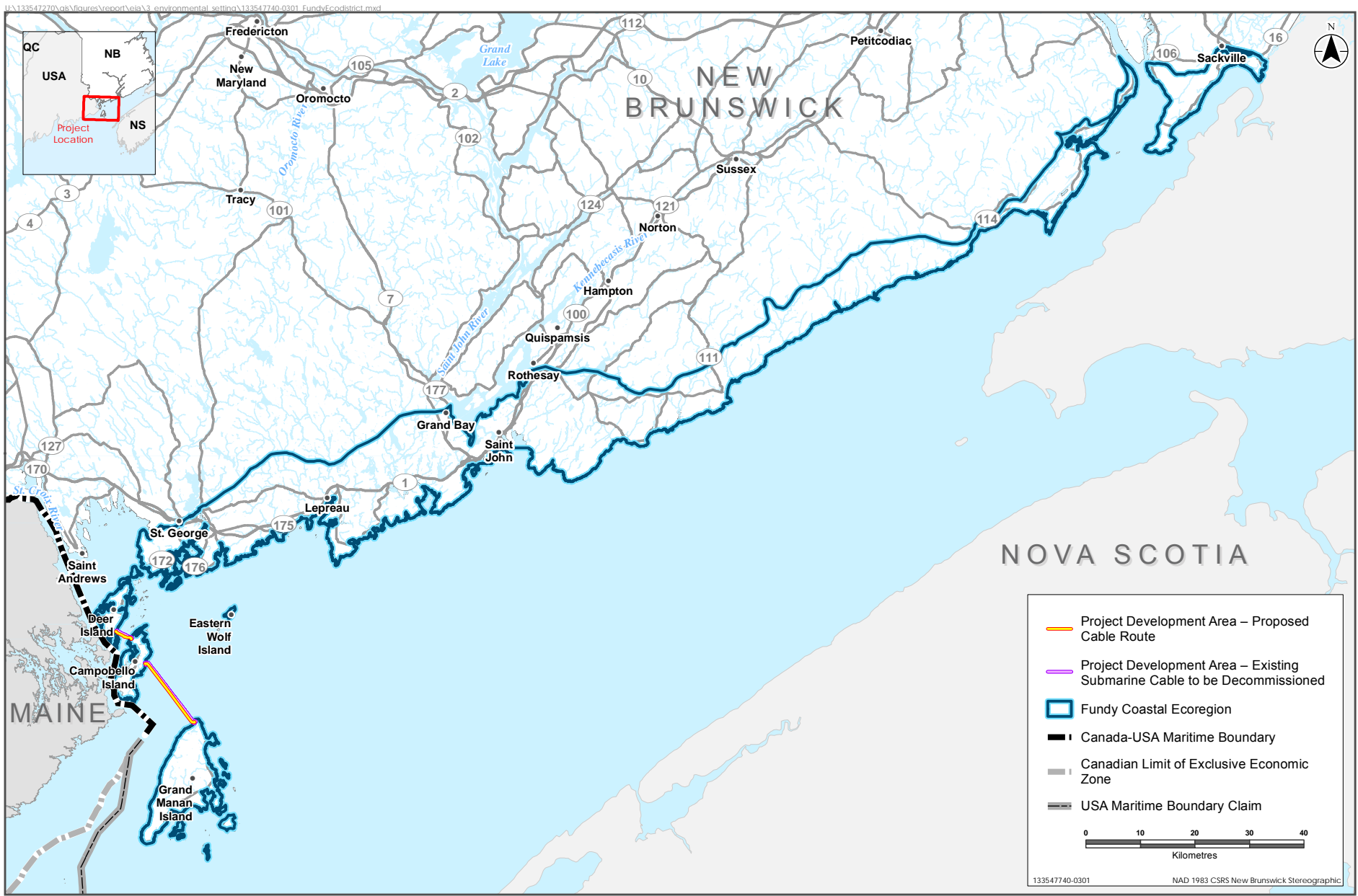
### **3.1 PHYSICAL SETTING**

#### **3.1.1 Physiography and Geography**

New Brunswick is divided into six geomorphologic regions defined by the underlying bedrock geology. The Project lies within the West Isles and Grand Manan Island portion of the St. Croix Highlands geomorphologic region (Rampton et al. 1984). The bedrock in the area consists of Precambrian metasedimentary strata to Jurassic volcanic rocks, with rocks of intermediate age including granites near St. George and Cape Spencer and sedimentary strata at St. Martins and along the Fundy coast, east of the National Park (NBDNR 2007).

#### **3.1.1 Topography and Drainage**

Elevations in this ecodistrict range from less than 100 m to over 300 m in coastal cliff areas. The rivers in this ecoregion flow into the Bay of Fundy, or a subsidiary bay or basin.



Sources: Base data provided by Service New Brunswick, Governments of Canada and Maine.

Fundy Coastal Ecoregion, New Brunswick



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### **3.1.1 Bedrock Geology**

The bedrock in the vicinity of the Project consists of mafic volcanic rock (basalt, dolerite and gabbro), felsic volcanic rock (rhyolite), and deep water clastic (greywacke, slate, siltstone, sandstone, conglomerate and limestone). See Figure 3.2 for the bedrock geology in the Fundy Coastal Ecoregion.

### **3.1.2 Surficial Geology**

The surficial geology of the northern portions of the Fundy Isles is mapped as exposed bedrock (Rampton et al. 1984), although topsoil will exist in some areas mapped as bedrock. Soils in the general vicinity of the Project area are mostly derived from igneous lithologies (e.g., granite, gabbro, and acidic volcanic rocks). The areas with the most fertile and arable lands are areas with sedimentary rocks and tidal deposits that readily erode to create fine-textured soils of loam to clay (NBDNR 2007).

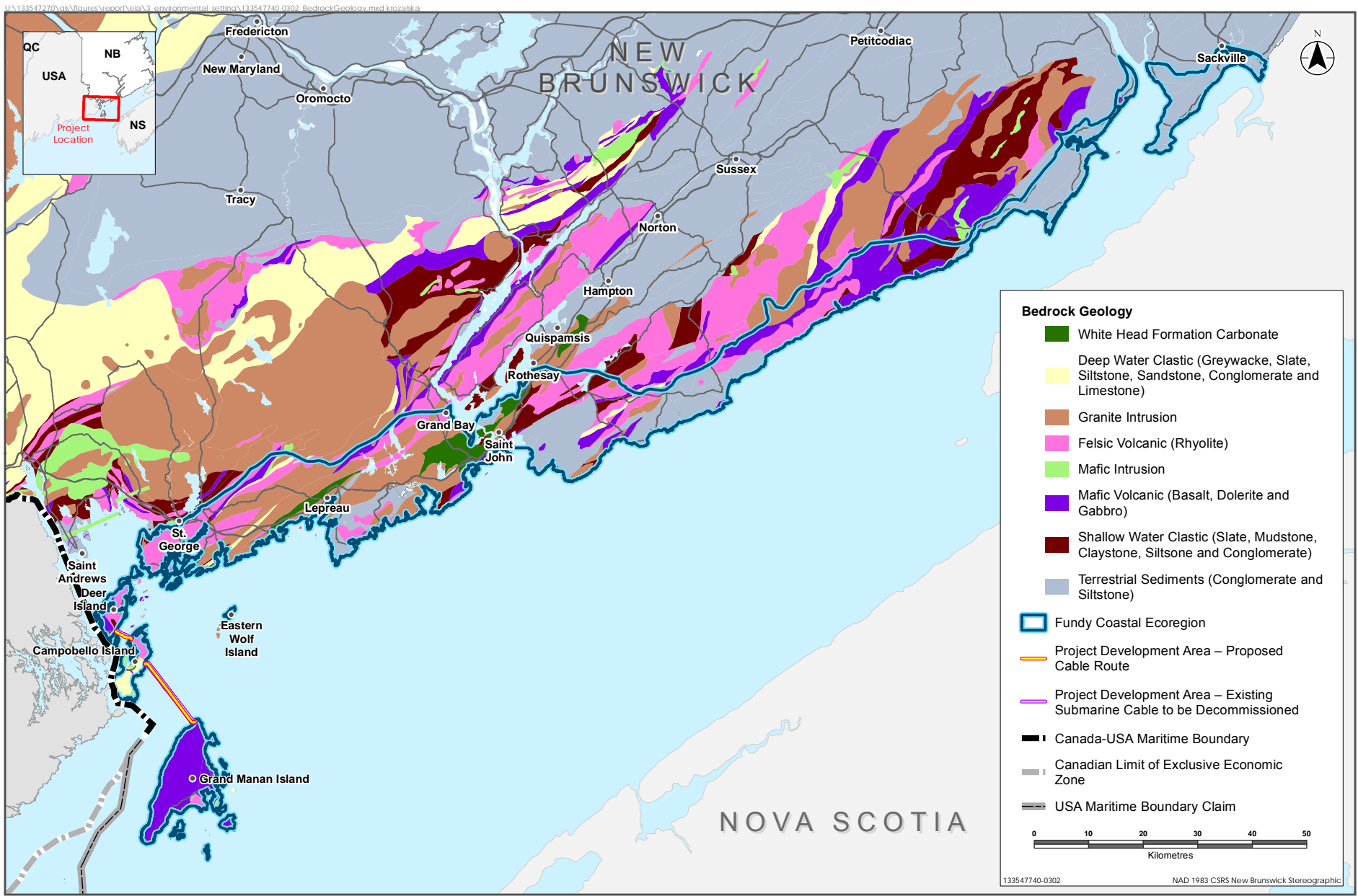
## **3.2 BIOPHYSICAL SETTING**

### **3.2.1 Atmospheric Environment**

The current climate conditions are generally described by the most recent 30-year period (1981 to 2010) for which the Government of Canada has developed statistical summaries, referred to as climate normals (Government of Canada 2016a). The closest weather station to the Project with available historic data is the Pennfield station, located approximately 25 km northeast of the Project. Limited historical climate data are available for the Pennfield station; therefore, data from the Saint John weather station, located approximately 75 km from the Project area, are also used to supplement information on regional conditions.

The average daily temperature in Pennfield ranges between -7.1°C (January) and 15.6°C (July and August) (Table 3.1). The extreme maximum temperature was 37.2°C (May 1977) and the extreme minimum temperature was -36.5°C (January 1982). From November to February, the dominant wind direction is from the northwest, with winds predominantly blowing from the north during March and April, from the south during May to August, and from the southwest during September and October (Government of Canada 2017). Further information on the climatology of the Fundy Isles area is provided in Section 13.0.

The New Brunswick Department of Environment and Local Government (NBDELG) publishes an annual report summarizing air quality monitoring results in the province. Based on a review of the most recent air quality monitoring report entitled “Air Quality Monitoring Results 2015” (NBDELG 2016), the air quality in southwestern New Brunswick and within the Fundy Isles specifically is generally considered to be good to very good, primarily because of a lack of concentrated heavy industry in the area. The closest NBDELG-operated air quality monitoring station to the Fundy Isles is located in St. Andrews, but only measures ground-level ozone and particulate matter less than 2.5 microns (PM<sub>2.5</sub>). The next closest NBDELG-operated air quality monitoring station to the Fundy Isles is in Saint John (Castle Street), which measures



Sources: Base data provided by Service New Brunswick, Governments of Canada and Maine.



Bedrock Geology, New Brunswick

Figure 3.2

**Table 3.1 Air Temperature and Precipitation Climate Normals, Pennfield and Saint John, NB (1981-2010)**

Month	Temperature (°C)					Precipitation (mm)					Mean No. of Days with							
	Averages			Extreme		Rainfall (mm)	Snowfall (cm)	Precipitation (mm)	Extreme Daily Rainfall (mm)	Extreme Daily Snowfall (cm)	Temperature (°C)				Snow (cm)		Rain (mm)	
	Max	Min	Avg	Max (Year)	Min (Year)						>=30*	>=20*	<=-20	<=-30	>=10	>=25	>=10	>=25
Jan	-1.9	-12.3	-7.1	14.4 (1979)	-36.5 (1982)	73.1	53.5	126.6	82.6	38.0	0	0	4.9	0.09	2	0.26	2.4	0.74
Feb	0.0	-10.9	-5.5	14.5 (1994)	-31.0 (1993)	60.6	40.7	101.3	83.3	36.0	0	0	3.3	0.05	1.5	0.14	2	0.59
Mar	3.4	-6.3	-1.5	19.5 (1998)	-28.5 (1989)	84.9	45.2	130.1	71.8	34.0	0	0	0.86	0	2.2	0.18	3	0.64
Apr	9.0	-1.0	4.0	23.0 (1982)	-14.0 (1995)	105.8	10.3	116.0	86.4	31.0	0	0.36	0	0	0.23	0	3.5	0.86
May	14.3	3.1	8.7	37.2 (1977)	-7.8 (1977)	130.2	0.0	130.2	60.0	8.1	0.05	2.4	0	0	0	0	4.4	1.3
Jun	18.5	7.0	12.8	33.5 (1983)	-2.2 (1976)	111.0	0.0	111.0	62.8	0.0	0.33	9.7	0	0	0	0	3.2	1.1
Jul	21.1	10.0	15.6	34.4 (1977)	2.2 (1976)	107.3	0.0	107.3	68.0	0.0	0.27	17.1	0	0	0	0	2.9	1.1
Aug	21.3	10.0	15.6	36.7 (1976)	-0.5 (1982)	98.0	0.0	98.0	111.0	0.0	0.55	18.1	0	0	0	0	2.6	0.91
Sep	18.1	6.8	12.4	34.0 (1989)	-5.0 (1995)	120.9	0.0	120.9	82.0	0.0	0.18	6.3	0	0	0	0	4.1	1.1
Oct	12.8	2.4	7.6	25.0 (2002)	-9.0 (1997)	115.8	0.1	115.8	75.9	12.2	0	0.73	0	0	0	0	4	1.1
Nov	7.0	-1.6	2.7	18.5 (1989)	-18.3 (1978)	132.2	8.3	140.4	84.3	22.9	0	0	0	0	0.32	0	4.4	1.4
Dec	1.4	-8.2	-3.4	16.5 (1982)	-35.5 (1989)	97.9	34.1	132.0	103.8	30.0	0	0	1.4	0.05	1.4	0.05	3.3	0.82
Annual	10.4	-0.1	5.2	-	-	1,237.7	192.0	1,429.7	-	-	1.4	54.7	10.5	0.19	7.6	0.63	39.6	11.7

NOTES:  
 Max = maximum  
 Min = minimum  
 Avg = average  
 \* Data taken from the Saint John weather station, as these data are not available for Pennfield  
 SOURCE: Government of Canada 2017a

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carbon monoxide, relative humidity, ambient temperature, barometric pressure, sulphur dioxide, PM<sub>2.5</sub>, nitrogen dioxide, ground-level ozone, wind speed, and wind direction. There have been no exceedances of the ambient air quality standards at Saint John in 2012, 2013, 2014 or 2015 for PM<sub>2.5</sub>, ozone, carbon monoxide, or nitrogen dioxide. Ambient air quality data for 2016 are not yet available. Additionally, the monitoring station in St. Andrews reported results within acceptable standards for ozone over the same periods (NBDELG 2016).

Currently, New Brunswick's contribution to the national total releases of air contaminants is relatively low, approximately 1.21 to 3.46 % of the national total (ECCC 2017), and its contribution to Canada's greenhouse gas emissions is approximately 1.9% (ECCC 2017).

Sound pressure levels near the Project are characterized by typical rural sounds including light traffic, natural sounds such as wildlife, noise from waves and marine vessel travel in the area.

Further information on air quality, GHG emissions, and noise are provided in Section 5.0.

### 3.2.2 Terrestrial Environment

The Project is located in the Fundy Coastal Ecodistrict of the Fundy Coast Ecoregion (Figure 3.1). The area consists of significant forest stands, major river systems, wetlands, rural residential areas, and a variety of travel corridors, such as paved and dirt roads, and trails.

#### 3.2.2.1 Vegetation

The Fundy Coast Ecodistrict is 76% forested and is dominated by coniferous forest cover, mainly by a mix of red spruce, balsam fir, black spruce, white spruce, and tamarack. At lower elevations, the vegetation is predominantly coniferous coastal forests, then transitions to mixed or deciduous forests over the warmer inland terrain. Common hardwoods found in the region are white birch, mountain ash, red maple, and yellow birch (NBDNR 2007).

#### 3.2.2.2 Wetlands

The plants in the Fundy bogs consist of mainly dwarf huckleberry, the lichen *Cladina terrae-novae*, and the mosses *Sphagnum imbricatum* and *Sphagnum austinii*.

#### 3.2.2.3 Wildlife

Excluding fish and marine mammals, New Brunswick is host to 531 vertebrate animal species, including 449 birds, 59 terrestrial mammals, 16 amphibians and 7 terrestrial reptiles (NBDNR 2017). The Project is in the south of the Province, and within an ecodistrict of several rare or uncommon species. The offshore islands of New Brunswick are known for their seabird and floral significance (NBDNR 2007). Machias Seal Island has the only known nesting site in the province for Arctic tern (*Sterna paradisaea*), Atlantic puffin (*Fratercula arctica*), and razorbill (*Alca torda*). Machias Seal Island is approximately 40 km southwest of the PDA. The Wolf Islands contain one of the largest concentrations of wintering harlequin duck (*Histrionicus histrionicus*) in NB. This species is recognized as Schedule 1, Special Concern under

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the federal *Species at Risk Act*. The Wolf Islands are approximately 15 km northeast of the PDA. It is unlikely these species would be found near the Fundy Isles area, given their distance from the Project.

Detailed information on vegetation, wetlands and wildlife is provided in Section 6.0.

### 3.2.3 Marine Environment

The Bay of Fundy has an extreme tidal range, which increases from 6 m at its entrance, to as much as 16 m at the head of the Bay (DFO 2012a). Strong tidal currents and complex bottom topography in some areas results in high current velocities including tidal rips, whirlpools, upwelling and intense mixing throughout the region. The Bay of Fundy generally has high turbidity in part from its high currents (DFO 2012a). Due to these characteristics, the Bay of Fundy is a species-rich environment that harbours a great number of different marine wildlife species.

The Bay of Fundy is generally characterized based on two zones that make up the entire Bay: the Inner Bay of Fundy (iBoF), and the Outer Bay of Fundy (oBoF). The iBoF generally consists of the portion of the Bay of Fundy from a point east of the mouth of the Saint John River (but excluding the Saint John River itself) to the easternmost point of the Bay of Fundy and Chignecto Bay. The oBoF consists of the portion of the Bay of Fundy, from and including the Saint John River and westward until the Bay of Fundy reaches the Gulf of Maine.

The Bay of Fundy is characterized by a wide variety of habitat types (DFO 2012a). Over 100 fish species can be found, with many of these species occurring in coastal areas surrounding Grand Manan, Campobello Island, outer Passamaquoddy Bay, and in the mid Bay off Mispec Point.

Seven species of marine mammals are found year-round or seasonally within the Bay of Fundy (Stantec 2016): fin whales (*Balaenoptera physalus*), North Atlantic right whales (*Eubalaena glacialis*), minke whales (*Balaenoptera acutorostrata*), humpback whales (*Megaptera novaeangliae*), harbour porpoise (*Phocoena phocoena*), Atlantic white-sided dolphins (*Lagenorhynchus acutus*), and harbour seals (*Phoca vitulina concolor*)

The Bay of Fundy is located on a major migration route that has been known for many years by birdwatchers and ornithologists as an important part of the Atlantic Flyway (Dietz and Chiasson 2000).

Within the Bay of Fundy, there is the critical habitat for the North Atlantic right whale in the Grand Manan Basin. This critical habitat supports adult foraging and feeding, calf rearing and nursing, and resting and socializing.

Detailed information on the marine environment is provided in Section 7.0.

### 3.2.4 Water Resources

The Project located in the Fundy Isles Composite drainage basin, occupying a drainage area of 237.32 km<sup>2</sup>. No mapped freshwater watercourses or waterbodies were identified within 500 m of any of the landfall sites. Surface runoff at the landfall sites flows toward the Bay of Fundy. Groundwater quality in the vicinity of the Project was evaluated using the NB Groundwater Chemistry Atlas (NBENV 2008), and

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is generally good, meeting the Guidelines for Canadian Drinking Water Quality (Health Canada 2017), with the exception of occasional exceedances of antimony, arsenic, iron, and manganese. These exceedances are presumed to be associated with the interactions with bedrock minerals.

There is an estimated total of at least 157 water wells within the LAA for all four landfall sites, based on interpretations of aerial imagery, of which 27 water well records are available in the NB OWLS database. The Wilsons Beach landfall site is the most densely populated of the four landfall sites, and is estimated to have at least 128 water wells within 500 m of the landfall site.

Detailed information on water resources is provided in Section 8.0.

## **3.3 SOCIOECONOMIC SETTING**

### **3.3.1 Economic Activity and Economic Drivers**

The Fundy Isles is located within the Southwest Economic Region of New Brunswick. Employment in this region is dominated by the sales and service industry; other major employers include business and administrative positions (GNB 2013).

### **3.3.2 Land Use**

Approximately 76% of the land in the Fundy Coastal Ecodistrict is forested. Of the remaining 24% unforested land, 37% of the land is wetlands, 24% for developments, 21% is used for agriculture, and 7% for roads (NBDNR 2007).

### **3.3.3 Transportation and Transportation Infrastructure**

There is one local numbered highway, along with a series of local roads on each of the islands within the PDA. Highway 772 travels along Deer Island, Highway 774 travels along Campobello Island, and Highway 776 travels along Grand Manan Island (NBDTI 2017). The nearest public international airport is the Saint John Airport, approximately 120 km (via highway) away, with a regional airport located on Grand Manan Island.

Further information on the socioeconomic environment is provided in Section 9.0.

## **3.4 COMMERCIAL, RECREATIONAL AND ABORIGINAL FISHERIES**

### **3.4.1 Commercial Fisheries**

Commercial fishing is an important industry in the Bay of Fundy. The Project is located within the Maritimes Region of the DFO. The Maritimes Region includes the Bay of Fundy and incorporates information from both New Brunswick and Nova Scotia. In 2015, 1,749 fishing licenses were issued for commercial fishing in the Maritimes Region in New Brunswick. The majority were for clam, lobster, scallop, and herring (DFO 2017).



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There are 34 different commercially fished species located with the Bay of Fundy, consisting of 18 groundfish species, six pelagic species, five shellfish species, one marine mammal, and five species of marine plants. The three major commercial fisheries by value are lobster, scallop, and herring.

Aquaculture production in the Bay of Fundy is primarily for Atlantic salmon. There are no known aquaculture leases within the PDA.

#### 3.4.2 Recreational Fisheries

Recreational fisheries exist in the Bay of Fundy for groundfish (cod, flounder, haddock, dogfish, pollock, and striped or Atlantic wolffish), mackerel, shark (porbeagle, blue shark, shortfin mako), bluefin tuna, marine worms, and shellfish, which includes bar clams, bay quahaug, razor clams, soft shell clams, scallops, and oysters (DFO 2016; 2015a; 2015b).

#### 3.4.3 Aboriginal Fisheries

The Mi'kmaq and Wolastoqiyik participate in fisheries for food, social or ceremonial (FSC) purposes under the constitutional protection of Aboriginal and Treaty rights. Access to these fisheries is through community negotiated AFS agreements, imposed licenses by the Government of Canada, or by community declarations of Aboriginal and Treaty rights for species which conservation is not a concern (MGS & UINR 2016). Commercial fisheries access is governed through commercial communal licenses, in which for most cases the license owner is the First Nation band. The majority of the communal commercial fishing licenses are for lobster, herring, and groundfish.

Within NAFO 4X, which includes the Bay of Fundy, three Maliseet and 13 Mi'kmaq First Nations have allocations for marine/diadromous species for the purposes of food, social or ceremonial purposes

Detailed information on the commercial, recreational, and Aboriginal fisheries is provided in Section 11.0.